

FACTORS THAT INFLUENCE THE ADOPTION AND IMPLEMENTATION OF PUBLIC DIGITAL ACCOUNTING ACCORDING TO THE EVALUATION BY MANAGERS OF BRAZILIAN COMPANIES

FATORES QUE IMPACTAM NA ADOÇÃO E IMPLEMENTAÇÃO DO SPED NA AVALIAÇÃO DOS GESTORES DAS EMPRESAS BRASILEIRAS

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ABSTRACT

This study aims to identify the factors that influence the adoption and implementation of the Public Digital Accounting System (*Sistema Público de Escrituração Digital*, or SPED) according to the evaluation of managers of Brazilian companies, expressed in response to a survey, based on the criteria established by the TOE framework, considering technological, organizational and environmental dimensions. The results

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show that although other factors influence decisions about the adoption and implementation of the SPED, government requirement, as a component of the environmental dimension, is the main factor driving those decisions. This seems to result from the fact that the government is a major, if not the main, actor in the regulatory environment. We also identified big expectations of companies regarding the possibility of reducing the volume of ancillary tax obligations (record-keeping and reporting obligations). The ranking generated from the survey is a contribution to the improvement of strategies for implementation of e-government projects, both by governments and companies.

Keywords: Electronic Government; SPED; TOE framework.

RESUMO

Esta pesquisa procurou identificar os fatores que impactam a adoção e implementação do SPED segundo avaliação de gestores de empresas brasileiras, contemplando fatores estabelecidos pelo Modelo TOE, passando pelas dimensões tecnológica, organizacional e ambiental do referido modelo. Através do tratamento estatístico dos dados oriundos da aplicação de uma *survey*, buscou-se resposta aos objetivos de pesquisa. Detectou-se que, embora existam outros fatores influenciando decisões sobre adoção e implementação do SPED, a obrigatoriedade governamental, enquanto componente do contexto ambiental, demonstrou ser o principal vetor de impacto, isto é, de influência, sobre tais decisões. Isto pareceu decorrer do fato de que o governo ser um dos principais, se não o principal ator do ambiente regulatório.

Palavras-Chave: Electronic Government; SPED; TOE framework.

1. INTRODUCTION

As proposed by Pudjianto *et al.* (2009), among many others, the Internet phenomenon has had a truly transformative influence on society, opening a new means of communication for individuals and firms. Besides facilitating the exchange of information, the Internet provides totally new ways to find data. Verdegem and Verleye (2009) corroborate this argument, stating that the Internet has changed the ways people live, learn, work and produce. According to Pinho (2008), the transformations afforded by advances in information and communication technologies (or ICTs) can be classified as a new developmental stage of societies.

In turn Kumar *et al.* (2007) recognize the transformative impact of the Internet on firms and point out that the political class cannot be apathetic to these transformations, ignoring innovations that can and should be assimilated also to revolutionize public administration, enhancing the provision of services and the transparency of government to society as a whole.

Rodriguez-Domínguez *et al.* (2011) note that in various countries, politicians and public administrators have taken advantage of the potentials of ICTs to communicate with citizens through totally new interfaces. Al-Zoubi *et al.* (2011) complement this observation, affirming that these new technologies have fostered many transformations and enriched the possibilities for interaction of governments, companies, citizens and other stakeholders through the mechanism of electronic

government.

Leite and Rezende (2010) propose a model based on the strategic use of information technology that provides public managers with information to monitor and control strategic execution of policies, make decisions and manage the relationships with citizens. Their conclusion is that the utilization of the model can make a significant contribution to the advancement of municipal management.

The Organization for Economic Cooperation and Development (OECD, 2001) defines electronic government or e-government as the application of new information and communication technologies (ICTs) in all governmental functions.

Patel and Jacobson (2008) indicate that many of the dimensions of electronic government, such as its adoption and implementation, have not yet been studied and defined and that it is hard to understand its different communication interfaces and applications, considering that electronic government is a relatively new field of research regarding information systems.

For Titah and Barki (2006), despite the relative immaturity of studies about electronic government and the lack of mature models to explain its various dimensions, many exploratory and empirical studies exist, which can be classified into five large categories: a) management practices; b) individual and organizational characteristics; c) characteristics of information technology (IT); d) evaluation of electronic government; and e) subcultures in electronic government. According to them, these five categories explain five important factors that influence the adoption of electronic government.

Al-Zoubi *et al.* (2011), on the other hand, stress that the field of implementing electronic government and its impacts on companies only received attention in the preceding five years and that the increase in the number of studies of this aspect can support improvements in the quality of projects. This argument finds support from Pudjianto *et al.* (2009), who had previously diagnosed from a literature review that approximately 60 percent of IT projects for the adoption and implementation of electronic government had failed or had not managed to attain the expected objectives. Thus, it is necessary to consider a significant lack of in-depth studies about the adoption and implementation of this type of project. Despite this alarming statistic presented by Pudjianto *et al.* (2009), Faria *et al.* (2011) point out that technological advances in recent times, particularly the Internet, provide an opportunity to create tools to collaborate with governments in the exercise of their functions and that increasingly stimulate new electronic government initiatives, including in Brazil.

These mechanisms for evaluation and control can be applied to the services of electronic government both manually and automatically, among them systems for auditing, tabulation of indicators, data gathering and knowledge management (Rezende, 2008)

In this sense, Duarte (2011) states that Brazil is the protagonist of the largest electronic government project on the planet, due to the creation of the Public Digital Accounting System (SPED), an electronic government project conceived by the Brazilian government, led by the Federal Revenue Secretariat, starting in 2007, with the aim of improving oversight and control by governments at all levels (state and municipal as well as central) of information on taxes and fiscal policy.

As clarified by Silva *et al.* (2014), the SPED is a project that includes various technologies, such as digital certification and web services, among others, for the purpose of facilitating and operationalizing various flows of information to improve the oversight apparatus of the government.

With the creation of the SPED, the Brazilian government definitively entered the digital era, “for the purpose of bringing the tax administration closer to taxpayers” (Faria *et al.*, 2011, p. 2). According to Duarte (2011), the project was originally created through Decree 6,022 in January 2007, as one of the elements of the Growth Acceleration Program (PAC) for the 2007-2010 period.

