

PUBLIC E-PROCUREMENT AND THE DUALITY OF TECHNOLOGY: A COMPARATIVE STUDY IN THE CONTEXT OF BRAZIL AND OF THE STATE OF PARAÍBA

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ABSTRACT

In this study, an attempt was made to understand the e-procurement theme from the perspective of the duality of technology, understanding it both as a product and as a means for human actions, which, interacting with institutional properties, produces and reproduces the current organizational practices. From the multiple interpretative case studies conducted, it was evidenced that e-procurement is a subjective element, sometimes understood inconsistently by human agents in the different organizational contexts studied (Brazil and the State of Paraíba). Users appropriate the rules, knowledge, and assumptions incorporated into the implemented system to perform tasks, contributing to a reaffirmation of the status quo.

Keywords: Public Administration. Eletronic Government. E-procurement. Duality of Technology. Qualitative Research.

1. INTRODUCTION

The diffusion of e-commerce technology in the private sector has led public administrations to use the potentialities of information and communication technologies (ICTs), including the redesign of several governmental activities (Cordella, 2007). Managing public purchases, “one of the main areas where the government can be ‘reinvented’” (Santos, 2004, p. 150), represents one of the areas that has received a great deal of investments and attention, both in technological terms, aiming to modernize the process, and in juridical–legal terms. In this way, the electronic public process (e-procurement) became widely adopted by organizations, including public administration

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(PA), seeking to improve the business process (Coulthard & Castleman, 2001; Leukel & Maniatopoulos, 2005).

Although the investments in electronic government and information systems (IS) represent a significant proportion of the organization budget (Mussi & Zwicker, 2009), the literature presents several failure cases (Wilson & Howcroft, 2002; Doherty & King, 2005; Luna-Reyes, Zhang, Gil-Garcia, & Cresswell, 2005; Mussi & Zwicker, 2009); since the end or the objective is given a great deal of consideration, less attention is paid to the means by which and the context in which the introduction will happen. On this account, it is realized that unanticipated organizational impacts are common, which can represent failures or the neglect of the importance of human and contextual aspects (Mussi, 2008). ICTs, including those involved in electronic government, are rarely easily introduced, since they demand complex configuration and customization, according to the context (Badham, 1995). Thus, although the use of e-procurement in PA seems obvious, its development, introduction, and management should not only consider technical and economic factors (Coulthard & Castleman, 2001), since political, social, and organizational factors may also contribute to containing the benefits of the electronic procurement implementation (Henriksen & Mahnke, 2005), restraining the benefits that technology has to offer (Luna-Reyes *et al.*, 2005).

In this way, it is apparent that e-procurement may not be understood as a deterministic object, implying that it should not be considered as a simple tool (Kling, 2000). Therefore, this vision retreats from the deterministic way that ICT impacts on organizations, understanding that technology shapes and is socially shaped by organizations. This understanding is useful for comprehending the reasons why the same technology may be implemented, interpreted, and it may generate distinct organizational impacts, even when introduced in similar contexts.

This study adopted the perspective proposed by Orlikowski (1992), the duality of technology, which, even though its utilization in Brazil is not wide (Fell & Rodrigues Filho, 2006, 2007), has attracted a significant number of international papers into the IS area (Jones & Karsten, 2008). The association of the duality of technology approach with the context of the Brazilian public e-procurement brings the possibility of increasing the understanding of the phenomenon and the organizational consequences of adopting this technology, since the consequences of the introduction and use of ICT, which is increasingly common in the public sector, has not yet been appropriately understood (Grönlund, 2002).

