The role of trust in the alignment between system and operational effectiveness: the case of e-government in Colombia

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Abstract

E-government systems are becoming an essential strategy in countries' development and governments are integrating their operations with local organizations (G2B) online. The findings suggest that trust has impact on operational effectiveness, quality of the system, quality of information and quality of the service. Therefore, trust is built through the effectiveness of the operations that e-government systems bring to organizations. Quality of information showed the most significant impact on operational effectiveness. In order to build up efficient operations of the users of e-government applications, the government needs to improve the quality of the systems and quality of the service.

Keywords: e-government system, trust and user satisfaction, operational effectiveness

Introduction

The rapid proliferation of the internet has dramatically changed the way businesses and particularly government organizations are operating (M. Shareef, Kumar, & Kumar, 2008). In all cases, government organizations search for better and more efficient ways to interact with the community (Park, 2007). Ongoing IT advancements make it possible for developing countries to acquire state-of-the-art technology, but the required organizational and process changes and effective implementation seems to be slower than expected (Bakunzibake, Grönlund, & Klein, 2016; Meijer, 2010). Due to the momentum of e-government implementation and the acceptance of such systems by businesses and citizens, the issues related to the development and implementation of e-government systems have become of academic interest (Hsieh, Huang, & Yen, 2013; M. A. Shareef, Archer, Kumar, & Kumar, 2010; Yildiz, 2007). Nevertheless, the literature indicates that there is a need for the development of reliable metrics that allow organizations to measure the efficiency and effectiveness of the services provided by e-government systems (Hsieh

et al., 2013; Rana, Dwivedi, & Williams, 2015; Rodríguez Bolívar, Alcaid Muñoz, & López Hernández, 2014).

In Colombia, the implementation of e-government systems is slow compared with developed countries, and the literature about e-government in this country is scarce (Córdoba-Pachón & Orr, 2009). Furthermore, there is no literature available about the relationship between e-government systems and their impact on operational effectiveness. Organizations and governments dedicate significant amounts of resources to the implementation of e-government systems expecting a positive impact on the performance of the organizations that use it, but the extent to which these changes improve the operational effectiveness of organizations outside the government still needs to be explored (Armbruster, Bikfalvi, Kinkel, & Gunter, 2008).

Operational effectiveness relates to the ability to establish processes, based on core capabilities within the organizations, that allow them to meet or exceed customers' expectations (Evans & Lindsay, 2011). In turn, the effectiveness of an e-government system relates to how an e-government application can successfully meet the operational needs of an organization under specific conditions (Santa, Hyland, & Ferrer, 2014).

In view of all the above, it is important to explore what the expectations of the users are in regards to their trust in e-government systems and how an organization's innovation in the implementation of e-government applications can improve operational effectiveness. Based on the review of the literature, the specific research question being addressed in this study is "How does the users´ trust predict attitudes toward system quality, service quality, information quality and operational effectiveness?" To answer the question, this research uses quantitative data collected from organizations using e-government applications in Colombia.

Background

E-government

The definition of e-government is still difficult to define, but according to Yildiz (2007), e-government includes every system or process used as a method of information exchange between government and citizen that is based on the internet and the World Wide Web.

The government entity in Colombia responsible for the implementation of e-government systems is the Ministry of Information Technology. In 2008, the ministry started an initiative called "Gobierno en línea" (government online). Between 2013 and 2014 it spent more than 35 million USD to promote e-government initiatives, strategies and consultancy, but a survey, published by the United Nations in 2016, stated that Colombia is number 57 of 193 countries, with an index number of 0,6237 (from 0,0 to 1,0) proving the poor performance of e-government implementation in the country (UN, 2016). The results of the e-government plan in Colombia are not encouraging, and considering the investment made by the Colombian state it is important to explore the needs of organizations and citizens and the impact of e-government applications on operational effectiveness and user satisfaction. Trust is essential to the acceptance of e-government systems as these psychological stages define how citizens and organizations perceive the effectiveness of government systems and operations.