Neves Júnior *et al.* (2011) points out that before the SPED, other e-government projects had been instituted in Brazil to modernize the tax oversight of governments, but the results had not been fully successful due to the lack of standardization of the information required by the three levels of government (federal, state and municipal). Therefore, “information technology, together with the joint efforts of various public spheres, has enabled greater interactivity and agility in the process of transmitting information to the Federal Revenue Secretariat, with the creation of the SPED standard” (Neves Júnior *et al.*, 2011, p. 1). Mota and Cirino (2010, p. 2) add that the SPED is an e-government project that “results in a new behavior, new policies and procedures to be adopted by organizations [...] that will benefit the process of accounting management and generate improvements in the process of fiscal control of organizations.”

Understanding the vagaries and requirements of this new paradigm is a condition *sine qua non* to make suitable decisions related to the adoption and implementation of the necessary adaptations, considering the reality of firms, which are supervised more intensely, as well as considering government reality, which over time can implement improvements in e-government projects, such as simplifying ancillary obligations and streamlining interaction with companies.

The main objective of this article is to identify the factors that affect the adoption and implementation of the SPED as evaluated by the managers of Brazilian companies. This study is limited to the perspectives of companies regarding the adoption and implementation of electronic government projects that affect them, especially in the area of taxation, which is one of the most timely and proper perspectives to understand the government-business (G2B) relationship. This standpoint is regarded as timely considering the recent implementation of the SPED in Brazil, and proper considering the strong governmental efforts in recent years to improve its oversight and prescriptive apparatus regarding compliance with obligations involving corporate taxes. This governmental effort has unquestionably influenced, or impacted, decisions on the adoption and implementation of new technologies by firms, since in essence the technical parameters of the SPED prescribe what the government wants, but not how this must be accomplished by companies.

2. THEORETICAL FRAMEWORK

2.1 Electronic Government

On the matter of the application and use of technologies by governments, Jordana *et al.* (2005) indicate three main arenas of governmental influence, namely: a)

regulatory policies, including the power to define rules for control of economic agents and supervise their operations; b) promotion (or incentive) policies, encompassing the power to develop policies to stimulate digital economy through initiatives that encourage the emergence of base industries and innovation linked to technology; and c) dissemination policies, covering the implementation of measures that stimulate the use and incorporation of information resources in society as a whole, to increase the demand for services and knowledge linked to information technology.

Diniz (2009) and Jovarauskiene and Pilinkiene (2009) also recognize a certain protagonism of governments by proposing that they have important roles to play, mainly in regulating the activities of companies and citizens in the area of electronic commerce, and also as agents themselves able to incorporate technological resources to offer information and services to citizens.

In this sense, it is fitting to analyze the main concepts of electronic government, its classifications and aspects that relate electronic government and the modernization of tax administrations, as summarized in the next sections.

According to Agner (2007), information and communication technologies (ICTs) have been considered the main vector for transformation of the economic, political and cultural fabric of human societies, able to change the relations of the various actors and the way that institutions are configured and managed. Abuali *et al.* (2010) corroborate this statement, stressing that humanity is experiencing a great transformation caused by ICTs and is feeling the effects on varied routine daily activities, like watching television, using computers, shopping and studying.

Ho, Kauffman and Liang (2006) also recognize the transformative effects of ICTs on economies and societies, and note that the productive capacity and standard of living of a nation are determined by technological advances and that the associated information and knowledge are key factors for economic growth.

Despite its transformative power, the use of ICTs “is influenced by the organization of existing institutions. The limits of the structural arrangements that exist in the State impose on the various actors decisions about how the World Wide Web and other technologies should be used” (Agner, 2007, p. 37).

Fountain (2011) indicates that at least for the next 25 years, new forms of governmental organization are not on the horizon. In other words, the legacy of the bureaucratic school will continue to be felt, since it has contributed greatly to the professionalization of public management. The author also stresses that it is impossible to predict how information technology resources will influence the procedural organization of the State. Nevertheless, she argues that governments have perceived new possibilities for use that prioritize focus on citizens, companies and other spheres of the public power, such as the tax administration.

In parallel, in the business context, the advances intensified by ICTs “enable organizations to migrate their existing systems in conventional platforms to systems with web interface” (Medeiros, 2004, p. 29). In contrast, according to the author, in the governmental context, the prevailing scenario is one of slow death of legacy systems, consisting of the applications made available by old data processing centers of government, utilized for many decades, normally for the purpose of supporting transactional activities.

Verdegem and Verleye (2009) recognize that the advances indicated by Medeiros (2004) have drastically modified the way organizations and society work, and contend that those advances cannot be ignored by the political class and that public managers need to incorporate those trends and rethink the ways of providing services and information to citizens in general.

This context stimulates the intensive use of Internet-based systems by firms and governments, which, according to O'Brien (2006), have enabled various types of electronic interactions, including electronic government.

According to Faria *et al.* (2011), the term electronic government was first used in 1999 in the United States, by then vice president Al Gore, who at the time signaled the need for the public administration to incorporate and use information and communication technologies to support and improve the services provided to society in general.

Considering the difficulties of defining electronic government pointed out by Agner (2007), Ho, Kauffman and Liang (2006) and Yang *et al.* (2012), below we propose a list of concepts to allow comparisons and accompany the evolution of the construct over time.

In a less prescriptive and broader format, the Organization for Economic Cooperation and Development (OECD) proposes that “the term ‘e-government’ focuses on the use of new information and communication technologies (ICTs) to the full range of government functions” (OECD, 2001, p. 2).

According to Ferrer (2003), electronic government can be considered the set of services and ways of accessing information that government offers to the different actors of civil society by electronic means.

A broader definition is proposed by Ahmadabahi *et al.* (2013), in stating that electronic government, or e-government, is the selection, implementation and utilization of information and communication technologies in government to provide public services, improve managerial efficacy and promote democratic values and mechanisms, accompanied by the development of a legal and regulatory framework that facilitates information-intensive initiatives and promotes the knowledge society.

Al-Azri *et al.* (2010) clarify that the varied demands of the many segments of society require specific interfaces for relating with government, which he believes explains the various segments of e-government, such as government-to-business (G2B), government-to-citizens (G2C), government-to-employees (civil servants) (G2E) and government-to-government (G2G).

