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Model Analysis of the Relationship Between Strategic Organization Knowledge and the Use of Information Systems in Firm Performance in Brazil

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Information Technology (IT) consolidates as an essential element to support the business strategies to survive and rapidly adapts to changes in the competitive environment. This paper examines the impact of the use of information systems (IS) and strategic organization knowledge (SOK) on firm performance in 150 Brazilian companies. The study uses partial least squares structural equation modeling (PLS-SEM) and establishes models to express the relationship among the constructs examined. The study identifies that the direct influence of IS use on performance is moderately significant. However, when mediated by orientation strategy, the total effect of IS use on firm performance is demonstrated to be highly significant. The model explains 54% of the variability of firm performance and confirms IS use as a fundamental resource to support strategic business processes.

Keywords: firm performance, strategic organization knowledge (SOK), information systems (IS) use, information technology (IT)

Introduction

The rise of Brazil has been one of the greatest economic success stories of the last decade. Record levels of foreign investment, millions of people being lifted out of poverty, and a growing middle class have created a vibrant new market for global trade (Reid, 2013). Companies in Brazil must actualize their strategies as a key requirement to compete in the global market.

The strategy appears in modern times as a process that not only reflects the company strategic top-down direction, but also is a set of pragmatic compromises between various firms' stakeholders (Segal-Horn, 2004). The strategy is a broad and complex framework of collective influences of the various approaches that integrate and reinforce the mutual form (Andersen, 2004; Mintzberg, Ahlstrand, & Lampel, 2009). The strategy is connected and interwoven in a continuous process by employees (Sharma & Kaur, 2009; Bettis-Outland, 2012; Elbanna, 2012; Sminia & Rond, 2013) to develop coherent and sustainable actions to face the challenges of the organization (Ketokivi &Castañer, 2004).

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Various strategies are aimed at having a fundamental impact on firm performance (Venkatraman & Ramajunam, 1986; Mintzberg, 1998; Ghemawat, 2002; Combs, Crook, & Shook, 2005; Kaplan & Norton, 2004; M. Song, Im, Bij, & L. Song, 2011; Ouakouak & Ouedraogo, 2013). Several studies confirm that the intense use of IT is one of the main components of performance (Chan, Huff, Barclay, & Copeland, 1997; A. L. Albertin & R. M. Albertin, 2012; Ju, Zhou, Gaoo, & Lu, 2013).

Nevertheless, most studies have investigated key issues of IT investment returns on financial performance (Melville, Kraemer, & Gurbaxani, 2004; Anderson, Banker, & Ravindran, 2006; Chari, Devaraj, & David, 2008) and placed less emphasis on the effects of IS use (Devaraj & Kohli, 2003).

Corporate performance models are presented in different ways in the academic literature based on the high number of variables that can influence and be influenced by firm performance. Based on the presupposition that the strategy concept has many dimensions (Mintzberg et al., 2009), this study has focused on the descriptive approach of strategy from the dimension of SOK (Nonaka & Takeuchi, 1995; Mintzberg, 1998) and firm performance to a company's ability to meet stakeholders' demands (Glick, Washurn, & Miller, 2005).

Given that IS use influences strategic organizational aspects (Porter & Miller, 1985; Kaplan & Norton, 2004), firm performance (Melville et al., 2004; Ju et al., 2013), and system quality, service quality and information quality (Delone & Mclean, 2003), this article therefore aims to examine the influence of SOK and IS use on firm performance from the shareholder, customer, internal process, and learning and growth perspectives (Kaplan & Norton, 1996) for companies in Brazil. The strategic value of IS use is not simply in the adoption of IT but in adding value as the organization makes use of it (Chan & Huff, 1993). The research model Figure 1 shows the relationships and hypothesis proposed in this study.

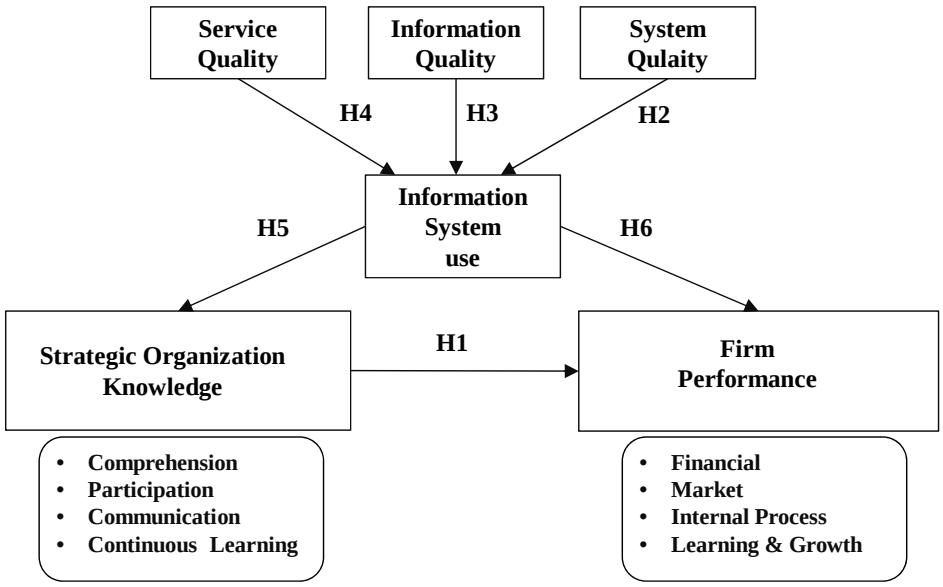

Figure 1. Proposed model.