This study, therefore, addresses the management of public procurement, focusing on the electronic process used in the context of PA in Brazil and in the State of Paraíba for the acquisition of goods and services using the modality of *pregão*, a reversed bid auction modality. Besides, this study understands e-procurement technology both as a product and as a means for human actions that, interacting with institutional properties, produces and reproduces the current organizational practices, representing a set of rules and resources built by users in their everyday actions. The objective is to comprehend public e-procurement in Brazil and in the State of Paraíba based on the duality of technology approach, in the context of federal and state public institutions located in João Pessoa, the capital City of the State of Paraíba. From a theoretical viewpoint, this study is justified since it adopts an interpretative perspective (Walsham, 1993, 1995a), outside the dominant rational/technical standard of studies of IS (Avgerou, 2000; Avgerou & McGrath, 2005), electronic government (Heeks &

Bailur, 2007; Rodrigues Filho; Mota, 2010), and public e-procurement in Brazil (Sáfadi & Reinhard, 2002; Alves & Dufloth, 2004; Campos, 2008; Galhardo & Côrtes, 2008).

2. LITERATURE REVIEW

E-procurement

According to Santos (2004, p. 150), the management of procurement represents an important area of work in electronic government projects, in which is created “the biggest bureaucratic tool structure to control and prevent possible deviations, and for that there is one of the main spaces where the government can be ‘reinvented’.” Although e-procurement represents one of the key factors of public management policies, it has become a critical area, since the operationalization of buying, entering into contract, the economic gains, and the use of more transparent practices to control public spending have not occurred in an appropriate way (Gaetani *apud* Campos, 2008). Thus, as a response to this situation, e-procurement has been adopted by organizations, including PA, aiming to improve the business process (Coulthard & Castleman, 2001; Leukel & Maniatopoulos, 2005).

E-procurement is defined as the use of electronic commerce for buying, involving the use of ICTs such as the Internet to automate and dynamize the organizational process, from the requisition to the final payment (Thomson & Singh, 2001; Vaidya, Juul, Korzen-Bohr, & Pedersen, 2003). In the public context, e-procurement may be understood as a term that covers a wide range of technologies used to automate the internal and external processes associated with the searching for and buying of goods and services for PA (Leukel & Maniatopoulos, 2005). From a general viewpoint, the implementation of e-procurement systems within an electronic government strategy is motivated by government initiatives or legally imposed (Bof & Previtali, 2007), supported by a vision that they are tools capable of bringing benefits to PA (Talero, 2001), including the potential rationalization of public buying (Somasundaram & Damsgaard, 2005) and the simplification and automation of procedures that, combined with regulatory reformulation propositions, make e-procurement an attractive solution compared with the *status quo* (Henriksen & Mahnke, 2005).

According to Somasundaram and Damsgaard (2005), the use of an electronic process to conduct public buying has occurred in many countries, although with a great waste of resources due to a lack of knowledge about how, in fact, the process itself happens. Besides, not all nations develop e-procurement equally, as different standards exist (Somasundaram, 2004). In the public sector, the risks associated with e-procurement may be even higher than those in the private sector, because economic and social factors influence the administrative, political, and structural contexts in a singular way (Gichoya, 2005; Bof & Previtali, 2007), since the public procurement process is highly controlled, regulated, and influenced by public policies (Henriksen & Mahnke, 2005). Therefore, the public e-procurement implementation should be conducted more carefully, because depending on how it is implemented, there will be organizational and political implications (Coulthard & Castleman, 2001; Henriksen & Mahnke, 2005) that, according to how the process configuration is established, the political, organizational, and institutional structures will be reinforced or a total transformation will take place

(McLoughlin *et al. apud* Maniatopoulos, 2005). Thus, the available technical options undergo a social shaping process, since economic, cultural, political, and organizational factors influence and are influenced by the technology use and development, which generate legal and theoretical consequences as well as unpredictable results depending on the institutional and organizational context (Maniatopoulos, 2005), and, while PA seeks to improve its efficiency and efficacy, it is restricted by laws and the political context (Fountain, 2001).