Duarte (2011), complementing the reasoning traced out by Vasconcellos and Rua (2005), indicates that the ambit of B2G includes transmission of information relevant to taxation i.e., the transactions that generate the obligation for firms to pay taxes or report information based on engaging in economic activities regulated by the government.

In turn, according to Turban *et al.* (2010), the government-to-government category (G2G) covers all the intra-governmental exchange activities, both between different units of a government and between different spheres or levels of government.

2.2 Electronic government and oversight by the tax authorities through the SPED

As noted by Faria *et al.* (2011), among many others, the tax burden in Brazil is very high in relation to the gross domestic product (GDP). As if this were not enough, Brito (2008) points out that considering all the types of economic activities, there are more than 170 record-keeping and/or reporting obligations regarding taxes, subsets of which must be satisfied by each company depending on its type and economic segment.

Another latent factor making this situation even more complex is the widespread occurrence of tax evasion, which, as defined by Siqueira and Ramos (2005), corresponds to the difference between the amounts paid and the amount that legally should have been paid. According to this concept, some “taxpayers take advantage of the imperfect information the tax administration has about their tax liabilities to shirk their payment obligations” (Siqueira, & Ramos, 2005, p. 5).

In specific terms, tax evasion is possible because of the inability of government “to observe the real amount of the taxable basis of an individual, and the resulting inability to know the true tax liability” (Siqueira & Ramos, 2005, p. 5). Therefore, the government needs to react and seek ways to “fight this tax evasion, through increasingly stringent controls by the tax administration system” (Faria *et al.*, 2011, p. 3). The latter authors further stress that the recent advances in the field of ICTs, especially the Internet, besides interconnecting the world, also provide tools to help governments in exercising their oversight and operational functions.

Mota and Rodrigues Filho (2010) observe that the generalized diffusion of electronic commerce technologies in the private sector has prompted governments also to use this potential, by redesigning various areas of governmental activity, such as electronic processing of purchases (e-procurement), as well as projects to improve the quality of information received and the supervisory power in the area of taxes.

According to Vasconcellos and Rúa (2005), one of the gains obtained from technological advances for electronic government is the possibility of improved interactions among governments, citizens and firms regarding tax obligations, which are “necessary in a democratic system”.

As observed by Neves Júnior *et al.* (2011), because of the growing attention of governments to the opportunities provided by ICTs, many e-government projects have been put in place. In Brazil, the Public Digital Accounting System (SPED) in particular has enabled an impressive transition from “the paper phase to the digital transmission phase, increasing the speed, security and reliability of sending information and facilitating its sharing among tax authorities at different levels of government” (Neves Júnior *et al.*, 2011, p. 2).

As recounted by Sant’Anna and Teló (2010, p. 402), the creation of the SPED traces its roots to Federal Decree 5,378/2005, which established the need for “measures to improve the national taxation system,” more specifically regarding the oversight powers of governments, with significant impacts, by “requiring a higher level of adaptability of organizations, the government and society.”

Subsequently, with the establishment of the SPED, the Brazilian government definitively entered the digital age, “for the purpose of bringing the tax administration

closer to taxpayers” (Faria *et al.*, 2011, p. 3). As mentioned previously, this project was formally created by Decree 6,022, issued in January 2007, as one of the elements of the Growth Acceleration Program (PAC) for the 2007-2010 period.

Duarte (2011) believes that with the SPED, the Brazilian government became the protagonist of the largest electronic government project on the planet, covering around a half million companies that issue electronic invoices under its auspices, without considering the firms that are required to submit to other projects for reporting tax information.

Neves Júnior *et al.* (2011) points out that the SPED was not the first e-government project in Brazil aiming to improve oversight of taxes, but these initiatives were not completely successful because of a lack of standardization of the information demanded by the three levels of government (federal, state and local). Therefore “with the creation of the SPED standard, information technology, through the joint efforts of various public spheres, has enhanced the interactivity and agility of the process of transmitting information to the Federal Revenue Secretariat” (Neves Júnior *et al.*, 2011, p. 1).

Vasconcellos and Rua (2005) also point to the previous lack of standardization of information and technologies, which posed barriers to full compliance by taxpayers, since the systems employed by tax authorities were fragmented in technical aspects and did not include mechanisms for the exchange of information.

Therefore, it can be stated that the SPED is an e-government project that “results in a new behavior, new policies and procedures to be adopted by organizations [...] that will benefit the process of accounting management and generate improvements in the process of fiscal control of organizations” (Mota & Cirino, 2010, p. 4). Understanding the vagaries and requirements of this new paradigm is a *sine qua non* to make suitable decisions related to the adoption and implementation of the necessary adaptations.

According to the Federal Revenue Secretariat, the SPED project is a key initiative for modernization of the current system of compliance with record-keeping/reporting obligations. In this new context, information is transmitted electronically by taxpayers to the various tax authorities and oversight entities, using digital certification for purposes of signing electronic documents.

In this respect, Faria *et al.* (2011) highlight that the SPED improves tax authorities’ processes, by allowing more effective supervision of taxpayers’ transactions and enabling automatic electronic auditing, as already applied to income tax returns.

In turn, Decree 6,022/2007 refers to the SPED as an instrument that unifies the activities of receiving, validating, storing and authenticating the documents and books that compose the commercial and tax accounting systems of entrepreneurs and businesses, through a singular computerized flow of data.

In this context, according to the Federal Revenue Secretariat, the SPED, while making tax evasion harder, will also provide benefits to taxpayers, by reducing the use of paper (with environmental benefits as well), reducing costs through rationalization and simplification of ancillary obligations, improving the quality of information, reducing involuntary involvement in fraudulent practices and good faith errors, facilitating the exchange of information with taxpayers through a standard layout, and reducing administrative costs, among others.

To summarize, according to Duarte (2011), with the implementation of the SPED, taxpayers will no longer have to deliver information to multiple tax authorities on paper. Instead, they will do so over an online digital system. Besides this, the three levels of government will have access, through working arrangements, to all the information stored in the system.

Duarte (2011) explains that the SPED initially contemplated three projects: Electronic Invoicing; Digital Accounting Books (ECD); and Digital ICMS¹/IPI² Books (EFD ICMS/IPI). However, new projects are in the implementation phase, such as Digital PIS/Cofins Books³ (EFD Contributions), or in the planning phase, such as Electronic Real Profit Determination Book⁴ (e-Lalur), Social Fiscal Book (e-Social) and Central Balance Sheet Reporting.