The relevance of the study stems from the intense and meaningful IS use (Meirelles, 2013) by Brazilian companies to position themselves as large influencers in the world economy. In addition, the study contributes to the literature investigating the integration and cross-influences of IS use constructs in terms of multiple aspects of strategy and performance. Cross-fertilization between various management supports raises important

questions about the impact of multiple performance indicators (Mahmood, 1993; Devaraj & Kohli, 2003) and how technology is used to address the quality aspects of IS, provide services, and address the strategy aspects of comprehension, participation, communication and continuous learning in the Brazilian context.

The article begins with a review of the firm performance literature, incorporating various perspectives of measurement, quality aspects of IS use, and SOK. Then it presents the hypotheses, the research technique, the instruments of data collection, and the results obtained by applying the model in the surveyed companies. Finally, it considers outcomes, possibilities, and limitations of the model and makes suggestions for future research.

Theoretical Background

Firm Performance

The term performance is recurrent and of widespread interest to administrators and scientists. However, what constitutes performance is also one of the thorniest issues in academic research (Venkatraman & Ramanujam, 1986; Falshaw, Glaister, & Tatoglu, 2006). The concept is customarily defined narrowly (Glick et al., 2005) based on financial results like revenue, expenses, return on investment, profit, profitability, and so on.

Research incorporating non-financial measures is recommended (Falshaw et al., 2006; Ong & Teh, 2009) to address important aspects of the competitive environment (Pace, Basso, & Silva, 2003). Extending the measurement of firm performance is necessary to adopt multidimensional factors (Chakravarthy, 1986; Glick et al., 2005; Ong & Teh, 2009; Ouakouak & Ouedraogo, 2013). It is not prudent to use a single measure to measure the complex theoretical foundations of firm performance (Cameron, 1986; Chakravarthy, 1986; Murphy, Trailer, & Hill, 1996; Combs et al., 2005).

Firm performance is associated with the quality of IT use in the execution of the business's value chain activities (Yoshikuni & Albertin, 2013; Porter & Miller, 1985). Technology improves productivity, income generation, cost reduction, competitive advantage, and inventory reduction, among other performance measures (Melville et al., 2004). Activities are related to the processes of generation and delivery of the company's value proposition to stakeholders (Friedman & Miles, 2002; Kaplan & Norton, 2004).

The impact of IS use is measured by the benefits (tangible and intangible) that technology offers to businesses; these include various organizational aspects. The impacts involve different activities undertaken by the company, either internally or within the value network (A. L. Albertin & R. M. Albertin, 2012). Tangible benefits can be measured directly by the company's financial results, such as cost reduction, revenue growth, and profit generation (Venkatraman & Ramanujam, 1986; Ouakouak & Ouedraogo, 2013), and intangible impacts are characterized by the improvement of firm performance in ways that do not directly impact the company's bottom line, such as information management, security, and image (Murphy, 2002).

Financial results like profitability, profits, costs, expenses, and investments are key indicators to measure financial performance, which is understood as the primary objective of for-profit organizations (Atkinson, Kaplan, Matsumura, & Young, 2011). All strategic objectives are defined as direct actions for the generation of long-term value for shareholders (Pace et al., 2003). Financial methodologies can be used to analyze tangible performance aspects of IS use, which corroborates the singular vision of technology use. However, it is necessary to identify indicators that can measure intangible aspects of firm performance, like quality, flexibility, and business innovation (Kaplan & Norton, 2008).

IS use is measured by the benefits generated for the organization (A. L. Albertin & R. M. Albertin, 2012) to establish how technology influences the various perspectives of firm performance. Performance evaluation suggests that the efficiency of a firm depends on how well it meets stakeholders' demands (Glick et al., 2005; Ong & Teh, 2009; Ouakouak & Ouedraogo, 2013). The use of multiple indicators is necessary for the organization to obtain a consistent evaluation of firm performance and technology use (Mahmood, 1993). The balanced scorecard (BSC) (Kaplan & Norton, 2008) considers four perspectives understood to be appropriate and comprehensive to measure firm performance from the financial, customer, internal processes, and learning and growth perspectives..

Financial Perspective. The financial perspective defines the logical chain along which assets (tangible and intangible) are converted into economic and financial value for the company. The organization's financial performance is related to the company's ability to generate added value for shareholders over the long term (Mitchell, Agle, & Wood, 1997; Kaplan & Norton, 2004). This long-term value is a result of firm performance based on strategies for productivity and growth (Narasimhan & Kim, 2002; Baum & Wally, 2003). The performance of a productivity strategy is related to the efficient management of costs, expenses, and investment performance, while growth strategy performance is related to revenue generation (Kaplan & Norton, 2004)

Customer. The customer perspective clarifies the conditions that create value for the market (Mitchell et al., 1997; Ong & Teh, 2009). Market performance is measured by objectives related to product and service attributes such as price, quality, time, availability, and functionality. The customer relationship is measured by partnership, customization, and so on, and image is measured by brand loyalty (Kaplan & Norton, 2004). The delivery of the various attributes to the market promotes customer satisfaction (Tracey, Vonderembse, & Lim, 1999) and retention (Sila & Ebrahimpour, 2005; Sila, 2007), demonstrating added value.

Internal Process. The internal process perspective identifies the activities of the value chain that transform assets into results for clients and shareholders (Kaplan & Norton, 2004). Internal process performance is measured by the degree of excellence in operational management (activities undertaken to deliver products and services) (Kanter & Brinkerhoff, 1981); customer management and innovation (activities that increase customer value); and the management of regulatory and social processes (activities related to sustainability). Efficient companies are characterized by a high level of process integration, a low amount of administrative and productive bottlenecks, and continuous vertical and horizontal flows of information (Cameron, 1986).