In this way, the peculiarity of the contexts in which e-procurement systems are introduced has resulted in the creation of specific legal mechanisms, causing, as a consequence, the necessity for the bureaucratic process to be in accordance with the institution that receives the system (Henriksen & Mahnke, 2005; Leukel & Maniatopoulos, 2005; Somasundaram & Damsgaard, 2005; Bof & Previtali, 2007). This implies that, as most purchasing orders occur by requisitions, it is necessary to make a major effort to include them in the system, resulting in internal expense for the coordination of contract procedures (Henriksen & Mahnke, 2005). Therefore, it is realized that ICTs are not always capable of generating the expected effects (Avgerou, 2000), since determining whether the obtained results reach the expected and planned objectives is not simple (Hardy & Williams, 2008). Political will and administrative behavior, for instance, affect the political results of the process, while legal norms and institutional characteristics influence both decisions and how PA deals with its administrative routines (Bolgherini, 2007). Besides, although the objective is to increase the efficiency, quality, and accountability of the public sector, ICTs cause changes in power relations in such a way that some people have increased power over other people (Zimmermann & Finger, 2005).

Structurational model of technology

The duality of technology has its origin in the adaptation of Giddens's (2009) ideas to the IS field. Orlikowski (1992) avoids the understanding of technology as a mere physical object, viewing it "as the outcome of coordinated human actions, which is inherently social" (Orlikowski, 1992, p. 403). Thus, "the interaction of technology and organizations is a function of the different actors and socio-historical contexts implied in its development and use" (Orlikowski, 1992, p. 405). In this way, the technology assumes structural properties, being "physically constructed by actors working in a given social context, and technology is socially constructed by actors through the different meanings they attach to and the various features they emphasize and use" (Orlikowski, 1992, p. 406). This perspective is called the duality of technology (Jones & Karsten, 2008).

In the model by Orlikowski (1992), in Figure 1 and explained in Figure 2, structuration is understood as a dynamic process that is embedded historically and contextually; therefore, although the components and the nature of the relationships that compose the model are stable, the scope, content, and power will vary over time. According to Orlikowski (1992), instead of models that relate the elements in a linear way, the structurational model of technology proposed considers that the elements interact recursively, and may be in opposition and mitigate the effects on each other. It should be noted, however, that when revising this theoretical model, Orlikowski (2000) introduced the concept of "technology in practice," emphasizing practice as the source and reinforcement of structures.

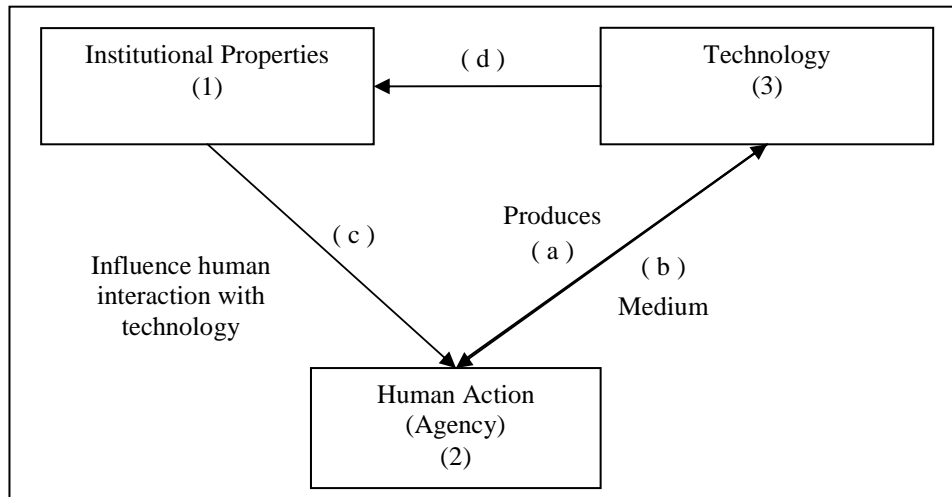


Figure 1. Structural model of technology

Source: Adapted from Orlikowski (1992, p. 410) and Fell and Rodrigues Filho (2006)