Currently, e-Social is the main project under way to expand the scope of the SPED's electronic controls system, to cover payroll information for purposes of social security contributions and income withholding tax.

2.3 Technology-Organization-Environment (TOE) framework

The academic literature presents several models that attempt to identify the factors that determine rational behavior regarding the adoption of ICTs. A systematic review of these models is beyond the scope of this article, but we can mention among them the Theory of Reasoned Action (TRA) (Fishbein & Ajzen (1975), the Technology Acceptance Model (TAM) (Davis, 1989) and the Unified Theory of Acceptance and Use of technology (UTAUT) (Venkatesh *et al.*, 2003). The evolution of these models reflects the influence of the results of empirical tests applied over the last four decades since the diffusion of ICTs in the organizational context and goes a long way to explain the variance in the intentions to use different ICTs developed during this period and the behavior related to adopting them.

Based on the description in section 2.2, the SPED can be interpreted as a technological innovation made possible by ICTs, but one with a key characteristic, which is the obligation imposed by the government to adopt it, regardless of individual intentions. For this reason, we use the TOE (technology, organization, environment) framework, or model, proposed originally by Tornatzky and Fleischer (1990). It has

¹ ICMS is a Tax on Circulation of Goods and Services (only interstate and intercity transportation and communication services), levied exclusively by the state governments. It is a value-added tax (subject to offsetting debits and credits).

² IPI is the Tax on Manufactured Products, a federal value-added tax.

³ PIS and Cofins are, respectively, the Contribution to the Social Integration Program and the Contribution to Finance Social Security (not to be confused with social security contributions to the pension system). *Contribuições* are levies whose revenues are reserved for specific uses instead of going into the general fund. Contributions may only be established by the federal government and allow more discretionary spending power, since revenues in the general fund are subject to several mandatory set-asides (e.g., for health, education and revenue sharing with the state and municipal governments).

⁴ "Real Profit" refers to the main taxation regime applicable to businesses, whereby revenue is adjusted by deductions in determining the taxable basis. The other main regimes are the expected profit and the *Simple Nacional* systems. The first is an option for mid-sized companies (below a yearly revenue threshold), in which the two business levies (Corporate Income Tax and Social Contribution on Net Profit) are charged on a expected profit margin calculated on gross revenue (the rates depend on the company's business activities). The effective tax rates are lower than in the real profit regime, but tax is owed even if the company makes a loss. The *Simple* regime applies to micro and small businesses, and, besides simplifying the ancillary requirements, it grants substantial tax breaks.

been widely applied in empirical studies of the implementation of ICTs, especially of applications developed since the start of widespread use of the Internet. In the case of the SPED, this innovation reflects the process of obtaining new tools in a given environmental context, which allows studying the complex interdependencies resulting from the introduction of e-government, as observed by Jordana et al. (2005). It also reflects the dynamics of technological innovation involving individuals, organizations and public policies (Mello, 2012.)

According to the model originally proposed by Tornatzky and Fleischer (1990), the environmental dimension considers the factors of the external context that influence decisions to incorporate technological innovations. In turn, the organizational dimension permits analyzing how the characteristics of the organization, present in its management models, influence the adoption and implementation of new technologies. With respect to new technologies, consideration is given to their inherent characteristics, reflecting their stage of diffusion, which can consequently influence their adoption and implementation by an organization.

As demonstrated by Chan, Chong and Zhou (2012), in recent years many studies have been published applying the TOE framework to investigate the process of adopting and implementing innovations, and more recently innovations connected with electronic government. Chart 1 lists some of the studies on the adoption and implementation of ICT tools, particularly electronic commerce and electronic government, using the TOE framework in recent years:

Authors and Year	Title	Subject Matter	Scope	Methodology
Chan, F.T.S., Chong, A.Y.L., & Zhou, L. (2012)	An empirical investigation of factors affecting e-collaboration diffusion in SMEs	e-Collaboration (collaboration of companies of a supply chain using electronic commerce technologies)	Malaysia	Qualitative
Rodríguez-Ardura, I., & Meseguer-Artola, A. (2010)	Toward a Longitudinal Model of e-Commerce: Environmental, Technological, and Organizational Drivers of B2C Adoption	Factors that affect the adoption and implementation of B2C in companies	Spain	Quantitative
Oliveira, T., & Martins, M. F. (2010)	Firms Patterns of e-Business Adoption: Evidence for the European Union- 27	Factors that affect the adoption of B2C and B2G in European companies	27 European countries	Quantitative

Henderson, D., Sheetz, S. D., & Trinkle, B. S.	The determinants of inter-organizational and internal in-house adoption of XBRL: a structural equation model	Factors that affect the adoption of electronic government technologies (XBRL standard)	11 countries	Quantitative
Pudjianto, B. W., & Hangjung, Z. (2009)	Factors Affecting E-Government Assimilation in Developing Countries	Adoption of electronic government technologies in developing countries	16 countries	Qualitative
Bandyopadhyay <i>et al.</i> (2012)	Organizational adoption of cyber insurance instruments in IT security risk management – a modeling approach	Adoption and implementation of cyber insurance instruments in IT security risk management	United States	Quantitative
Pitassi, C. Gonçalves, A.A., Moreno, V. (2012)	Fatores que influenciam a adoção de ferramentas ICT nos experimentos de bioinformática de organizações biofarmacêuticas: Um estudo de caso no Instituto Nacional do Câncer	Bioinformatics tools	Brazil	Qualitative

Chart 1: Some studies published in recent years employing the TOE framework

Source: Authors.

Below we discuss the factors that we chose from the literature studied, including those in the chart above, and that will compose the TOE model employed here regarding the adoption and implementation of the SPED by Brazilian companies.

2.3.1 Technological context

On the matter of integration of technology, Oliveira and Martins (2010) suggest that new technologies, particularly those based on the Internet, are characterized by enormous potential to generate savings, such as reduction of the cycle of development of new products/services, improvement of support and response to customers, reduction of procurement costs and improved coordination of the various steps of the supply chain. Nevertheless, the empirical cases studied indicate that the adoption depends on the availability of qualified professionals (Rodríguez-Ardura *et al.* 2010). In the case herein studied, this means people with solid knowledge of the SPED and the associated technological standards, to enable better integration of the various modules that are directly and indirectly involved in the application (Neves Júnior *et al.* (2011).