Operational Effectiveness

A changing environment and increased competition make it more difficult for organizations to achieve high performance. Organizations have responded to these challenges by improving their services and making their processes more flexible. This includes reconfiguration and transformation to reduce cost and become more efficient

(Grundy, 2006; Teece, Pisano, & Shuen, 1997). To this end two different generic strategies are employed as drivers for competitive advantage: Differentiation and Cost leadership (Dess & Davis, 1984; Porter, 2004). Operational effectiveness is thus clearly part of a cost leadership strategy and one of the primary drivers of organizational performance. Competitiveness depends on organization performance and therefore organizations need to focus on quality, cost, reliability, flexibility, and how fast operations and processes are carried out (Ben-Rajeb, Morel-Guimaraes, Boly, & Assielou, 2008). Therefore, operational effectiveness can be the key to organizational success if the organization operates faster and better than the competition (Namnai, Ussahawanitchakit, & Janjarasjit, 2015). Operational effectiveness is based on the core abilities of the organization to establish processes and methods to exceed customer expectations (Porter, 1996). To be operationally effective, the organization needs to measure, control, and improve their processes. Better use of resources within core processes implies eliminating waste and reducing costs, and allows the adoption of appropriate technological innovation (Porter, 1996). Difficulties arise when trying to measure the performance. However, not only quantitative benefits have to be measured, but also qualitative benefits, and this presents another difficulty when trying to measure performance (Brigham & Ehrhardt, 2017; Ehrhardt & Brigham, 2015). Therefore, the organization needs to study how they perform their primary and supporting activities for their service delivery to internal and/or external clients, and as a result, the organization can define how to add value at every point of the process and improve, while meeting its operational performance objectives (Rosenbusch, Brinckmann, & Bausch, 2011). There are five performance dimensions which influence operational effectiveness. Those are, according to Hill, speed, reliability, cost, quality, and flexibility (Hill, 2005).

Cost performance refers to identifying and reducing inefficiencies and waste in all processes i.e. procurement, product design, etc. (Russell & Taylor, 2008). Cost efficiency refers to productivity relative to cost and meeting goals at the lowest price (Bisbe & Otley, 2004). Quality is not only producing with no defects, but also giving the customer products or services that satisfy their need (Russell & Taylor, 2008). Reliability means that the processes of the organization perform as expected over time; in other words, that customers are satisfied with the organization's products or services that do not fail or are delivered as agreed (Corbett, 1992; Porter, 1996). Flexibility is vital for any process in any organization and is highly relevant in the present environment of highly competitive markets (Slack, Stuart, Johnston, & Betts, 2006). Operational flexibility is therefore the core capability of the management of providing a quick answer to environmental changes through the set-up of different processes or routines that fit into the changing market conditions (Verdu-Jover, Llorens-Montes, & Garcia-Morales, 2004; Zajac, Kraatz, & Bresser, 2000). The last of the five performance dimensions, speed, is the time required to respond to market requirements, and how fast an organization can provide new products or services. Due to constant changes in the environment it is considered a core capability (Tidd & Bessant, 2009).

E-Government Effectiveness

Maintaining or improving performance is one of the main goals of all groups of interest of any organization and can be considered one of the critical issues in any firm's strategy (Santa, Hyland, & Ferrer, 2014). One of the keys to improving performance is investment in technology and technological innovation. E-government qualifies perfectly as such a technological improvement, as it grants benefits to public entities, citizens and organizations, such as reducing information cost, enhancing communication speed and/or reducing distance between all involved parties (Jaeger & Thompson, 2003). E-

government services have the benefit of allowing the effective management of information between public entities, any organization, and citizens, and therefore is a powerful tool to improve performance and efficiency (Shan, Wang, Wang, Hao, & Hua, 2011).

It still remains difficult to measure the improvement in performance of the organization after the implementation of technological programmes. Although the success of information system (IS) implementation has been discussed by the scientific community, there still exists disagreement as to what is the best construct to be used as the measurement for IS success (Wang & Liao, 2008). One of the common understandings is that the effectiveness of IS (as e-government applications) depends on how the system adds to the achievement of the firm's corporate goals, benefits and performance. The enhanced DeLone & McLean model defined six variables to measure the success of an IS implementation process: service quality, system quality, information quality, user satisfaction, user use, perceived net benefit (DeLone & McLean, 1992; DeLone & McLean, 2003; Wang & Liao, 2008).