Arrow	Type of influence	Nature of influence
a	Technology as a product of human actionz	Technology is an outcome of such human action as design, development, appropriation, and modification
b	Technology as a means of human actions	Technology facilitates and constrains human actions through the provision of interpretive schemes, facilities, and norms
c	Institutional condition of interaction with technology	Institutional Properties influence humans on their interaction with technology, for example, intentions, professional norms, state of the art in materials and knowledge, design standards, and available resources (time, money, skills)
d	Institutional consequences of interaction with technology	Interaction with technology influences the institutional properties of an organization, through reinforcing or transforming structures of signification, domination, and legitimation.

Figure 2. Structural model of technology explanation

Source: Orlikowski (1992, p. 410)

3. METHOD

Klein and Myers (1999) point out that, in general, IS research may be classified into positivist, critical, or interpretative understanding. The positivist studies have been

dominant; however, the interpretative conception has been emerging as an important trend (Walsham, 1995a). This research adopts an interpretative perspective, since it does not seek to measure objectively the relationships previously established, which implies that it does not attempt to test hypotheses or quantify variables, which are characteristics of positivist studies (Orlikowski & Baroudi, 1991). Although the use of theories and theoretical models is not a common practice in interpretative studies, this research uses the duality of technology perspective (Orlikowski, 1992) as a background for understanding e-procurement. Thus, the objective is not to validate the theoretical model of Orlikowski (1992), proposed based on an interpretative study, but to use the model as a guide to comprehend the development and use of e-procurement in Brazil (federal institutions) and in the State of Paraíba (state institutions).

From the perspective described, the present research follows a qualitative approach, which represents “particular relevance in the study of social relations due to the pluralization of life spheres” (Flick, 2009, p. 20). Qualitative research, “as a set of interpretative activities”, does not privilege a unique methodological practice in relation to another,” and “It does not have a distinct set of methods or practices that are entirely yours” (Denzin & Lincoln, 2006, p. 20).

Research strategy

The case study was adopted as the research strategy, which probably, represents one of the most appropriated strategies in the perspective of interpretative research (Walsham, 1993). According to Yin (2005, p. 19), “the case studies represent the preferred strategy when questions starting with ‘how’ and ‘why’ are made, when the researcher has little control over the contemporary events inserted into some context of real life.” According to Yin (2005), case studies may be unique (one unit of analysis) or multiple (more than one unit of analysis). Multiple case studies aim to predict similar results or contrasting ones compared with what was predicted at the beginning of the research, contributing to the formation of knowledge on the studied theme.

The current research was conducted in the context of federal and state public institutions located in João Pessoa, the capital City of the State of Paraíba. The choice of the cases presented an opportunity to verify the similarities or the differences between the two levels of government that are located in the same context (the State of Paraíba) and have the same premises as acting in terms of laws for procurement, although they have distinct systems and structures of working.

The sub-units of analysis refer to the participants in this research. In each federal public institution, the operationalization of the procurement of goods and services is performed in the system (Comprasnet portal) in a unit/department/division (different nomenclatures according to the institution) composed of one or more auctioneers and their respective support team. In total, five auctioneers of distinct federal institutions participated in the research. In state-owned institutions, the procurement occurs through a public department specially created for that purpose (*Central de Compras – Procurement Center*), but with the effective participation in the system by the users in each state department. The selected sub-units were seven public employees who work in procurement both in the *Central de Compras* and in state department.