Learning and Growth. The learning and growth perspective determines how intangible assets are aligned and integrated to create value in the organization. Learning and growth performance is measured by human capital, information capital, and organizational capital (Kaplan & Norton, 2004). Human capital is related to the attraction, retention, and development of employees (Chakravarthy, 1986; Sila & Ebrahimpour, 2005; Sila, 2007); organizational capital is the ability to provide an organizational culture focused on quality, teamwork, leadership, strategic alignment, and so on (Garnett, Marlowe, & Pandey, 2008; Ouakouak & Ouedraogo, 2013); information capital is the ability of technological resources to create value in the company, whether through support or through the innovation processes for goods and services (Andriessen, 2004).

Strategy Organization Knowledge

The evolution strategy is constantly expanding to the integration of centralization and decentralization of decision making (Andersen, 2004) to direct, analyze, plan, execute, monitor business processes associated with

firm performance. The evolutionary approach proposed by Ansoff (1991) by a holistic strategy incorporates aspects of organizational capacity, bi-directional formulation (centralized and decentralized), focusing on communication, implementation and monitoring of the strategy, organizational learning, strategic simulation scenarios through technology enabling real-time response to environmental changes (internal and external) (Ansoff & Nakamura, 2007).

The strategy is connected and interwoven in a continuous process by employees (Sharma & Kaur, 2009; Bettis-Outland, 2012; Elbanna, 2012; Sminia & Rond, 2013) and occurs by understanding the role that they (employees) should play in the management of strategy (Boswell, John, & Alexander, 2006).

The various approaches and contemporanes strategic theories have a common factor in guiding employees in the strategy (Sharma & Kaur, 2009; Mintzberg et al., 2009; Sminia & Rond, 2013). The involvements of employees (ideas and viewpoints) within organizations need to be encouraged to come to the fore within teams and networks so that experimentation and learning occur (Segal-Horn, 2004).

Human capital becomes a major source of success for the organization (Barney, 2002; Nonaka & Takeuchi, 1995; O'Reilly, Caldwell, Chatman, Lapiz, & Self, 2010), and greater attention should be given to employee's SOK in the firm (Boswell et al., 2006; Khadem, 2008). The creation of alternative paths to achievement of organizational goals (Boswell & Boudreau, 2001) occurs in the firm by employee involvement in strategy (Ouakouak & Ouedraogo, 2013). The understanding of employees in strategy enables the change and encourages adaptive thinking needs and strategic actions (Maritz, Pretorius, & Plant, 2011; Vila & Canales, 2008).

Given that strategies are executed by employees in business processes (Mintzberg, 1998; Kaplan & Norton, 2008), SOK is one of the main resources (Earl, 2001) contributing to the effectiveness of the strategies (Nonaka & Takeuchi, 1995). The creation and maintenance of competitive advantage occur during the acquisition, maintenance, integration, and creation of SOK, thus improving firm performance. The development of SOK permeates through various organizational aspects such as culture, content, processes, infrastructure, and technology (Nonaka, 1994; Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998; Mathew, Kumar, & Perumal, 2011).

This study presents an illustration of SOK in strategic socialisation processes among employees from the perspectives of comprehension which is the sense of purpose and main objective to be achieved (Sharma & Kaur, 2009; Elbanna, 2012), the employees participation in the deployment of strategic actions (Boswell et al., 2006; Khadem, 2008; Ouakouak & Ouedraogo, 2013), the influence of communication and integration of employee collaboration (Khadem, 2008; Beehr, Glazer, Fischer, Linton, & Hansen, 2009; Ugboro, Obeng, & Spann, 2011), and continuous learning organization (Nonaka & Toyama, 2005; Bettis-Outland, 2012).

Comprehension. The organization's strategy is defined according to the primary objective to be achieved. The philosopher Seneca, from the time of Christ, is famously quoted as saying, "The captain who sails without a goal always claims that the wind blew in the wrong direction". It is essential for a company to define its main objective to its stakeholders by taking a broad approach and time period: This is classified as the organization's future vision (Hamel & Prahalad, 1996; Drucker, 2006). In addition to defining the long-term vision, it is necessary to determine the role of the business through the organization's mission, which characterizes the reason for the company's existence (Drucker, 1993; Kaplan & Norton, 2008). The framework of the mission,

vision, and values is described as the strategic direction (Kaplan & Norton, 2008) and aligns with the organization's strategy (Boswell et al., 2006; Khadem, 2008; O'Reilly et al., 2010; Yoshikuni & Albertin, 2013).

Participation. The company's top management specifies the strategic direction to be achieved and implemented: It is up to the employees at various levels to participate in planning and implementing the strategic actions (Hall & Wade, 1993; Nonaka & Takeuchi, 1995; Porter, 1996; Boswell et al., 2006; Khadem, 2008; Ouakouak & Ouedraogo, 2013). Analyses and simulations of scenarios provide information to shareholders and directors about the risks and gains, and managers collaboratively present alternatives for the strategic course (Copeland, Koller, & Murri, 2000; Kaplan & Norton, 2008; Elele & Fields, 2010).

Communication. The implementation of strategic actions depends on the effectiveness of the communication strategy at the various levels of the organization (Rapert, Velliquette, & Garretson, 2000). The dissemination of the strategic guidelines should systematically involve all organizational levels so that everyone has a common understanding of the strategy (Beer, Voelpel, Leibold, & Tekie, 2005; Boswell et al., 2006; Kaplan & Norton, 2008; Beehr et al., 2009; Porter, 2010). The communication strategy for all employees becomes a crucial point for effectiveness. Shannon and Weaver (1949) highlighted that the communication process is based primarily on a common understanding of certain content (message). Thus, the company should be structured accurately, using a broad and systemic strategy to communicate to all employees through various channels: meetings, lectures, murals, portals, IS, social networks, and so on (Yoshikuni & Galegale, 2011).