Henderson *et al.* (2012), Rodríguez-Ardura *et al.* (2010) and Patel and Jacobson (2008) corroborate this argument by pointing out that higher levels of technological integration achieved with the creation of applications based on the Internet provide higher levels of business achievement, since the novel features are more easily integrated with the set of other pre-existing applications. In the case of the SPED, the interest is to assess the improvement in the processes and controls to enable compliance with the demands of regulatory authorities (Mota & Cirino, 2010).

2.3.2 Organizational context

Rodríguez-Ardura *et al.* (2010) note that larger companies tend to have greater propensity to innovate, besides typically being more eager to take advantage of gains of scale. Patel and Jacobson (2008) stress, in contrast, that larger firms can face greater difficulties in innovating, such as more intricate bureaucracy, which can make the process of deciding on new projects and ideas more complex, demanding levels of collaboration and coordination that are easier in smaller firms. In the e-commerce cases studied by the authors, the support from senior management for implementation of ICT projects is an important element that stands out. In the case study of the adoption of bioinformatics tools reported by Pitassi *et al.* (2012), the relevance of the availability of appropriate IT infrastructure stands out.

Gibbs and Kramer (2004), in turn, highlight the perceived benefits as factors that affect the decision to adopt and implement technologies. Among these benefits, the literature examined mentions reduction of costs. Various authors clarify that technologies that generate higher levels of perceived benefits tend to be preferred, while technologies that, though possibly technically superior, do not generate strong perception of benefits tend to receive short shrift. In the specific case of the SPED, the literature examined allows mentioning the following expectations: i) reduced volume of ancillary obligations (Brito, 2008); ii) better quality of the information delivered to the government, minimizing risks (Duarte, 2011); iii) creation of cooperative ties with governmental institutions (Faria *et al.* (2011); and iv) full adjustment of firms' tax accounting to the regulatory rules (Mota & Cirino, 2010).

Zhu *et al.* (2003) point to the importance of analyzing the relative weights associated with the perceived challenges or obstacles, because often the adoption (and

implementation) can be extremely complex and expensive, besides having a significant potential for falling short of expectations. In the SPED case, this aspect can be measured by the: i) assurance of security, given the critical nature of the information involved (Neves Júnior *et al.*, 2011); ii) high complexity of the projects that compose the application (Duarte, 2011); and iii) tax evasion by some firms (Faria *et al.*, 2011), which becomes much more difficult to occur after the implementation of e-government projects.

2.3.3 Environmental context

Oliveira and Martins (2010) stress the importance of the pressure of competition felt by firms, which impels the adoption of innovation. Rodriguez-Ardura *et al.* (2010) add that government regulations also exert pressure by obliging certain activities, although the way of satisfying this pressure can be relatively innovative. In the empirical cases studied by applying the TOE framework, the pressure of competitors that are already or will soon adopt the application stands out. In the case of the SPED, the evidence gathered indicates that the obligatory nature will not allow companies to choose, but the support offered by government institutions can facilitate the implementation of the application (Duarte, 2011).

Zhu *et al.* (2003), in turn, observe that the penetration of the Internet also has an influence on the adoption and implementation of certain technologies, to the extent it provides the basic infrastructure that enables adoption (and implementation), while technical incompatibility imposes restrictions or even prevents adherence to these novelties.

2.3.4 TOE model adapted to the study adoption of the SPED

Figure 1 summarizes the factors of the organizational, technological and environmental contexts, as originally proposed by Tornatzky and Fleisher (1990), which will be applied to study the adoption and implementation of the SPED by Brazilian companies.

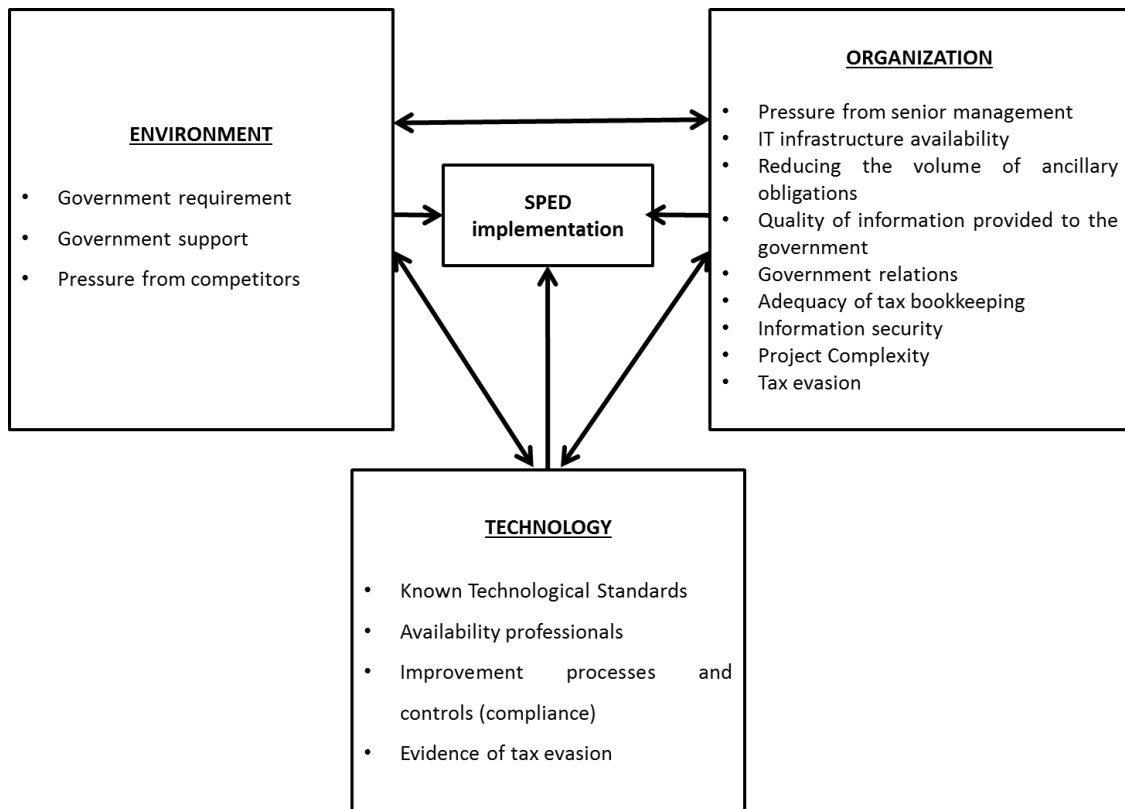


Figure 1: Conceptual Diagram of the TOE Framework

Source: Prepared by the authors based on the model proposed by Tornatzky and Fleisher (1990)

3. METHODOLOGY

This study is descriptive and explanatory in nature. Descriptive research “sheds light on the characteristics of a given population or phenomenon” (Malhotra, 2001, p. 147). We adopted the field study format, using a survey to collect data and obtain evidence to reach our conclusions.

