# AN EMPIRICAL STUDY OF IT-BUSINESS VALUE OF ALIGNMENT STRATEGY ON CORPORATE PERFORMANCE


## ABSTRACT

Current research provides empirical evidence for a positive effect of information technology strategic alignment (ITSA) on corporate performance. Specifically, some surveys indicate that focusing on IT-business value (ITBV) and understanding its antecedents and outcomes help to optimize strategic alignment between IT and business. In this vein, this study contributes to an understanding of the role of organizational knowledge of strategy (OKS) on IT-business value of strategic alignment (ITBVSA) oriented to business process on firm performance. Using data from Brazilian companies, we found that OKSs exert significant, positive effects on ITSA, benefits of IT use (BUTI), business process performance (BPP), and firm performance (FP). From these results, this study's primary contribution is an ITBVSA model designed to illustrate the interrelationships between antecedents (OKS and ITSA), outcomes (BPP and FP), and the variable through which these variables are mediated (IT use).



**Key Words:** Organizational knowledge of strategy, IT strategic alignment, business process performance, benefits of IT use, firm performance.


## 1. Introduction

For decades, strategic theory has provided organizations with competitive advantages (Grant, 2010) through the full involvement and participation of employees in the strategy management (Khadem, 2008; Ouakouak & Ouedraogo, 2013). Though there exist multiple approaches to the implementation of strategic theory, they all must overcome challenges associated with the strategic orientations of employees (Kaplan, 2010; Mintzberg, Ahlstrand, & Lampel, 2009; Sharma & Kaur, 2009; Sminia & Rond, 2013).

Strategy is connected and interwoven throughout organizations in a continuous process implemented by employees (Bettis-Outland, 2012; Elbanna, 2012; Nonaka et al., 2005; Sharma & Kaur, 2009) that facilitates the use of resources (Kaplan and Norton, 2008), the development of coherent and sustainable business-related activities (Porter, 1996; Ray, Barney, & Muhanna, 2004), and other organizational requirements (Davenport, De Long, & Beers, 1998; Ketokivi & Castañer, 2004).

In the last thirty years, many studies (e.g., Coltman, Tallon, Sharma, & Queiroz, 2015; Gerow, Thatcher, & Grover, 2015) have provided evidence to indicate that strategic alignment of IT generates business value for the firm and improves organizational performance (Celuch, Murphy, & Callaway, 2007; Kim, Shin, Kim, & Lee, 2011). According to Melville, Kraemer, and Gurbaxani (2004), "IT business value" is how IT (and other organizational) resources are used in to facilitate business processes and improve firm performance.

The current study describes the principal contributions offered by the use of IT with its complementary resources (Kohli & Grover, 2008, Melville et al., 2004). In doing so, this study extends our knowledge of ITSA, thereby providing a better understanding about how IT assets create differential value (Aral & Weill, 2007).

This paper also provides a number of perspectives that may help to better understand the role of ITBVSA via the model proposed in Figure 1. First, we can examine the influence of OKS on the alignment of IT-resource allocation with a business' strategy. Moreover, we can gauge the benefits of IT use in salient business processes (Kohli & Grover, 2008; Xue, Ray, & Sambamurthy, 2012). Second, we can investigate the effect of OKS on the generation of IT benefits, as well as its impacts on business process performance (Tallon, 2008). Third, we can explore the relationship between an OKS's business process performance and its firm performance (Melville et al., 2004). Finally, we can examine the association between IT use

and organization performance, including variables that mediate this relationship (Kohli & Grover, 2008, Melville et al., 2004).

To summarize, this empirical study evaluates the IT-business value of strategic alignment. Specifically, we explore a series of relationships whereby organizational knowledge of strategy causes IT strategic alignment, which unveils the benefits of IT use, which improves business process performance, and ultimately, firm performance. Past research has neglected to explore these causal relationships (Coltman et al., 2015; Gerow et al., 2015; Kohli & Grover, 2008; Melville et al., 2004), making the current investigation of strategic alignment and IT-business value all the more critical.

## 2. Theory and hypotheses development

In this section, the organization knowledge of strategy, IT strategic alignment, the benefits of IT use and corporate performance are described.

### 2.1 Organizational knowledge of strategy

According to Nonaka, Krogh & Voelpel (2006) organizational knowledge exist in aspects dynamic interaction among socialization, externalization, combination and internalization (SECI model) of tacit and explicit knowledge between individuals groups, and organizations. The corporate strategy has unfolded through multiple phases and has featured different meanings for various concepts and common among these strategy theories is the dissemination organizational knowledge of strategy by employees (Kaplan, 2010; Mintzberg et al., 2009; Sharma & Kaur, 2009; Sminia & Rond, 2013).

Thereby, knowledge of strategy helps to organization to developed strategic models (Wong, 2005) that help them to link resources, technologies, process business and organizational forms to business strategy to translate the goal of making their organizations more intelligent into a strategic course of action (Lack, 1999; Nonaka, Peltokorpi & Tomae, 2005).

Similarly, many researchers recognize knowledge of strategy as the most valuable assets in helping organizations to execute their strategies (Davenport et al., 1998; Wong, 2005; Yeh, Lai, & Ho, 2006) and achieve a sustainable advantage over competitors (Al-Ammary, 2014). So, organization knowledge of strategy identifies the actions that support its vision, mission, strengthen its competitive position, and create shareholder value (Zack, 1999).

In a recent study, Yoshikuni and Albertin (2014) argued that OKS is a collection of strategic processes involving, "participation", "communication", "comprehension" and "continuous learning" (Al-Ammary, 2014; Davenport et al, 1998; Swain & Ekionea, 2008, Wong, 2005).

Participation is the employees' engagement in actions and initiatives that reflect the organization's strategy and the development of corporate commitment to that strategy (Davenport et al., 1998; Khadem, 2008; Nonaka et al., 2005; Nonaka et al., 2006; Ouakouak & Ouedraogo, 2013; Swain & Ekionea, 2008). The strategy socialization allows sharing experiences (Nonaka, 1991) and creating alternatives strategic routes.

Effective communication allows an organization to disseminate its strategy to all employees (Yeh, Lai, & Ho, 2006). Given this, communication clearly has an effect on information sharing and thus, employee collaboration (Andrews, Boyne, Law, & Walker, 2011; Fuentes-Henríquez & Sol, 2012; Kaplan & Norton, 2008; Khadem, 2008; Nonaka et al., 2005; Ugboro et al., 2011; Vila & Canales, 2008; Wong, 2005). The externalization knowledge process translates the strategy to all team members understand theirs contributions in the organization (Nonaka, 1991).

Comprehension is the dissemination of the company's strategic direction such that all employees share the same goals, targets, company missions and values to create initiatives and action to active strategy objectives (Elbanna, 2012; Lack, 1999; Nonaka et al., 2005;). The internalization knowledge process allows employees to develop routine to plan, execute and control strategy (Nonaka, 1991).

Continuous learning organizations engage in processes through which they cultivate formal and informal skill (Bettis-Outland, 2012; Nonaka & Toyama, 2005; Nonaka et al. 2006). These processes tend to promote strategy culture systematization and the absorption of knowledge, skills, and attitude (Illeris, 2004; Lai & Ho, 2006; Nonaka & Takeuchi, 1995; Nonaka, Toyama, & Konno, 2000; Nonaka et al., 2005; Nonaka et al., 2006) to create the "combination" knowledge of strategy (Nonaka, 1991).

These factors of OKSs direct corporations towards objectives that provide them with long-term competitive advantages (Al-Ammary, 2014; Lack, 1999; Nonaka et al., 2005; Nonaka et al., 2006; Yoshikuni & Albertin, 2014). In this way, OKSs promote broad strategic policies that drive intention to use resources and technology in the processes (Al-Ammary, 2014;; Wong, 2005) and generating performance outcomes. The OKS shared between businesses is a key predictor of IT strategic alignment (Chan et al., 2006; Davenport et al., 1998, Melville et al., 2004; Wong, 2005; Yeh et al., 2006) and corporate performance (Al-Ammary, 2014; Lack, 1999).