Continuous Learning. This is the process of competency development (Senge, 1990; Gönczi, 1999), which occurs either naturally or through induction, and either formally or informally (Sonnentag, Niessen, & Ohly, 2004), to establish the absorption of knowledge and the development of skills and attitudes (Argyris & Schon, 1978; Nonaka & Takeuchi, 1995; Nonaka, Toyama, & Konno, 2000; Illeris, 2004). Firm performance reflects the level of essential competencies, individual and collective, developed by the organization (Barney, 2002). The degree of strategic learning is one of the drivers of the effectiveness of the strategy for promoting operational efficiencies and effectiveness in the organization (Porter, 1987). Organizational learning occurs through the process of integrating employees in promoting self-development, such as training, to generate new ideas, making it possible to break paradigms, rethinking the old to create or generate the new (Brandão, Borges-Andrade, & Guimarães, 2012).

From these arguments of SOK, this paper proposes the following hypothesis:

Hypothesis 1: Greater readiness to SOK is positively associated with firm performance.

IS Use

IT is presented as the elemental facilitator generating information and creating value for organizations and thus supporting the competitive business landscape (Porter & Millar, 1985). IT can transform the way activities are performed and the integration of the links between the broad value chain activities of the business, providing support for decision making in planning, execution, and monitoring.

However, IT alone does not guarantee the success or determine the failure of the organization's strategy: Value is added through the organization's use of IT (Chan & Huff, 1993; Melville et al., 2004).

The impact of IT adoption comes from the level of analysis and individual interaction or use of IT resources (Davis, 1989; Venkatesh, Morris, G. Davis, & F. Davis, 2003). Over the years, many methods have been developed (TAM, UTAUT, and SERVQUAL, among others) to measure the drivers of intention to use the

system as a result of perceived usefulness and ease of use experimentation (Parasuraman, Berry, & Zeithaml, 1988; Carr, 2002).

However, none of the previous models sought to develop successful IS use based on the components of information content, user interface, and process support. Relying on these components combined, the DeLone and McLean model (1992, 2003) as refined and validated by Rai, Lang and Welker (2002), seems more suitable for successful systems evaluation when the goal is to examine the separate contributions of each of the components, measured at the level of the users.

The IS success model has six variables (Delone & Mclean, 1992): system quality, service quality, information quality, use, user satisfaction, individual impact, and organizational impact. System quality is equivalent to the technical level of communication, whereas information quality is equivalent to the semantic level of communication. The other four mapped variables identify the level of effectiveness in receiving information, which is related to user satisfaction, and individual impact, which is associated with the influence of recipient information. Organizational impact involves the influence of IS (Delone & McLean, 2003). This first information flow model was established by adapting the linear theories of communication to IS.

The Delone and McLean model is considered as one of the most comprehensive models and is used worldwide. Its position was consolidated through review of the major studies in the area of IS (Wu & Wang, 2006) in which it has been referenced more than 1,000 times (Petter & McLean, 2009).

Systems Quality. The IS success model proposed by Delone and McLean (1992, 2003) evaluates the "systems quality" aspects of processing speed, ease of use, navigation, response time, and reliability of the system.

Information Quality. Information quality relates to the quality of the content deposited into the system, mostly from the user's point of view, including quality aspects of graphics, data, and the clarity with which the information is presented to users. It relates to the dimensions of the IS given its relevance, reliability, timeliness, clarity, readability, and interpretability (Delone & McLean, 2003), as well as the content, accuracy, and format (Rai et al., 2002).

Service Quality. Service quality relates to some essential services, such as training and helpdesk and user support. Service performance can occur online or offline (Delone & McLean, 2003). The services provided correspond to the processes of technology available by the organization for analysis, development, implementation, maintenance, and support of the IS.

In summary, these arguments have demonstrated that IS use is influenced by the quality aspects of systems, services, and information. Therefore, the higher the quality of the IS made available by the organization, the greater the decision making capacity provided to employees, and, therefore, the greater the benefits of its use (Venkatesh et al., 2003; Kalika, Kefi, & Schwarz, 2010). The information provided in the IS should therefore be adequate, relevant, and accurate in order to enable employees to perform their routine activities; it should also be strategic (Rai et al., 2002; Delone & McLean, 2003). By providing better service quality in its IS, the company will contribute to the efficiency of the execution of employees' activities. From these arguments, this paper proposes the following hypotheses:

Hypothesis 2: Systems quality is positively associated with IS use.

Hypothesis 3: Information quality is positively associated with IS use.

Hypothesis 4: Service quality is positively associated with IS use.

IS Use. User satisfaction is reflected in the perception and attitude of the individual; being satisfied with the system, the individual will propose to use it more. "Use" measures how many and what resources the system uses. Some measures that stand out for measuring IS use include the number of times accessed, amount of access time, access to different resources, and access to optional features (Delone & McLean, 2003). The perception of the IS use benefits provided to users is synonymous with the perceived usefulness (Davis, 1989; Venkatesh et al., 2003).

Net benefits are the contributions generated through the increased use of interaction with the IS (Delone & McLean, 2003). Benefits can measure dimensions of operational efficiency and effectiveness; flexibility; quality; speed; the ability to manage and coordinate new technologies and generate new products and services; protection of competitive advantage; and the satisfaction of customers, employees, and shareholders (A. L. Albertin & R. M. Albertin, 2012).

Firm performance is associated with employees' use of the IS to execute business processes (Davenport & Prusak, 1998). Technology improves business processes, firm performance, and competitive advantage (Melville et al., 2004). Starting from these arguments, this paper proposes the following hypotheses:

Hypothesis 5: IS use is positively associated with perceived SOK benefits.

Hypothesis 6: IS use is positively associated with firm performance.

Data Collecting

The survey research instrument was validated by six experts in the field and adapted according to their recommendation. To investigate possible problems of content and scale, a pre-test was conducted with 40 executives enrolled in an MBA course at a Brazilian educational institution. The final instrument consisted of 36 questions arranged in a five-point Likert scale (Lozano, García-Cueto, & Muñiz, 2008; Marôco, 2010).