Data collection techniques

Case study evidence may be obtained through various data collection techniques, such as documents, historical files, interviews, direct observation,

participant observation, and physical artifacts (Yin, 2005). Data collection to study and to explain social phenomena in qualitative research involves the use of documents, participant observation, and interviews (Myers, 1997). Thus, in this paper, empirical evidence was obtained using the following techniques:

(a) semi-structured interviews: these represent the main source of data in interpretative case studies (Walsham, 1995b). In the present research, the data collection instrument was a semi-structured interview plan divided into two parts. The first one aimed to identify the participants' profile. The second one was composed of questions representing general and guiding topics (with a subjective nature) to conduct the interview. In the case that an interviewee did not answer appropriately, the researcher asked complementary questions in order to obtain a better understanding of the planned theme. Questions referring to the general theme were built based on the literature review, it being possible to identify from this the representative dimensions of the studied phenomena. The complete interview is included in the paper by Mota (2010). Consistent with the adopted structure in each of the five participants' federal institutions, the public auctioneers in each public institution were interviewed. However, on every occasion, the auctioneers' support members participated in or complemented the answers or even answered the question for the auctioneer. Consequently, a total of seventeen people participated in the interviews, consisting of five auctioneers interviewed formally and twelve support members divided among all the institutions. In the institutions in the State of Paraíba, seven interviews were conducted. In this case, there was no participation from other members, since, in general, one employee in each department is responsible for the procurement function, while the process of the buying happens through the public department called *Central de Compras* (Procurement Center).

(b) documental analysis: as a way to contextualize information (Flick, 2009), documents associated with the Brazilian legislation of procurement and the public administration reform in Brazil and in the State of Paraíba, news from the Internet portal *Comprasnet*, the Paraíba public government portal and newspapers, among others, constituted the secondary data analyzed.

Data processing technique

In line with the perspective and research approach chosen, the technique for processing the collected data by the described means constituted a qualitative data analysis, based on the method of Gläser and Laudel (2009), which emphasizes interpretation in almost all the phases of the process; the analysis was supported by computer (Nobrega, 2005) through the MIA software *Makrosammlung für die qualitative InhaltsAnalyse* [Macro Compilation for Qualitative Content Analysis]. In a specific way, the main idea behind the content analysis used in this paper (Gläser & Laudel, 2009) was to work with a system of categories – themes or multidimensional variables – derived from the literature review, with the possibility of changes and amplifications during the whole process of data analysis, without the detriment of the preservation of the theoretical considerations. Initially, texts are obtained from interview transcriptions. Then, through a crawler – part of MIA (download available at: <http://www.laudel.info/buchdateien.html>) – a new series of texts (results from extraction) is obtained, containing only the information relevant to the research. Subsequently, the analysis is performed, aiming to identify the relevant causalities for the interpretation. The adopted procedures are thoroughly described in the study by

Mota (2010), which also presents the dimensions obtained that serve as the foundations for the result analysis presented in this paper.

Case studies' description

Case 1: E-procurement in federal institutions

The e-procurement implantation history in federal institutions merges with the regulation trajectory of the *pregão* (local or electronic) modality of buying. It is necessary to point out that the e-procurement on the federal level is mediated by the Internet portal *Comprasnet* (<http://www.comprasnet.gov.br>), the main objective of which is to provide the PA with a set of tools capable of increasing its efforts towards the accomplishment of the fiscal adjustments within the institutional goals, seeking to obtain short-term results through the universality, accountability, and pace of the Internet (Santos, 2004).

Thus, in this space, the electronic bids (*pregão*) occur; therefore, the operation is performed online, without the physical presence of the auctioneer. The proposals are made electronically by suppliers previously registered to access the system. Specifically, the operationalization of *pregão* occurs in the division/department responsible for it. However, this shows that the process happens in a decentralized way, since it happens independently in the different and distinct federal institutions of the Brazilian PA; therefore each one has autonomy in relation to the others and there is no concentration of efforts among them.

Case 2: E-procurement in state institutions

In order to search for a managerial model of government, the e-procurement in the State of Paraíba has as an initial mark decree n. 23.865 (Paraíba, 2003) (also known as *Proestado*), published in 2003, which defines the guidelines for the Paraíba public reform. This legal issue predicts the reform in ten areas of work, as the redefinition of the organizational and administrative structure, at all levels of the executive state power, in order to ensure the efficiency and efficacy of the governmental actions as well as the reduction of expenses and the provision of better services to citizens. One of the areas of work points refers to the revision, modernization, and consolidation of goods and services, suppliers' selection by the state executive PA, at all levels, aiming to ensure uniformity, efficiency, and economy according to objectively fixed criteria and parameters.