System quality is a technical variable and measures the technical efficacy: what the system should do according to the specification. Performance and productivity constitute the principal basis for evaluating system quality (DeLone & McLean, 2003; Von Hellens & Nielsen, 2004). Information quality can also be defined as the quality of the data and refers to the information given back by the system, such as an e-government application. It considers the content, accuracy and format given back and if such data satisfies the user requirement (DeLone & McLean, 2003; Von Hellens & Nielsen, 2004). Service quality considers the service level received by the user of the system application and also system support by the IT/IS department. Both characteristics have impact on user satisfaction (DeLone & McLean, 2003; Pitt, Watson, & Kavan, 1995). The perceived service quality of the IS/IT is a key factor in success. The IT/IS ability to provide installation assistance, system and product knowledge, training, and online and personal help will define the relationship between users and the IT/IS department and the success of the application (Moad, 1989; Pitt et al., 1995). Perceived net benefit can be considered as the sum of adequate management of the perceived quality of the system, system use and user satisfaction and as it is a perception based on psychological and behavioral processes, it can be developed according to management action (Wang & Liao, 2008). However, the effectiveness of the e-government systems should be measured according to real operational benefits rather than the achievement of information systems outcomes alone, as the technological innovation or the dedicated resources might not be enough and the expected performance may not be substantiated (Olson, Slater, & Hult, 2005). Therefore, the e-government effectiveness dimensions (system quality, service quality, information quality, user satisfaction) should be linked to operational performance and viewed in alignment with the system and environmental characteristics.

Trust

The idea of trust is one of the most commonly investigated concepts in behavioral sciences, and marketing literature cites trust as an important element of relationship and one of the key concepts in B2B and B2C service connections (Rauyruen & Miller, 2007; Samiee & Walters, 2003). Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA) is the basis for the handling of trust concerns, and was recently validated by Yzer (2017). The theory states that a person´s intention to perform an action or behavior is the trigger for the planned move. It also states that the customer acts rationally according to his beliefs. Customer beliefs are also a key reason for the adoption of new technologies (Bermudez-Edo, Hurtado-Torres, & Aragon-Correa, 2010).

The TRA model argues that actual behavior and attitudes are preceded by behavioral intentions, and behavioral intentions can be predicted by analyzing attitudes and subjective norms. Although uncommon, several studies relate the TRA model with Information Technology (Ajzen, 1991; Mishra, Akman, & Mishra, 2014; Moore & Benbasat, 1996). A few of these studies discovered a positive relationship between trust and user satisfaction. According to Benamati et al. (2010), trust has been a more important variable than technology acceptance and has a positive impact on the usage of B2C websites. Trust also has a positive impact on C2C business (Lu, Wang, & Hayes, 2012). Trust has been proven to be as important as perceived usefulness and perceived ease of use in online business (Gefen, Karahanna, & Straub, 2003) and to be a key factor in success in new technology implementation (Ettlie, Tucci, & Gianiodis, 2017; Mousavi, Pimenidis, & Jahankhani, 2008), and has been recognized as a key enabler for efficient implementation and adoption of technological innovation such as e-government (Srivastava & Teo, 2005; Warkentin, Gefen, Pavlou, & Rose, 2002)

Given the existing literature on trust, we propose that there is a need to construct a comprehensive theoretical framework that incorporates the relationship-facilitating aspects of e-government in a B2B context. Consequently, the hypotheses tested in this study are:

H1: Subjects with greater perceptions of Trust with respect to e-government services will report higher evaluations for Quality of the System.

H2: Subjects with greater perceptions of Trust with respect to e-government services will report higher evaluations for Quality of the Information.

H3: Subjects with greater perceptions of Trust with respect to e-government services will report higher evaluations for Quality of the Service.

H4: There is a predictive relationship of Quality of the System on Operational Effectiveness.

H5: There is a predictive relationship of Quality of the Information on Operational Effectiveness.

H6: There is a predictive relationship of Quality of the Service on Operational Effectiveness.

H7: Subjects with greater perceptions of Trust with respect to e-government services will report higher evaluations for Operational Effectiveness.