Given the above, we predict that OKS is antecedent of ITBVSA:

**H1:** Organizational knowledge of strategy is positively associated with IT strategic alignment.

**H2:** Organizational knowledge of strategy is positively associated with the benefits of IT use.

**H3:** Organizational knowledge of strategy is positively associated with business process performance.

**H4:** Organizational knowledge of strategy is positively associated with firm performance.

## 2.2 IT strategic alignment

Researchers have studied IT strategic alignment extensively in the last thirty years (Coltman et al., 2015; Gerow et al., 2015). More specifically, researchers have explored how the alignment of IT-related processes generates business value for a firm (Celuch et al, 2007; Kim et al., 2011). Generally, IT alignment and business processes occur in a continuously adjusting synergistic relationship, integrating business strategy and IT assets (Chan & Reich, 2007).

From seminal studies performed by Henderson and Venkatraman (1999) to more recent studies (Gerow et al., 2015; Coltman et al., 2015), researchers have suggested that firms must attempt to align their IT capabilities with their strategies and associated business processes. "Business strategy alignment" refers to high-level, externally focused strategic alignment and deals with how a firm's strategies support (and are supported by) its IT resources (Gerow et al., 2015).

Melville et al. (2004) argue that a diverse IT-asset portfolio can lead to an array of potential benefits. The realization of these benefits is largely dependent on whether a firm can achieve long-term and short-term goals through a balanced IT strategy alignment (Ross, Beath, & Goodhue, 1996).

Recent studies on IT-asset portfolios (see Ross & Beath, 2002; Xue et al., 2012) claim that IT-asset portfolios can facilitate strategic alignment in four ways: infrastructural, transactional, informational, and strategic (Aral & Weill 2007). According to Aral & Weill (2007) the IT infrastructural component represents the base foundation of shared IT services in multiple contexts in the organization (e.g., serves, networks, laptops, and databases). The IT transactional component relates to how IT assets can automate business-related routine processes (e.g., accounting, shop floor control, purchasing, sales) broad all organization. IT

informational application of IT assets refers to those processes that provide information that make it easier to carry out multiple business processes (e.g., decision support systems, business intelligence). Finally, the use of IT for strategic ends helps a firm to gain advantages in a competitive marketplace (e.g., enterprise performance management).

Information technology strategic alignment (ITSA) offers a more "holistic view" (Gerow et al., 2015) of alignment by simultaneously considering a business' strategies, IT resources, and processes (Chan & Reich, 2007; Chen et al., 2010; Henderson & Venkatraman, 1999). ITSA occurs when IT resources are coordinated (Brown, 1999), complementary (Chan et al., 1997; Sabherwal & Chan, 2001; Thrasher, Byrd, & Hall, 2006; Yayla & Hu, 2012), integrated (Kang, Park, & Yang, 2008; Lee, Kim, Paulson, & Park, 2008), part of business processes (Tallon, 2008, 2012) and IT application portfolios (Chan et al., 1997; Coltman et al., 2015; Tallon & Pinsonneault, 2011). By incorporating IT resources into business strategies in this manner, firms can be more efficient and realize innovative benefits they may have otherwise missed out on (Tallon, 2008; Xue et al., 2012).

Most extant studies argue that organizations perform well when key IT assets are aligned with business processes and firm strategy (Aral & Weill, 2007; Coltman et al., 2015; Kohli & Grover, 2008; Tallon, 2008). This alignment creates value for the firm, thereby improving organizational performance (Melville et al., 2004; Mittal & Nault, 2009).

Therefore, we offer the following hypothesis:

**H5**: IT strategic alignment is positively associated with benefits of IT use.

### 2.3.The benefits of IT use

A company's capacity to reap the benefits of IT use influences that company's ability to engage in competitive actions (Kohli & Grove, 2008), respond to changes in the business environment, develop entrepreneurial activities, and enable co-evolutionary processes

(Albertin & Albertin, 2012; Brynjolfsson & Hitt, 1996; Melville et al., 2004; Raschke, 2010; Sambamurthy, Bharadwaj & Grover, 2003). Evaluating the benefits of IT use requires more than a narrow quantification of costs, because the benefits of applying IT tend to be qualitative in kind (Stockdale & Standing, 2006).

The use of IT allows firms to organize important data and generates key intelligence for the firm (Davenport et al., 2010; Davenport & Harris, 2007), thereby improving managerial decision making (Arnott & Pervan, 2014). For example, superior information about a firm's customers and marketplace would enable that firm to develop better marketing initiatives and (Davenport & Harris, 2007), which would increase revenues and improve the firm's position in the market.

According to Irani (2002) and Irani and Love (2001), the benefits of IT use are evident along operational, tactical, and strategic dimensions. Moreover, these benefits can be financial, non-financial, or intangible in nature, but can nonetheless provide value to the organization (Brynjolfsson & Hitt, 1996; Hitt & Brynjolfsson, 1997) and affect firm performance (Melville et al., 2004; Nudurupati, Bititci, Kumar, & Chan, 2011; Schwarz, Kalika, Kefi, & Schwarz, 2010; Kohli, Devaraj and Ow, 2012; Yoshikuni et al, 2014).

The operational benefits of using IT are couched in IT's capacity to automate company activities (Otim, Dow, & Grover, 2012; Shang & Seddon, 2002). As IT assets infrastructure that enables the connection between companies, shares information and data structure, and deployment of the IT value across the enterprise (Weill, Subramani, & Broadbent, 2002). Transactional applications of IT automate operational tasks and generate information that contributes to understanding the activities for which the company makes and delivers its business value (Shang & Seddon, 2002). These operational benefits allow the firm to be more efficient (Melville et al., 2004) by reducing operational costs (Irani, 2002), improving product quality, and optimizing production capacity (Ramdani, 2012).

IT use also provides tactical benefits, including the improvement of information the company receives in three ways: accessibility, accuracy, and flexibility (Irani & Love, 2002; Maçada, Beltrame, Dolci, & Becker, 2012; Sobol & Klein, 2009). Specifically, IT provides management with particular information about company activities related to the planning, execution, and control of strategic activities (Arnott & Pervan, 2005; Singh, Watson, & Watson, 2002) to achieve organizational objectives (Aral & Weill, 2007; Arnott & Pervan, 2014). Technology allows for the analysis and measurement of variations in time, as well as the redirection of organizational actions to improve operational productivity (Kaplan, 1996). In this vein, IT use offers a number of tactical benefits that improve organizational flexibility, productivity, and the accuracy of decisions (Irani, 2002). These benefits also include improved relationships with customers, suppliers, partners, and shareholders. For example, use of IT in Material Requirement Planning (MRP) helps a firm to plan, monitor, and control routines on the shop floor, which in turn, provides the firm with agility and flexibility necessary to effectively perform operational activities.

The strategic benefits of IT use contribute to the development of competitive advantages that increase a firm's market share (Aral & Weill, 2007; Melville et al., 2004). Strategic applications of IT are directly related to a company's core business practices and align that company's portfolio with consumer needs (Albertin & Albertin, 2012; Love & Irani, 2004). IT assets also help organizations to transform their practices, thereby creating new methods of executing key processes (Henderson & Venkatraman,1999), developing new products and services, or increasing efficiency that can benefit customers in the form of lower prices (Maçada et al., 2012). In these ways, the strategic benefits of IT help organizations to grow, increase their market share, provide competitive advantages, support new technologies (Irani, 2002) and strategic directions, and improve customer relations (Irani & Love, 2004).

According to Davenport and Harris (2007) and Davenport et al. (2010), the tactical and

strategic dimensions of IT use can be combined to facilitate specific types of analysis. IT can be used to gather data and systemic knowledge that support organizational decision making and plan for future business endeavors (Davenport & Harris, 2007; Davenport et al., 2010). These analyses (and the foresight they provide) inform strategic processes, allowing firms to diagnose, plan, formulate, and implement business strategies in a flexible manner. This allows the organization to adapt to changing business environments as needed (Arnott & Pervan, 2014; Ramakrishnan, Jones, & Sidorova, 2012; Singh et al., 2002; Wagner, 2004).