Thus, in 2006, with the publication of decree n. 27.010 (Paraíba, 2006), which deals with the regulation of the procurement system of the State of Paraíba government – instituted through the state complementary law n. 67, from 2005 (Paraíba, 2005) – the public department, named *Central de Compras* (Procurement Center) was created, linked to the Department of Administration, aiming for the centralization of the acquisition of goods, material, and services for the State of Paraíba's direct and indirect PA. The final aim is to obtain a higher volume concentration of transactions and price reductions given by the suppliers. Before the implantation of this system, the process happened in each governmental unit, that is, in a decentralized and essentially manual way. In the State of Paraíba, e-procurement is mediated by the Internet portal *Central de Compras* (Procurement Center) (<http://www.centraldecompras.pb.gov.br>).

4. RESULT ANALYSIS

Public e-procurement and the duality of technology

E-procurement in this study is understood as a technology that represents both a product and a means for human actions, which, interacting with the institutional properties, produces and reproduces the current organizational practice, and therefore, represents a set of rules and resources built by users in their everyday actions. In order to study e-procurement based on this understanding, the study uses the model of Orlikowski (1992), aiming to explore the interaction among e-procurement, human actions, and the institutional properties of the State of Paraíba through the identified dimensions from the qualitative content analysis (Gläser & Laudel, 2009) made in the transcription of the semi-structured interviews. The interpretation follows the argumentative logic presented by Orlikowski (1992) in her study, adapting, however, to the particularities of this study, namely the technology (e-procurement), the PA context studied, and the human agents involved. Therefore, the analysis in this paper is based on the identified dimension of these themes, presented in detail in the studies by Mota (2010) and Mota and Rodrigues Filho (2010).

The results obtained evidence that the e-procurement in Brazil and in the State of Paraíba was designed and implemented with the objective of increasing the efficiency of the procurement process through the rationalization and standardization of procedures. The e-procurement is used by civil servants who did not participate in its development. This provides involvement and a passive utilization of the implemented system, as well as an economic orientation; that is, the focus is on the results to be achieved and not on a reflection of the procedures performed (Orlikowski, 1992).

Nevertheless, with the understanding of Orlikowski (1992), there is still the possibility of changes and influences in the process through the reflexive actions of the users. Orlikowski (1992) highlights that this happens up to the point where these users understand the very nature constituent in the technology (in this paper, the e-procurement) implemented, and this understanding is determined by the degree to which the users recognize the mediating role of technology, conceive alternatives to the technology, and motivate themselves to act.

In order to illustrate this, it was evidenced in the collected data that the State of Paraíba's e-procurement is not yet in full operation and that, in some federal public institutions, there is still the necessity for more adaptations. With the understanding of Orlikowski (1992), to the extent that e-procurement increases its potentialities, users' reflection about the process tends to decrease. Nevertheless, according to Orlikowski (1992), human actions through dialectical control may act against the apparent determinism of the institutionalized technology; therefore, if the users recognize that they are an interpretative flexible process, they may modify their interpretation and use. Given the institutional context of the State of Paraíba and Brazil with their mechanisms of control and standardization of procedures, as well as the relatively rigid development of e-procurement, the use of the electronic system for procurement may be characterized as having low interpretative flexibility. In both cases, in principle, the law does not permit other ways to carry out procurement procedures. However, in the State of Paraíba case, even though, due to agility motives, there is still the possibility of searching for other alternatives, they are based more on power relations than actually on new methods available in the system implemented.