The final instrument was applied to 183 executives enrolled in an MBA course at a major institution in Brazil. Because of invalid forms, outliers, and missing values, 33 questionnaires were eliminated, resulting in a final sample of 150 companies. The absence of outliers was assessed by the square Mahalanobis distance (Marôco, 2010). Table 1 summarizes the profile of the sample and the universe of respondents.

Table 1

Demographic Research

Sector		Employees		Annual Revenues	
Type	%	Quantity	%	US$ million	%
Agribusiness	4.0%	up to 500	40.0%	up to 25	26.0%
Commerce	8.7%	501 to 1,000	6.7%	26 to 50	10.0%
Finance	4.0%	1,001 to 3,000	18.7%	51 to 100	11.3%
Manufacturing	46.7%	3,001 to 5,000	6.7%	101 to 250	9.3%
Service	36.7%	5,001 to 9,000	7.3%	251 to 450	3.3%
Government	0%	more than 9,001	20.7%	more than 451	40.0%

The sample included a strong concentration (exceeding 80%) of companies in the manufacturing and services industries; 60% of companies had more than 500 employees, and 40% of companies had revenues of more than $450 million.

An analysis of structural invariance was performed to identify possible differences in the coefficients of determination, beta coefficients, and scores of factors among the groups; no significant differences were found. In order to check for the presence of multicollinearity, variance inflation factor (VIF) values were analyzed for the indicators in each construct. The highest VIF value was found to be 3.335 for indicator *F*13 of the "Financial" construct, so there is no evidence of multicollinearity among the indicators, with reference to the limit recommended (< 5) by Marôco (2010).

The technique used was structural equation modeling (Ringle, Sarstedt, & Straub, 2012), which is indicated when the goal is to simultaneously examine a series of dependence relationships. This method is useful when a dependent variable becomes independent in following relationships (Hair, Black, Babin, Anderson, & Tatham, 2009). The design of this study was estimated by partial least squares (PLS) path modeling, a technique considered advantageous when there is a small sample and a large number of parameters to be estimated (Chin & Newsted, 1999).

Results Analysis

Structural Equation Model

The model in Figure 1 was estimated using the (partial least squares) PLS method, operated by SmartPLS 2.0.M3 software (Ringle, Wende, & Will, 2005).

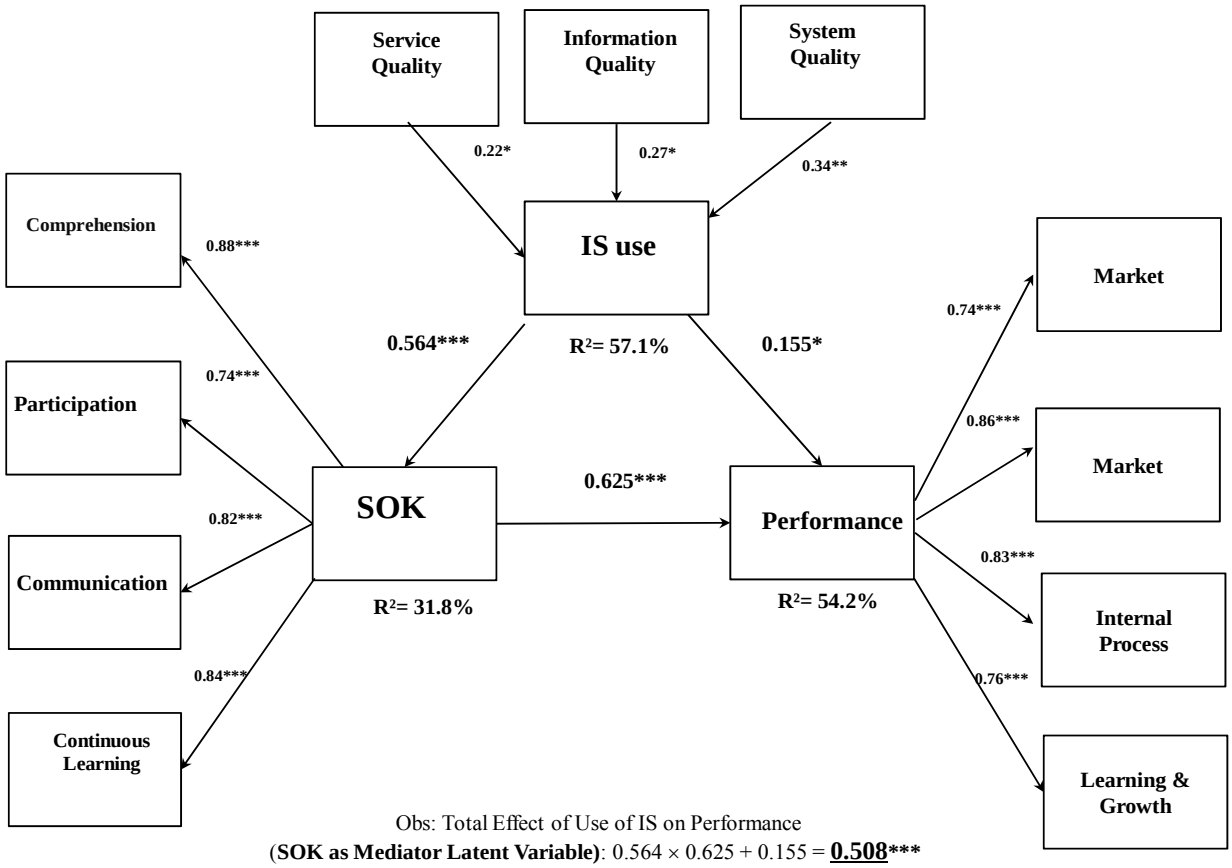

Figure 2. Structural model coefficients and significance estimated by the bootstrap technique (Developed by the authors).
Note. Significance was estimated using the bootstrap method with *N* = 150 and 1,000 replications. To avoid making the figure very complex, indicators were omitted; however, their factor loadings are presented in Table 2.