In summary, IT use can reduce spending, improve productivity, and increase organizational flexibility. A combination of the tactical and strategic applications of IT demonstrates that the use of IT can also provide analytical benefits. These benefits relate to the quality of the information that organizations use to make decisions. As a result, the analytical benefits of IT use can improve organizational efficiency, promote innovation, and increase revenue (Aral & Weill, 2007; Davenport et al, 2010; Davenport & Harris, 2007; Ramdani, 2012; Xue et al., 2012). Clearly, a firm's use of IT influences the business processes in which it engages (Ray, Muhanna, & Barney, 2005; Tallon, 2008), and consequently creates value for that firm (Kohli & Grover, 2008; Melville et al., 2004).

So, we propose the following hypothesis:

**H6**: The IT use is positively associated with business process performance.

### 2.4. Corporate performance

Business processes help organizations to realize salient objectives (Kaplan & Norton, 1996; Porter, 1987). Taken together, the realization of organizational goals can be described as "corporate performance" (CP; Melville et al., 2004; Tallon, 2008; Tallon & Pinsonneault, 2011)."Process-level performance" denotes a range of measures associated with enhancing the operational efficiency of specific business processes. Some of these metrics include

securing customers, transforming products, and/or delivering those products or services to customers (Kaplan, 2010).

Business process performance (BPP) manifests through activities that transform inputs to outputs (Melville et al., 2004; Raschke, 2010). These activities relate to innovation, operations, and post-sale support (Kaplan & Norton, 2000). Moreover, analytical activities which support organizational decision making (Davenport et al., 2010) are similarly part of business processes, and therefore influence firm performance (Daft, 2012; Grant, 2010; Kaplan, 2010). Given the importance of business processes, their quality is a critical predictor of a firm's ability to deliver products and services efficiently (Tarhan, Turetken, & Reijers, 2015). Thus, we predict that business process performance affects a firm's overall performance:

**H7**: Business process performance is positively associated with firm performance.

Models of corporate performance use different metrics (i.e., financial and non-financial) to gauge various outcomes associated with a firm's capacity to achieve organizational objectives (Ouakouak & Ouedraogo, 2013; Kaplan, 2010). Financial measurements of corporate performance typically evaluate a firm's long-term value (Baum & Wally, 2003), which typically results from the effectiveness with which a firm produces and sells its goods and realizes its strategies (Ouakouak & Ouedraogo, 2013; Kaplan and Norton, 1996). The financial measure of productivity is related to the efficient management of spending (costs, expenses, and investments), and growth is related to the generation of revenue (Kaplan, 2010; Kaplan & Norton, 2000, 2008).

According to Kaplan and Norton (1996) achieving long-term value for shareholders is necessary to understand the needs and conditions that create value for clients. "Customer performance" is a non-financial measure of organizational performance (Ong & Teh, 2009) that relates to the attributes of the goods and services a company provides, the relationships

that a company cultivates with customers, and the image of the company's brand (Kaplan & Norton, 2008; Sila & Ebrahimpour, 2005; Tracey, Vonderembse, & Lim, 1999). Delivery of product attributes that customers expect adds value to the product, thereby increasing customer satisfaction (Tracey, Vonderembse, & Lim, 1999), which leads to the retention of those customers (Sila, 2007; Sila & Ebrahimpour, 2005).

This literature review has presented important concepts related to organizational knowledge of strategy, IT strategic alignment, the benefits of IT use, and corporate performance. In this study, we adopt a process-oriented perspective to propose a theoretical model of ITBVSA. This model is meant to determine the factors that influence OKS, including ITSA, BUTI, BPP, and FP (see Figure 1).

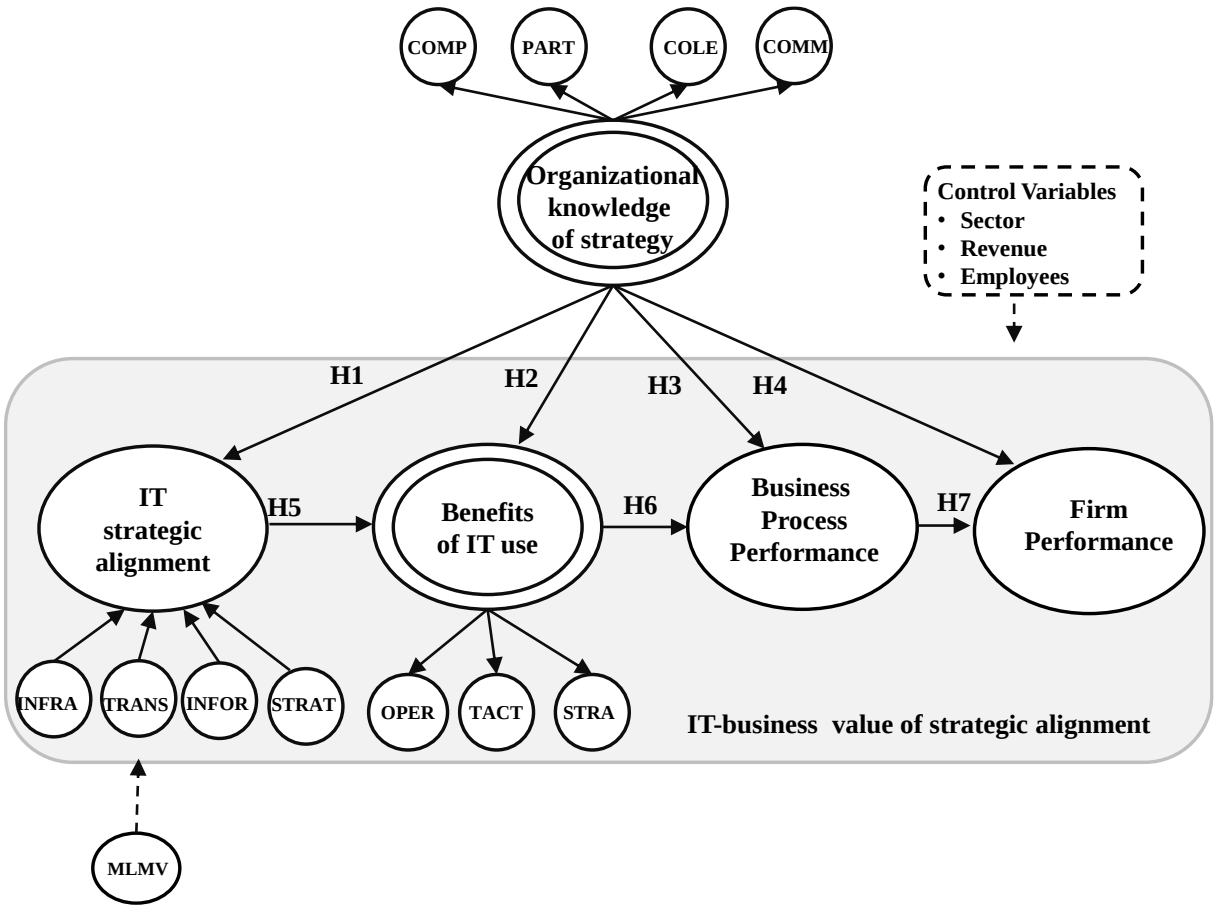


**Figure 1:** ITBVSA Model

**Notes:** In this model, the latent variables include organizational knowledge of strategy (OKS), IT strategic alignment (ITSA), benefits of IT use (BUTI), business process performance (BPP), and firm performance (FP). Second-order reflexive constructs associated with OKS are comprehension (COMP), participation (PART), communication (COMM), and continuous learning (COLE). Items that comprise the ITSA construct are infrastructure (INFRA), transactional (TRANS), informational (INFOR), and strategic (STRAT). Second-order reflexive constructs associated with BUTI are operational (OPER), tactical (TACT), and strategic (STRA) dimension. This model also accounts for multiple control variables, including demographic information related to the business sector in question (SE), numbers of employees (EM), and annual revenues (RE). We account for the influence of the control variables on all endogenous variables in accordance with Liang, Saraf, Hu, and Xue (2007) and Nitzl and Hirsch (2014). Where possible, this model also controls for common method bias through Chin, Thatcher, Wright, and Steel's (2013) measured marker variable technique (MLMV). To facilitate model visualization, we omit indicators for the constructs.