Meanwhile, this search for alternative methods represents a form of reaction by e-procurement users, since it is understood that at certain times, in the State of Paraíba case, the *Central de Compras* (Procurement Center) represents a more bureaucratic way of proceeding with the procurement process. This example reveals that it is not possible to understand a technology as a fixed object at any stage of its development, since its possibilities and implementation standards may change through time and human actions (Orlikowski, 1992). Whether the method involving power relations, which opposes the predicted institutional properties in e-procurement, lasting over time or not depends on the point up to which this practice is sustained, as well as the proportion by which it propagates in other State of Paraíba's public institutions. However, the more e-procurement is implemented in its fully capacity, the greater the possibility that the users do not realize other opportunities to conduct the procedures to buy and contract goods and services in a way that is not the electronic one implemented.

To Orlikowski (1992), the contradictory nature of technology is evidenced at this moment. E-procurement, in both cases, was implemented with the objective of improving the efficiency of the procurement process, generating, consequently, financial economies. However, this limits the users' actions to seeing only this possibility for undertaking the procedures; therefore, civil servants and PA remain loyal to one way, even though, perhaps, there are other possibilities. Besides, they may be unable to recognize it when e-procurement restricts productivity and more efficient work.

Therefore, it is possible to understand e-procurement from the adaptation of the structurational model of technology developed by Orlikowski (1992). In order to conduct e-procurement, the users utilize the electronic system implemented (in the State of Paraíba case, mediated by the public department and the *Central de Compras* (Procurement Center) system; in the Brazilian case, through *Comprasnet*) (**arrow f**, Figure 3). The institutional properties of PA influence the conducting of the procedures of the civil servants involved in the process (**arrow g**, Figure 3). When they carry out the procurement process through *Central de Compras* (Procurement Center) and *Comprasnet*, the actions and perceptions of the civil servants are mediated by interpretative schemes, norms, and the present resources in the e-procurement (**arrow h**, Figure 3). When they execute the procedures electronically, usually, they tend to reaffirm the institutional properties of PA (**arrow i**, Figure 3).

However, in accordance with Orlikowski (1992), it is possible that, occasionally, civil servants execute e-procurement in a non-predictable way with the implemented system (**arrow f**, Figure 3). Therefore, they have a certain amount of influence on the process and on their workplace, many proposing, in an active way, new functionalities and systems for the process, through the information provision about the difficulties faced. In this way, it is possible to identify bottlenecks, as well as the necessity for the allocation of resources and power redistribution.

This weakens the interpretative schemes, norms, and resources present in e-procurement, and also, in the case that it represents an alternative that is sufficiently strong and lasting, may transform the State of Paraíba's institutional properties through the changing of legitimation, domination, and signification (**arrow I**, Figure 3). In this way, it may result in a revision and in a change to the procedures and legal mechanisms; that is, PA promotes actions aiming to legalize and recognize the changes in e-procurement (**arrow g**, Figure 3). Thus, it represents a modification of the public e-procurement operation (**arrow f**, Figure 3). However, once put into practice, e-

procurement becomes institutionalized, serving to reproduce the PA's institutional properties.

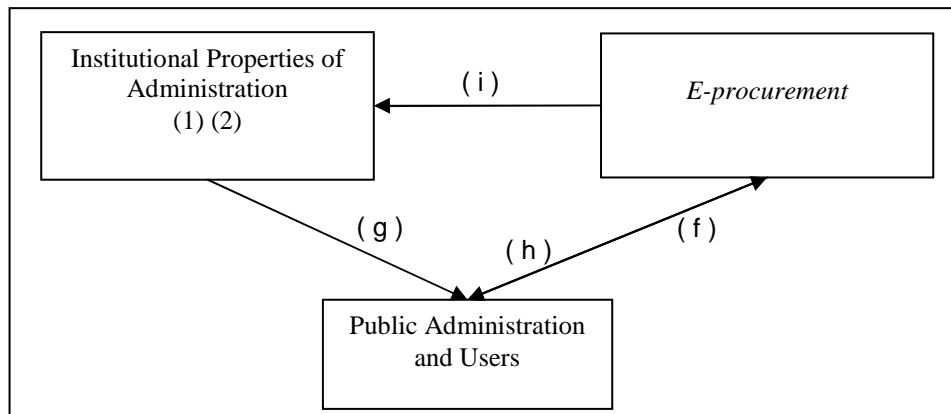


Figure 3. Structural model of Interaction with E-procurement in the State of Paraíba