The model includes second-order latent variables (LVs) (SOK and Performance) and is modeled according to guidelines taken from Wold (1982), Lohmöller (1989), and Wetzels, Odekerken-Schroder, and Oppen (2009). The indicators of the first-order LVs were reused as indicators of the second-order LVs, allowing the execution of the PLS algorithm. Assessment of the structural model will be carried out in following sections.

Evaluation of the Measurement Model

Before evaluating a structural model, it is important to check the reliability and validity of the measurement models. The reliability of the scale is related to the confidence level of the indicators of the constructs (Hair, Hult, Ringle, & Sarstedt, 2013). This study followed the recommendations of Fornell and Larcker (1981) using the minimum value of 0.70 as a reference (Marôco, 2010). Another relevant analysis is convergent validity, which measures how much the items converge toward the same concept, and which has value as a criterion of average variance extracted (AVE). It is recommended that the minimum value of 0.50 be used for each construct, which would indicate that at least 50% of the variance of a construct was incorporated into the analysis model (Chin, 2010).

Table 2 indicates that all LVs have AVE greater than 0.50, the equivalent of a square root of AVE of approximately 0.70, for both first-order LVs and second-order LVs, confirming the convergent validity. Likewise, the composite reliability values were above 0.75 for all constructs, indicating the reliability of the scale.

Table 2

Pearson Correlation and Descriptive Statistics of Latent Variables (LVs)

First-order LV	1	2	3	4	5	6	7	8	9	10	11	12
1: Comprehension	0.80											
2: Participation	0.67	0.76										
3: Communication	0.75	0.58	0.73									
4: Continuous Learning	0.69	0.55	0.62	0.76								
5: Systems Quality	0.47	0.45	0.49	0.48	0.86							
6: Information Quality	0.45	0.41	0.51	0.42	0.82	0.84						
7: Service Quality	0.28	0.32	0.33	0.29	0.74	0.64	0.81					
8: IS Use	0.48	0.50	0.48	0.47	0.72	0.69	0.64	0.83				
9: Financial	0.36	0.32	0.38	0.33	0.25	0.28	0.19	0.34	0.88			
10: Customer	0.56	0.49	0.51	0.49	0.37	0.39	0.33	0.39	0.48	0.78		
11: Internal Process	0.56	0.42	0.52	0.60	0.45	0.51	0.34	0.44	0.42	0.69	0.77	
12: Learning and Growth	0.49	0.44	0.52	0.45	0.41	0.43	0.40	0.47	0.43	0.55	0.56	0.72
AVE	0.64	0.58	0.53	0.58	0.74	0.70	0.66	0.68	0.78	0.61	0.59	0.51
Composite Reliability	0.84	0.81	0.77	0.81	0.89	0.88	0.85	0.87	0.91	0.83	0.81	0.75
R-Squared	0.77	0.55	0.68	0.69	#	#	#	0.57	0.55	0.74	0.69	0.58

Second-order LV	1	2	AVE	Composite Reliability	R^2	Means	Median	SD	VC
1: SOK	0.77		0.60	0.94	0.32	3.30	3.35	0.62	19%
2: Firm Performance	0.71	0.81	0.65	0.88	0.54	3.56	3.58	0.57	16%

Discriminant validity checks that the concepts represented by the constructs are sufficiently distinct (Hair et al., 2009). Following the recommendation of Fornell and Larcker (1981) that an LV should be distinct from the others, its square root of AVE should be greater than the Pearson correlation with each of the other constructs. The discriminant validity of the model is satisfied based on this criterion.

Table 2 shows the correlation between the latent variables proposed in the model. The values in bold (diagonally) are the square root of the AVE. The means, medians, standard deviations, and coefficients of variation AVE, composite reliability, and *R*-squared were calculated based on the scores obtained in the estimation of the model using the SmartPLS 2.0.M3 software (Ringle et al., 2005).

Another way to check the discriminant validity of the model is to analyze the crossed loads. Table 3 shows that the indicators have higher loads on their constructs and lower loads in the other constructs, indicating discriminant validity.

Table 3 also shows the results generated for crossed loads. The indicators have significant loads ($p < 0.05$) in their constructs, confirming convergent validity. The discriminant validity is revealed when the load has the highest indicators in its own LVs. Significance was estimated using the bootstrap method with 150 cases and 1,000 repetitions.

Assessment of the Structural Model

Figure 2 shows the results of the structural model. The concepts of SOK and performance, here considered as second-order LVs, can adequately represent their first order. The high factor loadings (all above 0.74) allowed us to assign reliability and convergent validity for both concepts.

The structural model presented was able to explain 54.2% of the variability of firm performance, strategy 31.8%, and IS use 57.1%.

The path coefficient between IS use and Strategy is presented as highly significant (0.564, $p < 0.001$). In like manner, the effect of strategy on firm performance also demonstrates high influence (0.625, $p < 0.001$). The effect of IS use on firm performance, although statistically significant ($p = 0.027$), showed little influence (beta coefficient = 0.155) when analyzed directly. However, when checking the total effect of this relationship, and strategy as a mediating variable, the relationship becomes highly significant (0.508, $p < 0.001$).

To test the hypotheses proposed by Delone and McLean (2003), it was possible to identify the antecedents: system quality (0.34, $p < 0.01$), information quality (0.27, $p \leq 0.01$), and service quality (0.22, $p < 0.05$) on IS use.