## 3. Methodology

In this section, sample, pretest, data treatment and statistical techniques are described.

### 3.1. Sample

The target population was a collection of organizations couched in a number of business sectors (Ouakouak & Ouedraogo, 2013). According to Tallon et al. (2000), one method for determining the business value of IT is through perceptions of the business' executives. Given the importance of these executives, participants in this study were professionals in decision making positions. These include CEOs, VPs, directors, managers, supervisors, coordinators, and business executives involved in their respective company's management. Specifically, we surveyed participants' perceptions of issues related to OKS, ITSA, BUTI, BPP, and FP

(Malhotra, 2006; Sekaran, 2000). Because we sampled a variety of executives from a number of different types of organizations, the sample was heterogeneous (Maçada et al., 2012).

The organizations respondents are employed professionals taking evening MBA classes (D'arcy & Devaraj, 2012) at a southwestern Brazilian university. Respondents had between eight and 30 years of experience in executive management, and possessed substantial knowledge of the aforementioned constructs in the context of their companies.

Participants were provided the survey and were given 20 days to coordinate with other executives at their firms to ensure accurate responses to the survey's questions. During this period, respondents were free to communicate with the study's researcher via phone, e-mail, or personal consultation to ask questions about the survey itself. Any incomplete surveys were eliminated from the dataset.

The questionnaire was divided into two sections: demographic and study-specific information. The former was used to characterize the company characterizing the company as well as validate the participation and offer direct search for secondary data. The latter section was designed to evaluate participants' perceptions of the aforementioned constructs that comprise the model depicted in Figure 1. In accordance with Nitzl and Hirsch (2014), the demographic information (i.e., business sector, employees, annual revenues, and MLMV) was incorporated into the model at the firm performance level.

All manifest variables were obtained from a review of the literature, as was guidance concerning the variables' content validity, the number of categories for the items, and other issues related to the items to which participants responded (see Hair, Black, Babin, Andersen, & Tatham, 2009; Sekaran, 2000). All items were evaluated using a five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree), representing an interval scale

for measuring respondents' perceptions. (Lozano, García-Cueto, & Muñiz, 2008; Marôco, 2010).

### 3.2 Pretest

The questionnaire served as a pretest for evaluating participants. Results of the pretest were positive and provided evidence for the quality of the questionnaire. In addition, because we administered the questionnaire to personnel in 23 organizations, we exceeded the recommended sample size of 15 (Malhotra, 2006). In evaluating the questionnaire, respondents rated the format of the instrument, the degree to which they understood the content contained therein, and other characteristics of the questionnaire. The participants provided feedback on the questionnaire which was incorporated into its final form. See Appendix B for the final form of the questionnaire.

### 3.3.Data treatment

Thirty-five questionnaires were returned with missing data. We removed these response sets from the analyses. The 225 complete response sets were stored in a Microsoft Excel 2010 spreadsheet. We tested the data for non-response bias by comparing pretest respondents (N = 29) with the executive respondents that comprised the full study's sample (N = 225). We also tested whether each participant's involvement in the pretest or true study affected perceptions of firm performance (Nitzl & Hirsch, 2014). The path coefficient linking a dummy variable indicating the stage of the study in which a respondent participated and firm performance was non-significant ($\beta = .056$).

The final sample size (N = 225) satisfies the requirement for partial least squares path modeling (PLS-PM; Henseler, Ringle, & Sinkovics, 2009; Sosik, Kahai, & Piovoso, 2009; Urbach & Ahlemann, 2010). The literature on PLS-PM mandates that a sample be no less than 10 times the number of structural paths that predict a given reflective construct (Hair,

Hult, Ringle, and Sarstedt (2013). However, we performed a more rigorous test of our study's minimum sample size by calculating the statistical power of our sample size with G*Power Version 3.1.9.2 (Faul, Erdfelder, Lang, & Buchner, 2007). Cohen (1998) and Hair, Hult, Ringle, and Sarstedt (2013) recommended a power of 0.80, with a median effect size ($f^2$) of 0.15. Using these parameters, G*Power recommended a minimum sample size of 74 cases. To produce more consistent results, however, Ringle, Silva, and Bido (2014) argue that a sample size that is twice or thrice as high as the recommended minimum sample size is optimal. Therefore, our sample of 225 cases is sufficiently large to produce consistent results in the test of our model.

We used the Mahalanobis distance metric ($dM^2$; Marôco, 2010) to identify outliers in our data. This procedure revealed only three cases to have high $dM^2$ values; these three cases were removed from subsequent analyses. We also used asymmetry coefficients (Sk) and kurtosis metrics (Ku) to evaluate the normality of all variables. No variable was sufficiently abnormal to warrant correction (all $|Sk| < 3$ and $|Ku| < 10$; Marôco, 2010). See Table 3 for a summary of these statistics.

### 3.4.Statistical technique

We used PLS-PM perform all relevant statistical analyses on the variables (and relationships between them) in our model (Hair et al., 2013). We opted to use PLS-PM because it has been used to address a number of common issues in IT research (see Ringle, Sarstedt, & Straub, 2012). These issues include asymmetric distributions for variables of interest and limited data. In previous studies in this domain, PLS-PM has been shown to be robust and particularly applicable (Ringle, Silva, & Bido, 2014). We performed all PLS-PM analyses with the SmartPLS 2.0 M3 program (Ringle, Wende, & Will, 2005).

Analysis of the sample showed 10% to consist of C-levels personnel, 72% to consist of management and coordination personnel, and 24% to consist of supervisors with the power to make decisions in their respective companies.

Tables 1 and 2 summarize the makeup of the sample in terms of the sector in which they operate, the number of workers they employ, and their annual revenues.

Table 1. Demographic profile of the sample (N = 222 organizations)

| **Sector** | | **No. employees** | | **Annual revenue (millions of USD)** | |
|---|---|---|---|---|---|
| Agro-business | 2% | ≤ 9 | 2% | ≤ 1.2 | 5% |
| Commerce | 6% | 10 – 49 | 5% | 1.2 – 8.0 | 9% |
| Finance | 14% | 50 – 99 | 16% | 8.1 – 45.0 | 29% |
| Manufacturing | 31% | 100 – 249 | 14% | 45.1 – 150.0 | 12% |
| Service | 42% | 250 – 499 | 5% | ≥ 150.1 | 45% |
| Government | 5% | ≥ 500 | 58% | | |

Table 2. Crosstabs: Employees and revenues

| | **Annual Revenues (in millions of USD)** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Employees** | **≤ 1.2** | **1.2–8.0** | **8.1–45.0** | **45.1–150.0** | **≥ 150.1** | **Total** | |
| ≤ 9 | 4 | | | | | 4 | 2% |
| 10 – 49 | 3 | 6 | 1 | 1 | | 11 | 5% |
| 50 – 99 | 5 | 6 | 25 | | | 36 | 16% |
| 100 – 249 | | 3 | 20 | 6 | 1 | 30 | 14% |
| 250 – 499 | | 3 | 3 | 4 | 2 | 12 | 5% |
| ≥ 500 | | 1 | 15 | 16 | 97 | 129 | 58% |
| Total | 12 | 19 | 64 | 27 | 100 | 222 | 100% |
| Companies | 5% | 9% | 29% | 12% | 45% | 100% | |

As evidenced by the data in Table 1, the sample was largely characterized by firms in the services, manufacturing, and finance sectors (87% of companies surveyed). Similarly, organizations with over 500 employees (58%) were more heavily represented in our sample than firms of other sizes. Fifty-five percent of the sample organizations had less than $150 million USD in revenue (41% had revenues between $8.1 million and $151 million). Taken together, Tables 1 and 2 suggest that our sample has a high proportion of large Brazilian enterprises.