Research method

The purpose of this research is confirmatory – correlational. Confirmatory research is undertaken to explain and quantify relationships between variables and determine the causes of different phenomena (Kaplan, 2004; Yin, 2013). Although, there is no evidence of research on the role of trust in the alignment between e-government effectiveness and operational effectiveness in Colombia, similar studies already exist in other countries (Bélanger & Carter, 2008; Carter, 2005). To test the hypothesis, the survey instrument, measurement constructs, and best fit model were developed according to guidelines established by Hair et al (2010) and a self-administered questionnaire was designed and collected 440 valid responses from users of e-government applications in local businesses and government organizations in Colombia. Both SPSS V21 (SSPS Inc and IBM Company, Chicago, Ill, USA) and Analysis of Moment Structures (AMOS version 21.0.0, AMOS Development Corporation, Spring House, Penn., USA) were used to undertake multivariate analysis research on the gathered data. Confirmatory factor analysis (CFA) was used to study the relationships between observed and continuous latent variables, and to determine the measurement model's overall fit (Cooksey, 2007; Hair et al., 2010). Factor loadings were estimated, items loaded on only one construct (i.e., no cross loading)

and latent constructs were correlated (equivalent to oblique rotation in exploratory factor analysis). Internal consistency was assessed using Cronbach's alpha coefficient and the items-to-total correlation. Table I summarizes the constructs' coefficient values. All constructs have values greater than 0.7 of the cut-off level set for basic research (Nunnally & Bernstein, 1994). Additionally, confirmatory factor analysis (CFA) was conducted to test construct validity.

Table 1- Cronbach's alpha

Variable	**Number of Items**	**Alpha (α)**
Operational effectiveness **(**OE**)**	10	0.967
Quality of the system **(**QSY**)**	6	0.914
Quality of the service (QS)	7	0.808
Quality of the information (QI)	9	0.949
Trust (T)	6	0.936

To support the model goodness-of-fit indices (GFI) were utilized: the model shows 561 distinct sample moments, with 87 distinct parameters to be estimated. The Chi-square equals 1715,422 with 474 degrees of freedom, with a CMIN/DF of 3,619 and a 0.000 probability level. Note that Wheaton et al. (1977) suggested a ratio of approximately five or less as a reasonable criterion, and Marsh and Hocevar (1985) recommended using ratios as low as two or as high as five. The CFI value above 0.9 supports the model, with a result of 0.925 (Bentler, 1990). In addition, the reliability of each of the constructs in the model was evaluated using several fit statistics, the root mean square error of approximation (RMSEA) was acceptable as the model had a value of 0.077 and the maximum is considered to be 0.08 (Bentler, 1990; Jöreskog and Sörbom, 1982).
The baseline comparisons fit indices suggest that the hypothesized model fits the observed variance-covariance matrix well relative to the null or independence model (see Table 2).

Table 2- Baseline comparison

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.900	.888	.925	.917	.925
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

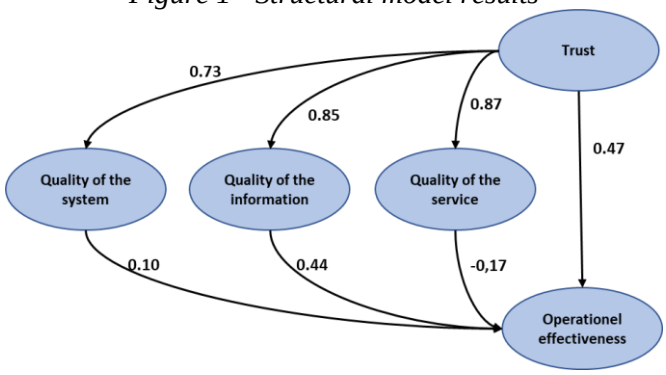
Results

The findings from SEM show a strong and positive relationship between trust and quality of the system (*b=0.73, p <0.001*); trust and quality of the information (*b=0.85, p <0.001*) and trust and quality of the service (*b=0.87, p <0.001*), thereby confirming hypothesis H1, H2 and H3 respectively. These three hypotheses endorse the importance of trust as a key element in the effectiveness of the e-government systems and also show that it is one of the key concepts in electronic commerce services connections as pointed out by Rauyruen & Miller (2007) and Samiee & Walters (2003).