Comparison Between the Means of the Latent Variables

To evaluate possible differences in the scores of the factors of the first-order variables of the strategy and performance constructs, this paper calculated the means of each LV and then compared the pairs using Student's *t*-test (Hair et al., 2009). The results are presented in Tables 3, 4, and 5. The normality of variables was evaluated by the coefficients of skewness (Sk) and kurtosis (Ku), and univariate and multivariate variables showed no severe violations of the normal distribution ($|Sk| < 3$ and $|Ku| < 10$, Marôco, 2010). The results are presented in Tables 4, 5, and 6.

The data in Table 4 represent the *p*-values of the student's *t*-test for each pair of means of the first-order strategy construct at a significance level of 5%.

The data in Table 5 represent the *p*-values of the student's *t*-test for each pair of means of the first-order firm performance construct at a significance level of 5%.

The data in Table 6 represent the *p*-values of the student's *t*-test for each pair of means of the first-order quality aspect of IS construct at a significance level of 5%.

Table 3

Loads Crossed to Assess Discriminant Validity

First order LV	Ind.	1	2	3	4	5	6	7	8	9	10	11	12	P Value
	D1	**0.85**	0.62	0.61	0.59	0.43	0.41	0.27	0.41	0.32	0.49	0.41	0.44	0.000
1: Comprehension	D2	**0.77**	0.42	0.54	0.53	0.32	0.32	0.16	0.32	0.20	0.39	0.48	0.40	0.000
	D3	**0.79**	0.56	0.65	0.54	0.37	0.35	0.24	0.42	0.34	0.47	0.45	0.35	0.000
	P18	0.54	**0.79**	0.46	0.45	0.35	0.33	0.31	0.41	0.31	0.41	0.38	0.33	0.000
2: Participation	P2	0.54	**0.78**	0.49	0.43	0.42	0.39	0.23	0.4	0.20	0.39	0.33	0.39	0.000
	P3	0.45	**0.72**	0.38	0.37	0.24	0.19	0.2	0.32	0.22	0.31	0.25	0.29	0.000
	CO1	0.43	0.42	**0.68**	0.4	0.43	0.45	0.32	0.35	0.32	0.39	0.34	0.42	0.000
3: Communication	CO2	0.63	0.39	**0.78**	0.55	0.35	0.41	0.23	0.35	0.32	0.42	0.52	0.43	0.000
	CO3	0.56	0.47	**0.72**	0.38	0.29	0.26	0.19	0.35	0.2	0.31	0.27	0.30	0.000
	AP1	0.57	0.48	0.49	**0.77**	0.35	0.30	0.16	0.38	0.26	0.3	0.39	0.37	0.000
4: Continuous Learning	AP2	0.59	0.41	0.52	**0.80**	0.47	0.44	0.36	0.45	0.24	0.39	0.47	0.33	0.000
	AP3	0.40	0.36	0.39	**0.71**	0.28	0.20	0.13	0.23	0.24	0.46	0.53	0.34	0.000
	QS1	0.44	0.42	0.42	0.47	**0.86**	0.71	0.59	0.65	0.23	0.38	0.45	0.43	0.000
5: Systems Quality	QS2	0.32	0.32	0.37	0.33	**0.82**	0.63	0.68	0.52	0.11	0.27	0.34	0.30	0.000
	QS3	0.43	0.40	0.45	0.42	**0.89**	0.77	0.65	0.67	0.28	0.30	0.36	0.32	0.000
	QI1	0.34	0.32	0.45	0.33	0.71	**0.86**	0.54	0.59	0.28	0.31	0.40	0.40	0.000
6: Information Quality	QI2	0.38	0.35	0.44	0.37	0.65	**0.82**	0.50	0.54	0.20	0.34	0.38	0.31	0.000
	QI3	0.41	0.36	0.40	0.36	0.71	**0.83**	0.56	0.6	0.23	0.34	0.50	0.37	0.000
	QE1	0.23	0.26	0.26	0.31	0.68	0.55	**0.84**	0.57	0.05	0.22	0.24	0.28	0.000
7: Service Quality	QE2	0.19	0.26	0.25	0.16	0.57	0.50	**0.80**	0.49	0.24	0.28	0.23	0.30	0.000
	QE3	0.27	0.27	0.31	0.23	0.56	0.00	**0.80**	0.49	0.19	0.32	0.38	0.40	0.000
	U1	0.35	0.30	0.43	0.37	0.68	0.62	0.63	**0.84**	0.24	0.26	0.35	0.39	0.000
8: IS use	U2	0.46	0.54	0.40	0.49	0.63	0.57	0.52	**0.86**	0.34	0.37	0.41	0.41	0.000
	U3	0.38	0.39	0.34	0.30	0.47	0.51	0.43	**0.79**	0.27	0.33	0.34	0.36	0.000
	FI1	0.26	0.19	0.33	0.26	0.15	0.21	0.13	0.25	**0.87**	0.33	0.35	0.26	0.000
9: Financial	FI2	0.39	0.34	0.36	0.36	0.30	0.30	0.21	0.35	**0.86**	0.51	0.43	0.49	0.000
	FI3	0.29	0.31	0.32	0.22	0.19	0.23	0.16	0.30	**0.91**	0.43	0.32	0.36	0.000
	ME1	0.42	0.34	0.36	0.37	0.35	0.32	0.31	0.36	0.38	**0.79**	0.53	0.40	0.000
10: Customer	ME2	0.51	0.46	0.46	0.35	0.36	0.41	0.30	0.35	0.41	**0.84**	0.52	0.40	0.000
	ME3	0.40	0.34	0.38	0.44	0.15	0.19	0.17	0.20	0.35	**0.72**	0.56	0.50	0.000
	PI39	0.55	0.41	0.54	0.49	0.41	0.50	0.26	0.37	0.45	0.51	**0.79**	0.49	0.000
11: Internal Process	PI47	0.43	0.34	0.39	0.45	0.40	0.41	0.27	0.39	0.26	0.64	**0.83**	0.41	0.000
	PI55	0.27	0.20	0.24	0.45	0.21	0.22	0.26	0.24	0.23	0.42	**0.67**	0.39	0.000
	AC1	0.17	0.18	0.20	0.13	0.19	0.18	0.21	0.12	0.00	0.18	0.21	**0.53**	0.000
12: Learning and Growth	AC2	0.36	0.36	0.37	0.26	0.30	0.34	0.32	0.36	0.36	0.41	0.40	**0.76**	0.000
	AC3	0.45	0.37	0.49	0.49	0.36	0.36	0.31	0.43	0.41	0.51	0.53	**0.83**	0.000