## 4. Results

In this section, measurement model, reflective construct, formative construct, structural, mediation, effects of size $f^2$ and $Q^2$ and hypothesis tests, are described.

### 4.1. Measurement Model

The ITBVSA model has both reflective and formative constructs. We first evaluated the reflective components of the measurement model by checking their internal consistency, indicator reliability, convergent validity, and discriminant validity. Second, we evaluated the formative constructs by analyzing the convergent validity, collinearity among indicators, and the significance and relevance of outer weights (Hair et al., 2013).

### 4.2. Reflective construct

To obtain the convergent validity and Average Variance Extracted (AVE; should be less than 0.50) of the reflective constructs, we used the Fornell and Larcker criteria (Henseler et al., 2009; Ringle et al., 2014). Composite reliability (CR) is the most reasonable measure of reliability for PLS-PM, as it prioritizes the variables according to their respective reliabilities (Ringle et al., 2014). CR values greater than 0.70 are considered internally consistent (Hair et al., 2009; Marôco, 2010). To analyze the validity of the model's constructs, we compared the Fornell-Larcker criterion to the square root of the constructs' AVE values with highest latent variable correlation with any other construct (Henseler et al., 2009), see table 3. We determined the statistical significance of our tests using the bootstrap method (N = 222; 1,000 replications).

We started analyzing the outer loadings relevance testing according (Hair et al., 2013) in the crossed loads to check the discriminant validity of the model. The outer loading were < 0.40 was delete the reflexive indicators (3_OPER_2, 3_OPER_7, 3_OPER_4 and 3_OPER_8)

and analyzing the impact of indicator deletion on AVE and CR, and was identified deletion increases measures above threshold and were delete the reflexive indicator (3_TACT_1 and 3_STRA_1), see the first proposal model in the appendix A.

We also evaluated the convergent validity and the square root of the strategy indicator's AVE. This value (0.78) was less than the correlation associated with the tactical indicator (0.87). Based on the work of Davenport and Harris (2007) and Davenport et al. (2010) we unified the strategic and tactical variables to create an analytical latent variable. Table 3 shows that all AVE and internal consistency (should be higher than 0.70) were acceptable. Most indicators' outer loadings were than 0.70. Moreover, we considered indicators with outer loadings between 0.40 and 0.70, because of increases in AVE and composite reliability above the threshold values suggested by Hair et al. (2013). Table 4 shows that the indicators have higher factor loadings on their assigned constructs and lower factor loadings on other constructs, thereby indicating discriminant validity (Chin, 1998; Ringle et al., 2014; Urbach & Ahlemann, 2010).

Table 3. Pearson correlations and descriptive statistics for latent variables

| **Latent variables** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|
| 1 – Communication | **0.70** | | | | | | | | |
| 2 – Comprehension | 0.68 | **0.79** | | | | | | | |
| 3 - Continuos Learning | 0.60 | 0.71 | **0.73** | | | | | | |
| 4 – Participation | 0.63 | 0.72 | 0.66 | **0.71** | | | | | |
| 5 – ITSA | 0.49 | 0.55 | 0.53 | 0.44 | **#** | | | | |
| 6 – Analytical | 0.52 | 0.55 | 0.56 | 0.52 | 0.83 | **0.82** | | | |
| 7 – Operational | 0.39 | 0.41 | 0.42 | 0.33 | 0.74 | 0.73 | **0.76** | | |
| 8 - Business Process Performance | 0.51 | 0.54 | 0.57 | 0.44 | 0.55 | 0.56 | 0.44 | **0.76** | |
| 9 - Firm Performance | 0.42 | 0.42 | 0.49 | 0.38 | 0.46 | 0.43 | 0.34 | 0.70 | **0.72** |
| AVE | 0.49 | 0.63 | 0.54 | 0.51 | # | 0.68 | 0.58 | 0.58 | 0.52 |
| Composite Reability | 0.80 | 0.87 | 0.82 | 0.81 | # | 0.93 | 0.84 | 0.81 | 0.86 |
| Mean | 3.26 | 3.16 | 3.10 | 3.23 | 3.11 | 3.07 | 3.17 | 3.46 | 3.53 |
| Standard Deviation | 0.70 | 0.85 | 0.80 | 0.82 | 0.93 | 0.83 | 0.71 | 0.73 | 0.73 |
| Variance Coefficient | 0.21 | 0.27 | 0.26 | 0.25 | 0.30 | 0.27 | 0.22 | 0.21 | 0.21 |
| Skewness | 0.18 | 0.08 | 0.01 | 0.11 | 0.03 | 0.02 | 0.01 | 0.18 | 0.31 |
| Kurtosis | 0.05 | 0.72 | 0.51 | 0.76 | 0.38 | 0.24 | 0.17 | 0.33 | 0.10 |

Note: The symbol # indicates the ITSA formative measurement

The second-order OKS and BUTI variables respectively demonstrated AVE values of 0.61 and 0.72. Both the second-order OKS and BUTI variables had CR estimates of 0.90. We compared the Fornell-Larcker criterion to the square root of OKS's (0.78) and BUTI (0.85) AVE values that satisfied the criterion.

Table 4. Cross-loadings of variables.