The results of the study show that there is a strong and positive impact of trust on operational effectiveness (b=0.47, p <0.001), which suggests that organizations with a greater perception of trust in the e-government services will have higher levels of operational effectiveness. Additionally, there is a strong and positive impact of quality of the information on operational effectiveness (b=0.44, p <0.001), which confirms

hypothesis H5. This finding suggests that the quality of the data or quality of information given back by the system when presented in the right format, at the right time and with easy access within their contextual and intrinsic context will satisfy the user requirements (DeLone & McLean, 2003; Lee, Strong, Kahn, & Wang, 2002; Von Hellens & Nielsen, 2004). H4 and H6 were rejected showing a very low relationship between quality of the system and quality of the service on operational effectiveness ((b=0.1, non-significant; p <0.001; b=-0.17, non- significant, respectively). This finding is important, as quality of the system and quality of information are two substantial factors in achieving system effectiveness according to the DeLone & McLean (2003) model. This demonstrates that there is a lack in the quality of the system and the quality of the services of e-government in the country, and indicates that the Colombian government needs to take measures to improve the service.

Figure 1 - Structural model results



Conclusion.

The research question ""How does the users´ trust predict attitudes toward system quality, service quality, information quality and operational effectiveness?" has been answered by this study. The proposed model provides a picture of the dynamics surrounding quality measures of e-government systems, when tested simultaneously with perceptions of trust and operational effectiveness. This study supports Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA) which is the basis for the handling of trust concerns. The fact that trust was an indicator of operational effectiveness and systems effectiveness, shows that users of e-government systems in Colombia act rationally according to their beliefs, which is also a key reason for the adoption of new technologies (Bermudez-Edo et al., 2010). Additionally, trust has a positive impact on the implementation and usage of e-government applications, a fact that supports the views of Benamati et al. (2010); Lu, Wang, & Hayes (2012) and Ettlie et al. (2017). This research also found that two of three dimensions stemming from e-government effectiveness (quality of the system and quality of the service), have no impact on operational effectiveness. The first indicates that the performance and productivity of the systems are not perceived by the users of these technologies as appropriate or adequate, as required by DeLone & McLean (2003) and Von Hellens & Nielsen (2004) for a system to be effective. Therefore, the Colombian government needs to focus more on the quality of the e-government system, in particular on the correction of problems or 'bugs' in the system, quality of documentation, user-friendliness, user interface consistency, and support and maintainability of the source code as a factor of system quality according to the view of Seddon (1997). The second factor with no impact on operational effectiveness is service quality which is perceived as inadequate by the e-government system users. The ability of the IT/IS department to solve user problems, to provide assistance, training, and product knowledge will enhance

the relationship with users and increase the success probabilities of the e-government application. Consequently, the investment focus of the government should not only be on the quality of the system (hardware) but also on the IT specialists attending the end-user and on training capacities and facilities. The third variable stemming from e-government effectiveness—quality of the information—is key to achieving operational effectiveness. The results of this study show that government authorities are paying attention to promoting the quality of the information of e-government systems and are seeking ways to guarantee operational effectiveness, through the achievement of better operational cost, quality, reliability, flexibility, and speed, which are part of the overall e-government implementation strategy. Users consider the content, accuracy, format, and time when information is given by e-government systems, and whether the data satisfies user requirements (DeLone & McLean, 2003; Von Hellens & Nielsen, 2004). Therefore Colombian specialists should focus on factors such as whether the data is available and of easy access when required, if it is correct and representational, and finally, that it adds value to the operations and processes of the user (Lee et al., 2002).

In our opinion, managers need to be aware that the five performance objectives stemming from operational effectiveness—cost, quality, reliability, flexibility and speed—are necessary in the quest for e-government systems to be successful and effective and help organizations in the government sector to help users to improve their operational performance. In the quest for operational effectiveness through the implementation of e-government systems, it is essential that government organizations encourage the delivery of value-adding flexible and reliable services of exceptional quality, on time and at reasonable cost, to guarantee successful implementation of e-government systems. Additionally, government officials and managers should pay more attention to other dimensions such as the quality of the service offered by the information systems department, which also impacts the quality of the e-government systems. The main reason for this claim is that between quality of the service, quality of information, and quality of the system, quality of the service has the most predictive impact on trust according to the DeLone and McLean (2003) model.

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