Table 4

Student's T-Test—Comparison Between Means (SOK Construct)

First Order LV	1	2	3	4
1: Comprehension				
2: Participation	0.876			
3: Communication	0.952	1.000		
4: Continuous Learning	1.000	0.856	0.94	
Mean	3.20	3.32	3.30	3.19
Median	3.33	3.33	3.33	3.33
Std. Deviation	0.82	0.75	0.71	0.74
Variance coefficient	26%	22%	22%	23%
Skewness (Sk)	-0.19	-0.37	-0.09	-0.17
Kurtosis (Ku)	-0.17	-0.14	-0.10	0.11

Table 5

Student's T-Test—Comparison Between Means (Performance Construct)

First Order LV	9	10	11	12
9: Financial				
10: Customer	0.002			
11: Internal Process	0.972	0.008		
12: Learning and Growth	0.996	0.004	0.997	
Mean	3.47	3.78	3.51	3.49
Median	3.67	4.00	3.67	3.33
Std. Deviation	0.90	0.69	0.66	0.72
Variance Coefficient	26%	18%	19%	21%
Skewness (sk)	-0.42	-0.52	-0.38	-0.25
Kurtosis (ku)	-0.16	0.65	0.15	-0.37

Table 6

Student'S T-Test—Comparison Between Means (Quality Aspects of IS)

First Order LV	5	6	7	8
5: System Quality				
6: Information Quality	0.311			
7: Service Quality	0.045	0.000		
8: IS use	1.000	0.336	0.040	
Mean	3.41	3.57	3.17	3.42
Median	3.33	3.67	3.00	3.33
Std. Deviation	0.84	0.77	0.80	0.80
Variance Coefficient	25%	21%	25%	24%
Skewness (sk)	-0.09	-0.20	0.04	-0.27
Kurtosis (Ku)	-0.27	-0.27	-0.07	-0.11

Discussion and Conclusions

The study developed a conceptual model to analyze the mediation of the relationship between SOK, IS use, and firm performance. The primary dependent variable of the model (performance) was explained 54% by exogenous variables (SOK and IS use). The mean performance factors demonstrated greater ability of firms to

meet the attributes requested by the customer (market). The Brazilian competitive market directs companies to deliver effective added value to achieve customer satisfaction. It is noted that companies have moderate performance for the aggregation of shareholder value (financial), efficiency in managing value-creating activities (internal process) and ability to provide resources for the generation of competence (learning and growth).

The study confirms that the strategic aspects of SOK comprehension, participation, communication and continuous learning still have significant influences on the firm performance—"SOK" can explain more than 54% of firm performance. The research reveals that Brazilian organizations have moderate emphasis on developing a strategic culture permeated throughout the organization. One perceives the construction of the knowledge growth of Brazilian firms in appropriating the fundamentals of strategic management.

Companies showed greater emphasis on IS aspects that relate to ensuring quality information content which is deposited in the system for reliability, relevance, accuracy, format, timeliness, clarity, readability, and interpretability for decision making. Companies also emphasized characteristics related to processing speed, ease of use, and navigability that matches the quality aspect of IS. Aspects of information quality and system aspects directly impact users' satisfaction in terms of perceived usefulness of IS use for employees' operational and strategic actions. The service quality aspect demonstrates minor emphasis on providing resources for analysis, development, implementation, maintenance, and support of IS. However, the difference among the means of quality factors and IS use factors was not significant, which reflects an emphasis on a homogeneous IS construct.

As the IS construct can indirectly explain much of the variability in performance, identifying its antecedents may help managers to establish guidelines and properly invest in IS. The study confirms that IS use is a feature that enables business processes but by itself is not sufficient to explain firm performance. In fact, systems are available to all interested parties and the definition of strategic processes associated with the use of systems should be considered

These results go far beyond the threshold of firm performance derived only from the traditional views regarding the financial performance of the strategy and IS constructs. The research allowed us to identify gaps in prioritizing the strategic aspects of quality and IS use in companies in Brazil, and contributes significantly to the improvement of efforts and allocation of organizational resources to provide greater influence on firm performance.

Table 7 shows that all hypotheses in this study were supported and showed a statistical significance of at least ($p < 0.05$).

Table 7

Assumptions and Original Evidence

	Hypotheses	Results
H1	Greater readiness to implement strategy is positively associated with firm performance.	Supported
H2	System quality is positively associated with IS use.	Supported
H3	Information quality is positively associated with IS use.	Supported
H4	Service quality is positively associated with IS use.	Supported
H5	IS use is positively associated with perceived strategy benefits.	Supported
H6	IS use is positively associated with firm performance.	Supported

Limitations are recognized in this study, which considered the perception of executives as the only source of information and measured indicators with an interval scale. The main limitation of our research concerns the inherent subjectivity and possible bias of the items of firm performance in our research. The study adopted a quantitative approach using the participants' declarative responses, which is a totally valid and acceptable methodology in management and business research; however, it would be useful to complete the survey with a qualitative research method for a deeper understanding of the phenomena under study and for a richer interpretation of our results.

Future research could investigate other aspects that directly or indirectly influence firm performance and identify how the use of technology can contribute to business management. The investigation of temporal questions about the training of users in business processes can help to identify different levels of organizational learning, flexibility, and firm performance.

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