| First Latent Variable | Items | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | *p* |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 – COLE | COLE_1 | **0.601** | 0.382 | 0.379 | 0.364 | 0.205 | 0.277 | 0.294 | 0.210 | 0.000 |
| | COLE_2 | **0.731** | 0.487 | 0.574 | 0.506 | 0.269 | 0.360 | 0.380 | 0.276 | 0.000 |
| | COLE_3 | **0.802** | 0.444 | 0.569 | 0.575 | 0.340 | 0.497 | 0.438 | 0.386 | 0.000 |
| | COLE_4 | **0.783** | 0.460 | 0.545 | 0.484 | 0.394 | 0.477 | 0.535 | 0.519 | 0.000 |
| 2 – COMM | COMM_1 | 0.443 | **0.706** | 0.518 | 0.492 | 0.279 | 0.432 | 0.381 | 0.330 | 0.000 |
| | COMM_2 | 0.350 | **0.661** | 0.372 | 0.352 | 0.207 | 0.244 | 0.295 | 0.284 | 0.000 |
| | COMM_3 | 0.388 | **0.686** | 0.350 | 0.362 | 0.251 | 0.280 | 0.331 | 0.290 | 0.000 |
| | COMM_4 | 0.493 | **0.753** | 0.624 | 0.523 | 0.348 | 0.462 | 0.399 | 0.271 | 0.000 |
| 3 – COMP | COMP_1 | 0.530 | 0.569 | **0.803** | 0.603 | 0.309 | 0.469 | 0.394 | 0.279 | 0.000 |
| | COMP_2 | 0.517 | 0.567 | **0.803** | 0.567 | 0.330 | 0.370 | 0.426 | 0.381 | 0.000 |
| | COMP_3 | 0.560 | 0.513 | **0.757** | 0.524 | 0.247 | 0.383 | 0.411 | 0.326 | 0.000 |
| | COMP_4 | 0.641 | 0.510 | **0.800** | 0.571 | 0.399 | 0.501 | 0.479 | 0.358 | 0.000 |
| 4 – PART | PART_1 | 0.422 | 0.477 | 0.594 | **0.765** | 0.218 | 0.363 | 0.226 | 0.182 | 0.000 |
| | PART_2 | 0.500 | 0.416 | 0.476 | **0.702** | 0.207 | 0.365 | 0.338 | 0.272 | 0.000 |
| | PART_3 | 0.428 | 0.476 | 0.476 | **0.710** | 0.237 | 0.338 | 0.337 | 0.285 | 0.000 |
| | PART_4 | 0.541 | 0.423 | 0.498 | **0.677** | 0.277 | 0.407 | 0.344 | 0.336 | 0.000 |
| 5 – OPER | OPER_1 | 0.357 | 0.313 | 0.299 | 0.225 | **0.835** | 0.540 | 0.362 | 0.280 | 0.000 |
| | OPER_3 | 0.104 | 0.143 | 0.149 | 0.112 | **0.488** | 0.342 | 0.171 | 0.159 | 0.000 |
| | OPER_5 | 0.315 | 0.248 | 0.345 | 0.260 | **0.836** | 0.588 | 0.363 | 0.235 | 0.000 |
| | OPER_6 | 0.429 | 0.439 | 0.398 | 0.357 | **0.824** | 0.683 | 0.400 | 0.338 | 0.000 |
| 6 – ANAL | STRA_2 | 0.466 | 0.380 | 0.441 | 0.412 | 0.641 | **0.865** | 0.472 | 0.337 | 0.000 |
| | STRA_3 | 0.525 | 0.446 | 0.487 | 0.432 | 0.596 | **0.849** | 0.464 | 0.412 | 0.000 |
| | STRA_4 | 0.469 | 0.457 | 0.445 | 0.427 | 0.576 | **0.811** | 0.465 | 0.365 | 0.000 |
| | TACT_2 | 0.451 | 0.480 | 0.453 | 0.444 | 0.654 | **0.808** | 0.461 | 0.332 | 0.000 |
| | TACT_3 | 0.408 | 0.345 | 0.401 | 0.373 | 0.545 | **0.752** | 0.416 | 0.298 | 0.000 |
| | TACT_4 | 0.446 | 0.461 | 0.468 | 0.464 | 0.573 | **0.848** | 0.509 | 0.354 | 0.000 |
| 7 – BPP | BPP_1 | 0.395 | 0.420 | 0.445 | 0.316 | 0.365 | 0.428 | **0.739** | 0.509 | 0.000 |
| | BPP_2 | 0.434 | 0.370 | 0.422 | 0.350 | 0.313 | 0.345 | **0.785** | 0.559 | 0.000 |
| | BPP_3 | 0.474 | 0.367 | 0.370 | 0.330 | 0.331 | 0.512 | **0.759** | 0.533 | 0.000 |
| 8 – FP | FP_1 | 0.396 | 0.292 | 0.386 | 0.317 | 0.291 | 0.360 | 0.435 | **0.797** | 0.000 |
| | FP_2 | 0.413 | 0.353 | 0.376 | 0.319 | 0.336 | 0.414 | 0.524 | **0.805** | 0.000 |
| | FP_3 | 0.404 | 0.385 | 0.372 | 0.341 | 0.303 | 0.413 | 0.516 | **0.810** | 0.000 |
| | FP_4 | 0.246 | 0.275 | 0.153 | 0.184 | 0.135 | 0.126 | 0.440 | **0.594** | 0.000 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| FP_5 | 0.278 | 0.265 | 0.270 | 0.212 | 0.202 | 0.240 | 0.570 | **0.633** | 0.000 |
| FP_6 | 0.346 | 0.205 | 0.235 | 0.231 | 0.175 | 0.230 | 0.521 | **0.636** | 0.000 |

### 4.3. Formative construct

We analyzed the asses the formative construct's convergent validity by examine global single item (ITSA_G) to test the redundancy analysis and correlation between the construct ITSA and ITSA_G was 0.881 higher than 0.80 that satisfied the test of redundancy analysis according Hair et al., (2013).

We checked the collinearity of indicators and the variance inflation factor (VIF) were lower than 5 and each indicator's tolerance (VIF) were higher than 0.20. It shows in the table 5 the VIF results are satisfactory, no critical level of collinearity (Hair et al., 2013).

Table 5. VIF values for the ITSA formative construct

| **ITSA** | |
|---|---|
| **Indicators** | **VIF** |
| TRANS | 2.879 |
| INFOR | 3.074 |
| STRAT | 2.635 |
| INFRA | 1.954 |

We also used 5,000 bootstrap samples to examine each indicator's outer weight (to evaluate their relative importance) and outer loading (to test their absolute importance). The bootstrap routine provided the standard error for each estimated coefficient and allowed us to check the t-value associated with each indicator. Table 6 shows the outer weights and significance tests for all indicators ($p < 0.01$) (Hair et al., 2013).

Table 6. Outer weight significance testing results for ITSA

| **Formative indicators** | **Outer weights** | **Mean** | **Standard Deviation** | **Standard Error** | ***t* value** | ***p* value** |
|---|---|---|---|---|---|---|
| INFOR | 0.2948 | 0.2960 | 0.0784 | 0.0784 | 3.7617 | 0.000 |
| INFRA | 0.1631 | 0.1621 | 0.0621 | 0.0621 | 2.6271 | 0.009 |
| STRAT | 0.4588 | 0.4566 | 0.0777 | 0.0777 | 5.9035 | 0.000 |
| TRANS | 0.2121 | 0.2112 | 0.0828 | 0.0828 | 2.562 | 0.011 |

### 4.4. Structural Model

To test for multicollinearity among constructs in the model, we evaluated the VIF values for FP, BPP, and BUTI. The highest VIF value was for BPP and OKS (1.515), which was well below the recommended limit of 5 (Marôco, 2010). Given that VIF values were all low, we found no evidence to suggest the presence of multicollinearity in our data.

.Table 7 illustrates the respective influences of all control variables on the model's endogenous variables. Our results indicate that neither the sector in which an organization operates, nor the revenue it earns affect FP, BPP, BUTI, or ITSA ($p < 0.05$). However, the number of workers an organization employs exerts a significant, positive relationship on ITSA ($\beta = 0.285$, $p < 0.05$). Given its influence, we retained the number of employees in the model (Nitzl & Hirsch, 2014).

Table 7. The influence of control variables on the model's endogenous variables

| | **Control variable → endogenous variable** | **β** | **Standard Error** | ***t* value** | ***p* value** | **$R^2$** |
|---|---|---|---|---|---|---|
| 1 | EM → ITSA | 0.187 | 0.086 | 2.168 | 0.031 | 16.80% |
| | RE → ITSA | 0.090 | 0.086 | 1.055 | 0.293 | |
| | SE → ITSA | 0.283 | 0.241 | 1.174 | 0.242 | |
| 2 | EM → BUTI | 0.143 | 0.081 | 1.766 | 0.079 | 11.10% |
| | RE → BUTI | 0.073 | 0.084 | 0.868 | 0.386 | |
| | SE → BUTI | 0.236 | 0.193 | 1.227 | 0.221 | |
| 3 | EM → BPP | -0.028 | 0.089 | 0.308 | 0.758 | 5.10% |
| | RE → BPP | 0.136 | 0.102 | 1.342 | 0.181 | |
| | SE → BPP | 0.174 | 0.210 | 0.830 | 0.407 | |
| 4 | EM → FP | 0.040 | 0.083 | 0.483 | 0.630 | 15.50% |
| | RE → FP | 0.169 | 0.092 | 1.842 | 0.067 | |
| | SE → FP | 0.309 | 0.277 | 1.113 | 0.267 | |
| 5 | EM → ITSA | 0.285 | 0.060 | 4.791 | 0.000 | 8.10% |

We also applied Chin et al.'s (2013) measured marker variable technique (MLMV) to control for common method bias and used four items designed to have the least possible logical correlation with other constructs under investigation (see Table 8). Results of the MLMV analysis showed that the case 8 was significant ($p < 0.05$) for MLMV variable. However,

variance between OKS and FP in the case 8 and 5 to path coefficient was little (0.062) and R square was 0.70%, indicating no difference in the significance levels, Chin et al. (2013), suggesting that common method bias was unlikely to be a significant concern for this study.