Source: Adapted by the author based on Orlikowski (1992, p. 420)
 (1) Public Administration of the State of Paraíba; (2) Brazilian Federal Public Administration

5. CONCLUSIONS

This paper addresses the public management procurement theme. It was perceived that the introduction and use of e-procurement produces consequences for the user's everyday actions, and also that these actions result in organizational implications in the context of the State of Paraíba's federal and state public institutions. It was evidenced that the institutional properties presented in the public institutions of Brazil and of the State of Paraíba influenced and continue to influence the actions of PA and the users of e-procurement. The implementation of e-procurement is supported by human actions, including the legal measures approved to regulate it, the commitment of senior management, the users involved in the procurement process, and the recognition of the suppliers.

In the introduction of this system, a direction not to question whether this is the best way to perform or operationalize the procurement process was perceived. This represents an effective way to control the understanding and users' actions, which consist of appropriate rules, knowledge, and embedded assumptions in the implemented system to perform tasks. The dual character of technology was evidenced, since contradictions in the interpretation of the same aspect of e-procurement by different users were perceived. Moreover, a reaffirmation of the *status quo* was perceived.

Contributions, limitations, and future research recommendations

In terms of scientific investigation, this paper presents contributions both to science and to practice. Scientifically, the use of an interpretative perspective in the e-procurement studies in Brazil, taking as a basis the duality of technology approach,

represented an advance, contributing to the understanding of the phenomena associated with this technology through a different angle. Through the content analysis method adopted to analyze and interpret the data in the investigated case studies, it was evidenced that e-procurement is a subjective element, comprehended, sometimes, contradictorily by human agents in the different organizational contexts. The results obtained through the interpretative perspective together with the qualitative approach used reinforce the necessity for the introduction and use of new technologies to be studied not only from a technical–economic viewpoint.

In practical terms, in both the cases studied, it was verified that, although e-procurement has obviously brought benefits to the federal and state PA, it still presents problems, with necessities for adjustment. It was perceived that some vices and negative cultural issues inherent in the PA are inserted into the public e-procurement, revealing that undesirable and avoided practices still remain, despite the introduction of a new technological tool, through the *pregão*. Thus, it is recommended that users and managers involved in public e-procurement perform actions to counteract the evidenced problems, allied with a more reflexive and active posture against e-procurement, aiming to make better use of the benefits mentioned.

This paper, however, having an exploratory nature, is liable to limitations that must be emphasized. Thus, aiming to protect against possible critics and also to raise the readers' awareness and to propose future research, the following are pointed out as the main limitations of this paper: the research strategy was the case study, which, although it promotes a high level of internal validation, given the deep data gathered, it has a low level of external validation. Therefore, the conclusions are limited to the cases investigated, although the duality of technology approach may be used in other contexts outside the State of Paraíba and the City of João Pessoa. Due to time and resource issues, on the federal level, the interviews concentrated on the buying sector, without the perceptions of others who supply the requested goods/services. It is possible that other aspects related to the institutional properties, to PA and users, and to e-procurement itself, which are not presented in this research, may exist and influence e-procurement in Brazil and in the State of Paraíba in a way distinct from that here presented.

Therefore, being aware of the presented limitations and the fact that this study consists of unfinished research, it is suggested that future research involving the e-procurement themat may continue to revise, consider, or add other aspects and perspectives besides the cited ones, aiming to contribute to the enrichment of knowledge of the public administration, information systems, electronic government, and e-procurement in Brazil.

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