Since the target population consisted of all Brazilian companies, which were possibly required to implement the SPED, we selected a sample limited to companies so required and that sought help from specialized forums to prepare themselves for the process of adopting and implementing the SPED. According to Duarte (2011), various such specialized forums exist with a national scope, serving as spawning grounds of information to support firms that need more details about the SPED project, to allow them to plan for the necessary changes in the business context.

In line with the taxonomy of Malhotra (2001), the sampling criterion was intentionally nonprobabilistic, and the sample was composed of companies that: a) were in the process of implementing the SPED; b) that had implemented the project at most 24 months beforehand, between November 2010 and November 2012; or c) that knew about and/or had consulted specialized forums to obtain information about the SPED project so as to adapt to its requirements.

The subjects of a survey, according to Malhotra (2001), are the people who supply its necessary data. Our subjects consisted of: a) managers of companies that had adopted the SPED; b) leaders of projects for the implementation of the SPED; or c) accountants or tax specialists who had direct or indirect involvement in processes for the adoption and implementation of the SPED, to support managers.

The survey was based on the application of a structured questionnaire with 11 questions, in the form of assertions, formulated to segment the respondents of the sample, observing the criteria established to make comparisons pertinent and capture the opinions of the managers of firms regarding the factors that impact the decision to adopt and implement the SPED. Those criteria were their economic sector, size and geographic region. The questions regarding the factors that influence the adoption and implementation of the SPED were formulated based on the literature review presented. The objective of each question and the aspects evaluated were those explained in sections 2.3.1, 2.3.2 and 2.3.3.

The questionnaire was applied online, by posting a link to the survey on the main page of the principal forums specialized in the SPED, namely the Prof. Roberto Dias Duarte Forum, José Adriano Forum and SPED Brasil Forum, during November 2012.

For treatment of the data, we first segmented the respondents, adopting specific criteria for region of location of the company's main establishment (Southeast/South/Northeast/Midwest/North), gross revenue (Small/Midsize/Large) and economic sector (Industry/Service/Commerce/Others).

Then the responses were tallied to obtain the normal descriptive statistics, to indicate the total number of respondents, regions and size of the firms.

For the assertions in the questionnaire aimed at identifying the factors that affect the adoption and implementation of the SPED in the opinion of the respondents, we prepared a ranking of those factors, to show the level of priority given by firms regarding the adoption and implementation of projects like the SPED.

The final analysis involved the use of nonparametric statistical methods, considering the nonprobabilistic nature of the sample. We applied comparisons of medians to questions without nominal character (ordinal): degree of importance – although the responses were expressed in the form of numerical values, these did not represent quantities properly input.

In these cases, we used the Kruskal-Wallis test. According to Doane and Seward (2008), this test, like the majority of nonparametric tests, is very useful to analyze ordinal data, or when there are outliers or groups with different variance, or also when the population cannot be considered normally distributed. Therefore, we checked whether the medians of the responses to these questions were the same for small, medium and large firms (H_0 = null hypothesis) or were different, indicating a trend (H_1) according to firm size. We did the same for the other segmentation criteria: geographic region and economic sector.

A common limitation of surveys is that “the respondents may be unable or reluctant to reveal the desired information” (Malhotra, 2001, p. 179). Roesch (2005) notes that respondents may find difficulty understanding questions, leading to

distortions in the answers. In this respect, Easterby-Smith *et al.* (1991) add that certain questions can be misleading or generate unsatisfactory responses because the respondents do not know the reasons for their actions and judgments.

Besides the inherent limitations of collecting and treating survey data, since this study was based on a nonprobabilistic sample, it is not reasonable to propose generalizations.

Another possible limitation to consider is the sincerity of respondents, which can bias the final result, since the accuracy of answers to questionnaires is strongly associated with the trustworthiness of the information gathered.

Furthermore, the Kruskal-Wallis method requires the different samples analyzed to have continuous distributions (Siegel, 2006:235). In other words, the assumption is that the populations from which the samples are extracted have distributions with similar shapes, even if they are not necessarily normal.

It is also possible for significant differences to exist between the people who answer and those who decline to respond, known as the non-response bias.

A final source of possible bias, called non-selection bias, arises from the fact that we only selected firms that had sought help or information regarding adoption and implementation of the SPED in specialized forums, while it is reasonable to assume that not all firms, relevant to the quality and scope of the conclusions, knew about or consulted such forums.

4. PRESENTATION AND ANALYSIS OF THE RESULTS

In line with the respondent selection criteria established in the sampling plan, we chose 345 respondents. Their distributions by region, economic sector and firm size are reported in the following three tables:

Table 1: Number of respondents (stratification by size and region)

Regions	Company Size				
	Small	Medium	Large	Total	Proportion
Southeast	33	69	99	201	58.26%
South	17	27	43	87	25.22%
Midwest	6	3	8	17	4.93%
Northeast	13	14	10	37	10.72%
North	0	1	2	3	0.87%
Total Respondents	69	114	162	345	100.00%
Proportion	20.00%	33.04%	46.96%	100.00%	

Source: Authors.

Table 2: Number of respondents (stratification by size and economic sector)

%	Company Size				
	Small	Medium	Large	Total	Proportion
Commerce	9	19	34	62	17.97%
Services	55	53	28	136	39.42%
Industry	2	37	91	130	37.68%
Others	3	5	9	17	4.93%
Total Respondents	69	114	162	345	100.00%
Proportion	20.00%	33.04%	46.96%	100.00%	

Source: Authors.