Table 8. Formative indicators used for the MLMV technique

| |
|---|
| MLMV_1: It's easy for me to reach my goals. |
| MLMV_2: Never abandon the desire to have my own business. |
| MLMV_3: I have a positive attitude towards others. |
| MLMV_4: I always imagine my house in the future. |

Table 9. Relationships between latent variables and MLMV

| | **Exogenous variables → endogenous variables** | **Path coefficient** | **Standard Error** | ***t* value** | ***p* value** | **$R^2$** |
|---|---|---|---|---|---|---|
| 1 | OKS → ITSA | 0.569 | 0.047 | 12.060 | 0.000 | 38.90% |
| | EM → ITSA | 0.187 | 0.054 | 3.447 | 0.001 | |
| 2 | OKS → BUTI | 0.592 | 0.044 | 13.522 | 0.000 | 74.40% |
| | ITSA → BUTI | 0.757 | 0.037 | 20.724 | 0.000 | |
| 3 | OKS → BPP | 0.611 | 0.043 | 14.349 | 0.000 | 42.90% |
| | BUTI → BPP | 0.299 | 0.064 | 4.704 | 0.000 | |
| 4 | OKS → FP | 0.521 | 0.056 | 9.327 | 0.000 | 50.50% |
| | BPP → FP | 0.614 | 0.055 | 11.134 | 0.000 | |
| 5 | OKS → ITSA | 0.546 | 0.051 | 10.788 | 0.000 | 40.00% |
| | EM → ITSA | 0.180 | 0.052 | 3.462 | 0.001 | |
| | MLMV → ITSA | 0.076 | 0.061 | 1.256 | 0.211 | |
| 6 | OKS → BUTI | 0.570 | 0.051 | 11.149 | 0.000 | 74.50% |
| | ITSA → BUTI | 0.752 | 0.038 | 19.997 | 0.000 | |
| | MLMV → BUTI | 0.074 | 0.065 | 1.143 | 0.254 | |
| 7 | OKS → BPP | 0.578 | 0.052 | 11.162 | 0.000 | 44.10% |
| | BUTI → BPP | 0.275 | 0.065 | 4.259 | 0.000 | |
| | MLMV → BPP | 0.097 | 0.062 | 1.564 | 0.119 | |
| 8 | OKS → FP | 0.459 | 0.062 | 7.399 | 0.000 | 51.20% |
| | BPP → FP | 0.597 | 0.055 | 10.885 | 0.000 | |
| | MLMV → FP | 0.159 | 0.068 | 2.332 | 0.021 | |

Figure 2 shows the adjusted model with non-significant MLMV and control variables removed. All numerals next to the paths represent structural path coefficients.

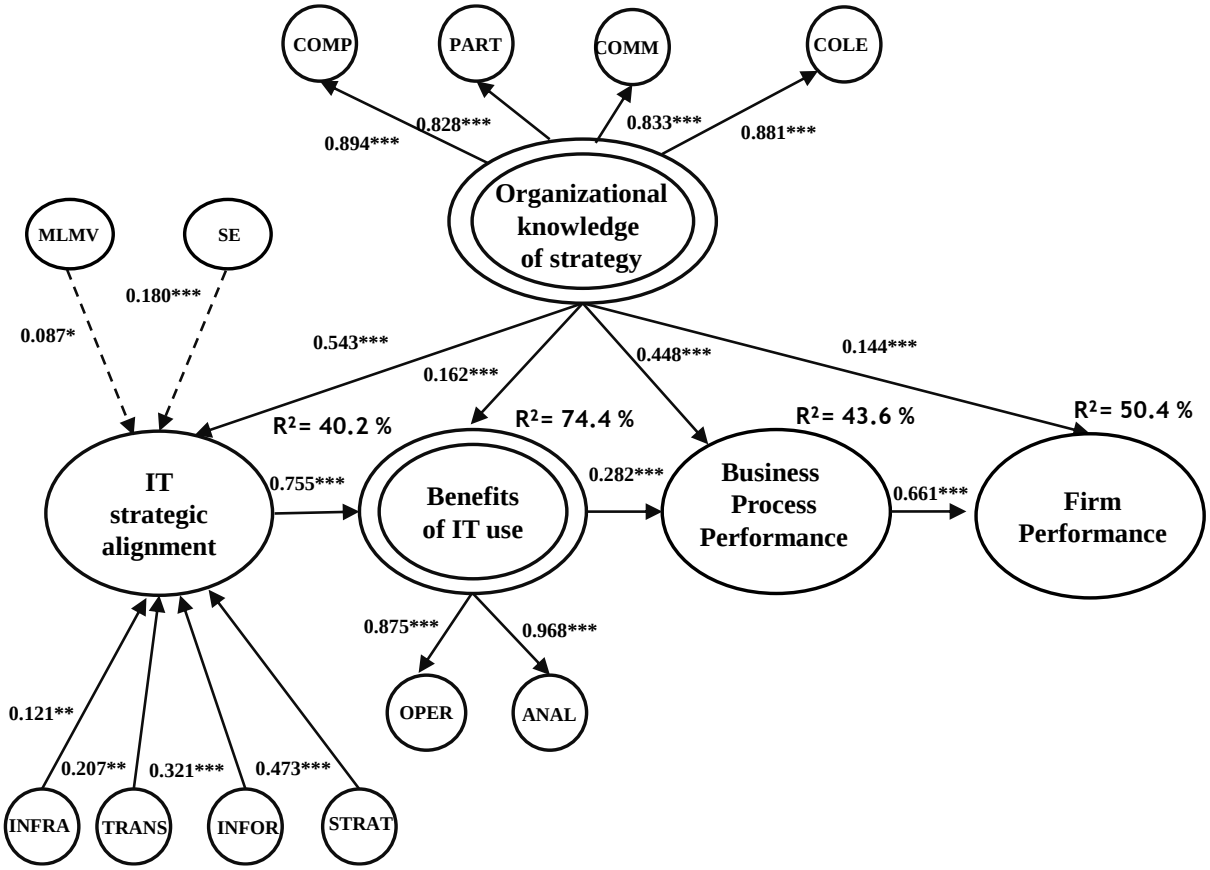


**Figure 2:** Structural model
**Notes:** Significance testing was performed using the bootstrap method (N = 222 with 1,000 replications). Indicators for all constructs were omitted from the figure for the sake of simplicity. *p < 0.05; **p < 0.01; ***p < 0.001.

Although the model includes second-order latent variables, OKS and BUTI were modeled according to guidelines suggested by Wold (1982), Lohmöller (1989), and Wetzels, Odekerken-Schroder, and Oppen (2009). Specifically, the indicators associated with the first-order latent variables were reused as indicators for the second-order LVs. This allowed for the execution of the PLS-PM algorithm.

The coefficient of determination ($R^2$) measures the variance of the endogenous variables and indicates the quality of the structural model. Cohen (1988) suggests that in the social and behavioral sciences, $R^2$ values of 2%, 13%, or 26% respectively indicate small, medium, and

large effects. As evidenced by the $R^2$ values in Table 9, all coefficients of determination demonstrated large effects

### 4.5. The mediating effect of IT strategic alignment

To begin the mediation analysis, we estimated the relationship between OKS and BUTI without including ITSA as a possible mediator. We also estimated the association between OKS and FP without including BPP as a mediator. Table 10 summarizes the results of these two estimations (Ringle et al., 2012), which show that all relationships were significant.

**Table 10**: Path coefficient results was estimated without the potential mediator

| Relationships between latent variables | Path Coefficient | *t* value | *p* value |
|---|---|---|---|
| OKS → BUTI | 0.163 | 3.823 | 0.000 |
| OKS → BPP | 0.448 | 6.923 | 0.000 |
| OKS → FP | 0.144 | 2.181 | 0.030 |

The value of variance accounted for (VAF) indicates the size of the indirect effect in relation to the total effect (Hair et al., 2013). According to Hair et al. (2013), when the VAF is less than 20%, (almost) no mediation takes place. In contrast, when the VAF is greater than 80%, one can assume a full mediation. When the VAF is between 20% and 80%, then partial mediation is the likely result. The presence of significant indirect effects led us to conclude that ITSA likely mediates the relationship between OKS and BUTI (VAF = 72%), and BPP mediates the relationship between OKS and FP (VAF = 66%). The low VAF for the relationship between OKS and BPP (as mediated by BUTI) suggests that there is no mediation in this relationship. See Table 11 for details of these mediation analyses.