Table 3: Number of respondents (stratification by economic sector and region)

Regions	Economic Sector					
	Commerce	Services	Industry	Others	Total	Proportion
Southeast	38	74	79	10	201	58,26%
South	7	41	35	4	87	25,22%
Midwest	4	6	5	2	17	4.93%
Northeast	12	15	9	1	37	10.72%
North	1	0	2	0	3	0.87%
Total Respondents	62	136	130	17	345	100.00%
Proportion	17.97%	39.42%	37.68%	4.93%	100.00%	

Source: Authors.

The data presented in the tables characterizing the respondents indicate a significant concentration in the Southeast and South regions, but there was still a relevant number of respondents drawn from the other regions of the country, especially the Midwest and Northeast.

Another pertinent observation is that although small businesses form the great majority of companies in Brazil – according to the Brazilian Institute of Geography and Statistics (IBGE), 99% of formal companies belonged to the micro and small enterprise segment in 2012 – they formed a much smaller proportion in the sample. This can arise from possible non-selection bias, indicated as a possible methodological limitation, as well as the fact that micro and small businesses enjoy tax breaks and simplified reporting requirements, placing them at the bottom of the list of companies prioritized by the government when implementing an e-government project like the SPED.

The next tables present a ranking of the general medians of the responses

considered in the analysis, contemplating the assertions of questions 10 (“Among the factors below, indicate the degree of importance of the impact on the decision of firms to adopt systems for the SPED”) and 11 (“Among the factors below, indicate the degree of importance of the impact on the implementation of systems for the SPED in firms“):

Table 4: Ranking of the general medians of the responses to the assertions of question 10

Assertions	General Median	1st Quartile	3rd Quartile
A= Government requirement	7.0	7.0	7.0
I= Expectation to reduce the volume of ancillary obligations	7.0	2.0	6.0
C= Availability of an experienced team	6.0	4.0	7.0
G= Expectations of improved quality of the information provided to the government, minimizing risks	6.0	4.0	7.0
H= Expectations of improved internal processes and controls	6.0	4.0	7.0
E= Pressure from senior management	5.0	3.0	6.0
B= Expectations of reduced costs	4.0	2.0	6.0
D= Expectations of creating cooperative ties with government institutions	4.0	2.0	6.0
F= Pressure of competitors that are already adopting or will soon adopt the SPED	4.0	2.0	6.0
J= Expectations of better security of information involved, considering the use of digital signatures	3.0	2.0	5.0
K= Availability of appropriate IT infrastructure.	3.0	2.0	5.0

Source: Authors.

Table 5: Ranking of the general medians of the responses to the assertions of question 11

Assertions	General Median	1st Quartile	3rd Quartile
A= Complexity of the projects that compose the SPED	7.0	6.0	7.0
B=Lack of full compliance of the firm’s tax accounts	7.0	5.0	7.0
D= Availability of qualified professionals with solid knowledge of the SPED	7.0	6.0	7.0
F= Support by government institutions to facilitate implementation	7.0	6.0	7.0
C= Occurrence of tax evasion by companies	6.0	5.0	7.0
E= Availability of satisfactory Internet access	5.0	3.0	7.0
G= Use of known technological standards	2.0	1.0	4.0

Source: Authors.

4.1 Results of the Statistical Tests

We applied the Kruskal-Wallis (KS) test to the assertions of the questionnaire associated with the factors that affect the adoption and implementation of the SPED in the opinion of the respondents, with null hypothesis that the medians are the same for all groups (no difference between groups) and the alternative hypothesis that at least one pair of groups has different medians. We considered the stratification variables (size, economic sector and region) in forming the groups of interest, based on the principle that the sample data of the populations covered by the survey and analyzed by the test presented similar distributions. In other words, the test served to verify if the level of importance of the factors for adoption of the SPED, according to the responses to the assertions of question 10, and implementation of the system, according to the responses to the assertions of question 11, for each factor are similar for all the groups, or if differences exist in the levels of importance attributed by the respondents, segmented into groups through the various clustering/segmentation criteria.

Table 6 below presents the results of the test for each item, by company size.

Table 6: KW test for question 10 analyzed by company size

Item	Test Statistic	p-value	Conclusion
A= Government requirement	0.6916	0.7077	Do not reject H_0
B= Expectations of reduced costs	0.3876	0.8238	Do not reject H_0
C= Availability of an experienced team	1.9445	0.3782	Do not reject H_0
D= Expectations of creating cooperative ties with government institutions	0.8223	0.6629	Do not reject H_0
E= Pressure from senior management	0.2586	0.8787	Do not reject H_0
F= Pressure of competitors that are already adopting or will soon adopt the SPED	2.1395	0.3431	Do not reject H_0
G= Expectations of improved quality of the information provided to the government, minimizing risks	10.5167	0.0052	Reject H_0
H= Expectation improved internal processes and controls	5.6904	0.0581	Do not reject H_0
I= Expectations to reduce the volume of ancillary obligations	10.1834	0.0061	Reject H_0
J= Expectations of better security of the information involved, considering the use of digital signatures	6.1797	0.0455	Reject H_0
K= Availability of appropriate IT infrastructure	7.6457	0.0219	Reject H_0

Table 6 indicates that the responses of small, medium and large firms were different regarding items G, I, J and K, i.e., that the expectation of improved quality of

the information provided to the government, expectation of reducing the volume of ancillary obligations, expectation of better security of information involved and availability of appropriate IT infrastructure have different levels of importance in the adoption of the SPED depending on the firm size.

The same analysis reflected in Table 6 was applied regarding economic sector of the companies and the null hypotheses were rejected for assertions D (p-value = 0.0147), F (p-value = 0.0277), G (p-value = 0.0491), I (p-value = 0.0095), J (p-value = 0.0007) and K (p-value = 0.0003). For the other assertions of the sector criterion the null hypotheses could not be rejected, since the p-values were greater than 0.05.

Considering regions of the firms, the null hypotheses were rejected for assertions I (p-value = 0.0479), J (p-value = 0.0000) and K (p-value = 0.0000). The null hypotheses of the other assertions could not be rejected due to having p-values higher than 0.05.

Analyzing the assertions of question 11, aiming to capture the evaluation of the managers surveyed in relation to the factors that affect implementation of the SPED and focusing on the firm size criterion, the null hypothesis was only rejected for assertion D (p-value = 0.0261), while the p-values for the other assertions were greater than 0.05 so the null hypotheses could not be rejected.

When examining question 11 under the prism of economic sector, the null hypotheses were rejected for assertions A (p-value = 0.0057) and G (p-value = 0.0476), while the rest had p-values greater than 0.05.

Finally, in analyzing question 11 from the standpoint of location of firm, none of the null hypotheses could be rejected due to p-values above 0.05.

Considering that our main objective and the rankings of the medians presented in Tables 4 and 5, the factors that impact the adoption and implementation of electronic government (specifically the SPED) are indicated below:

- **Factors that affect adoption of e-government:**

- a) government requirement;
- b) expectations to reduce the volume of ancillary obligations;
- c) availability of an experienced team;
- d) expectations of improved quality of the information provided to the government, minimizing risks;
- e) expectations of improved internal processes and controls;
- f) pressure from senior management;
- g) expectations of reduced costs;
- h) expectations of creating cooperative ties with government institutions;
- i) pressure of competitors that are already adopting or will soon adopt the SPED;
- j) expectations of better security of information involved, considering the use of digital signatures;
- k) availability of appropriate IT infrastructure.

- **Factors that affect implementation of e-government:**

- a) complexity of the projects that compose the SPED;
- b) lack of full compliance of the firm's tax accounts;
- c) availability of qualified professionals with solid knowledge of the SPED;
- d) support by government institutions to facilitate implementation;
- e) occurrence of tax evasion by companies;
- f) availability of satisfactory Internet access;
- g) use of known technological standards.

The results of the statistical tests suggest that in general the managers of Brazilian companies surveyed, regardless of the economic sector (principally), firm size (a bit less pronounced) and region of the country (to a still lesser extent), have the same opinions regarding the factors that influence the adoption and implementation of the SPED.

5. FINAL CONSIDERATIONS

The main objective of the survey herein reported was to identify the factors that affect the adoption and implementation of electronic government in the opinion of managers of Brazilian companies, using the case of the Public Digital Accounting System (SPED).

We believe that its objective was met, since we identified factors that explain or that are considered in the adoption and implementation of the SPED, an e-government initiative, in the companies covered by the survey, by applying the TOE framework and the theoretical adaptations proposed by Oliveira and Martins (2010), in line with the empirical studies of Rodríguez-Ardura *et al.* (2010), Zhu *et al.* (2003), Henderson *et al.* (2012), Zhu and Kramer (2005), Bosch-Rekvelde (2011), Titah and Barki (2006), Patel and Jacobson (2008), Gibbs and Kramer (2004), Koellinger (2008) and Bandyopadhyay (2012).

The results of the survey enabled identifying the factors that, as evaluated by the respondents, influenced the adoption and implementation of the system between August 2008 and November 2012.

As expected of an e-government initiative, the results demonstrated that governmental action exerted the main influence on the decisions for adoption and implementation, since the government is one of the main, if not the main, actor, in the regulatory environment. The study detected that it was the principal factor of influence.

Also in the environmental context, the competitive pressure factor had a significant influence on the companies studied, but not as strong, demonstrating that with respect to adoption and implementation of e-government, organizations want to

stay abreast of their competitors, aiming to adopt performance benchmarks and perhaps evaluate the management of their projects.

Although the Internet and its level of penetration in modern societies still attract the attention of many researchers and scholars, in various areas of knowledge, for the companies studied, the Internet penetration factor as a variable of the environmental context did not appear to influence the decisions regarding adoption of the SPED as strongly as the other factors. In turn, regarding implementation of this type of initiative, the firms recognize that Internet penetration has a significant weight.

With respect to the factors of the technological context, namely technological preparation, integration of technology and security of information, only the first had a strong and significant importance for the firms surveyed regarding adoption. This finding is surprising, because by the nature of the information involved in the transactions between the government and companies in the ambit of the SPED, it would seem that all these factors should have a substantial impact on the initiative's adoption and implementation, considering that those factors are related to technological competencies that may not be mastered by all organizations, especially smaller ones. Considering the rankings formulated based on the responses, those factors do not appear to be among the main preoccupations of the companies studied.

With respect to the organizational context, it is possible to state that it is the dimension of the TOE framework that encompasses the most factors with impact. While not exceeding the obligation imposed by the government of the environmental context, it was sufficiently significant for comparisons with that factor. In this group of variables, only firm size appeared to be indifferent regarding the impact on the adoption and implementation of the SPED. Perhaps this is a consequence of the fact that all companies at a certain moment will be required to adopt and implement that e-government project. The beneficial and challenging factors perceived showed a high level of conviction regarding the impact on the adoption and implementation of the SPED in the companies studied, indicating they have strong expectations about obtaining opportunities associated with simplified ancillary tax obligations and commensurate reduction in the costs of meeting these obligations, while at the same time perceiving that difficulties must be overcome to obtain the expected benefits. Finally, the factor involving perspectives for improved products, services or internal processes also was considered important, both regarding adoption and implementation of the SPED in the firms studied. This ratifies that companies see opportunities to realign their internal processes associated with products, services or administrative processes and to consolidate the adoption and implementation of more efficient and effective ways of working.

In summary, we believe this study contributes to the academic community by expanding the store of knowledge about the adoption and implementation of electronic government projects, and provides new perspectives for use of the TOE framework to study the adoption of e-government initiatives of the G2B type.

Another contribution is expansion of the management domains and conception of new e-government projects, because the results indicate factors of interest of organizations, through the formation of a ranking, indicating aspects that can be better developed by governmental bodies when focusing on implementation of initiatives with various types of companies.

A significant limitation of this study is the fact the sample was chosen by the criterion of accessibility, which makes it impossible to generalize the results to all

contexts of implementation of e-government initiatives.

In closing, we recommend conducting future studies on the adoption and implementation of e-government, focusing especially on the G2B type, to gain a better understanding of the variables and processes that are involved in the adoption and implementation of this type of initiative, especially from the perspective of businesses. Furthermore, the conduction of more studies to diagnose the level of satisfaction regarding the perceived gains could improve the understanding of the academic community regarding the potential benefits of e-government projects.

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