Table 11: Results of variance accounted for (VAF)

| Relationships between latent variables | Indirect effect | Standard error | *t* value | *p* value | Direct effect | Total effect | VAF |
|---|---|---|---|---|---|---|---|
| OKS → ITSA → BUTI | 0.410 | 0.064 | 6.449 | 0.000 | 0.163 | 0.573 | 72% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OKS → BUTI → BPP | 0.046 | 0.020 | 2.285 | 0.023 | 0.448 | 0.494 | 9% |
| OKS → BPP → FP | 0.274 | 0.105 | 2.616 | 0.010 | 0.144 | 0.418 | 66% |

### 4.6. Effect Size $f^2$ and Predictive Relevance $Q^2$

We evaluated the quality of our adjustment to the model with the Effect Size ($f^2$; also called Cohen's Indicator) and Relevance or Predictive Validity ($Q^2$; also referred to as the Stone-Geisser indicator).

To obtain Cohen's Indicator ($f^2$), a researcher includes and eliminates model constructs one-by-one to determine how useful each indicator is. Cohen's Indicator values of 0.02, 0.15, and 0.35 are considered small, medium, and large effect sizes (Ringle et al., 2014). These values are determined by evaluating the ratio of the variance explained by a particular variable to the variance that is not explained by the variable ($f^2 = R^2/(1- R^2)$). Table 12 lists the values for $f^2$. When removed, ITSA was shown to exert a large effect on BUTI (see Case 2). A similar relationship was shown between OKS on FP when is removed (see Case 6).

**Table 12:** Effects size ($f^2$) analyses

| | Relationships between endogenous and exogenous variables | Excluded variable | $R^2$ included | $R^2$ excluded | $f^2$ | Effect size |
|---|---|---|---|---|---|---|
| 1 | ITSA → BUTI | OKS | 74.40% | 72.90% | 0.06 | Small |
| 2 | OKS → BUTI | ITSA | 74.40% | 36.80% | 1.47 | Large |
| 3 | BUTI → BPP | OKS | 42.90% | 31.90% | 0.19 | Medium |
| 4 | OKS → BPP | BUTI | 42.90% | 36.70% | 0.11 | Small |
| 5 | BPP → FP | OKS | 50.50% | 50.40% | 0.00 | Small |
| 6 | OKS → FP | BPP | 50.50% | 26.10% | 0.49 | Large |

The Stone-Geisser Indicator ($Q^2$) evaluates the degree to which the model measures that which it was designed to measure (Chin, 1998). The $Q^2$ values associated with all relationships were well above zero, thus providing support for the model's predictive accuracy regarding the endogenous latent variables, according Ringle et al. (2014). Case 2 shows that when treated as

an exogenous variable, ITSA is predictive of BUTI. Similarly, Case 6 shows BPP to have medium predictive relevance for FP. All other relationships were characterized by small predictive relevance on the part of the endogenous variables. The results of these analyzes are listed Table 13.

Table 13: Predictive relevance ($Q^2$) and effect size ($q^2$) analyses

| | Relationship between endogenous and exogenous variables | Excluded variable | $Q^2$ included | $Q^2$ excluded | $q^2$ | Effect size |
|---|---|---|---|---|---|---|
| 1 | ITSA → BUTI | OKS | 41,31% | 40,35% | 0,02 | Small |
| 2 | OKS → BUTI | ITSA | 41,31% | 20,47% | 0,36 | Large |
| 3 | BUTI → BPP | OKS | 24,91% | 17,87% | 0,09 | Small |
| 4 | OKS → BPP | BUTI | 24,91% | 21,28% | 0,05 | Small |
| 5 | BPP → FP | OKS | 24,87% | 24,69% | 0,00 | Small |
| 6 | OKS → FP | BPP | 24,87% | 13,41% | 0,15 | Médium |

### 4.7. Hypothesis tests

All hypotheses outlined in Figure 1 were supported ($p < 0.05$). See Table 14 for the details of those predictions.

Table 14. Hypotheses and results

| | Hypotheses | Results |
|---|---|---|
| **H1** | Organizational knowledge of strategy is positively associated with IT strategic alignment. | Supported |
| **H2** | Organizational knowledge of strategy is positively associated with the benefits of IT use. | Supported |
| **H3** | Organizational knowledge of strategy is positively associated with business process performance | Supported |
| **H4** | Organizational knowledge of strategy is positively associated with firm performance | Supported |
| **H5** | IT strategic alignment is positively associated with benefits of IT use. | Supported |
| **H6** | The IT use are positively associated with business process performance | Supported |
| **H7** | Business process performance is positively associated with firm performance. | Supported |

## 5. Discussion and conclusions

In this study, we empirically examined a model with which we evaluated the business value of aligning IT with strategic activities. Specifically, we looked at antecedents (OKS and ITSA) and outcomes (BPP and FP) associated with the benefits of IT use in organizational settings. The proposed ITBVSA Model had high explanatory power in terms of $R^2$ for all endogenous variables (Cohen, 1988). The study appears to be an excellent option for directing the adoption of strategy-oriented technology in business processes (Kohli & Grove, 2008; Tallon, 2008), because it helps to identify the benefits of IT use and how those benefits influence firm performance.

We have demonstrated that organizational knowledge of strategy provides key information concerning how a firm can leverage its capabilities and use its resources (Wong, 2005, Yoshikuni & Albertin, 2014). Furthermore, we showed that it is necessary to involve employees in the successful implementation of corporate strategies (Mintzberg et al., 2009). In this vein, we demonstrated strategic knowledge shared between businesses is the key predictor of business value associated with the strategic alignment of IT.

Our analyses further demonstrated that the adoption of IT was associated with processes that provide useful intelligence to an organization. This intelligence can help an organization to become more efficient, effective, or innovative (Xue et al., 2012). We believe that the limited contributions of IT assets of infrastructure and transactional are likely due to the standardization and consolidation of IT applications in Brazilian organizations (Meirelles, 2014).

We also showed that the benefits of IT use in the analytical domains assist managers in their decision making. We believe that executives have greater autonomy to make decisions related

to productivity, and largely increase revenues through the generation of new products and services. This assumption is consistent with the notion that applications of IT are consolidated in Brazilian companies.

In addition to the theoretical contributions they provide, our research findings also produce a significant amount of insight in terms of practical, managerial knowledge. First, that OKS exerted a significant positive impact on ITBVSA suggests that one outcome of OKS is the involvement of all employees in the adoption of IT assets and practices (Aral & Weill, 2007). OKS is also related to the benefits of IT use (Kohli & Grover, 2008), business process performance (Tallon, 2008, 2012), and firm performance (Melville et al, 2004).

Second, our findings show that ITSA is significantly and positively related to BUTI. This result demonstrates the importance of IT use to perform activities related to the value chain and support decision making related to future strategic plans. Thus, the BUTI value is measured by to provide information quality for execution activities and decision making to increase the efficiency and effectiveness, and grow revenue with innovative products and services.

Arguably, one of the greatest contributions this research is a more comprehensive understanding of the antecedents and outcomes associated with the benefits of IT use. Specifically, we showed that the benefits of IT use generate added business value when IT is strategically aligned with a number of business activities. This alignment provides integration and harmonization between infrastructural, transactional, informational, and strategic IT assets. This finding is reiterated by the fact that ITSA exerted a strong effect (0.755) on the benefits of IT use, as well as the high level of variance explained (74.4%) Taken together, these results provide evidence for the importance of aligning an organization's IT use with its activities.

Third, our findings revealed that BUTI was positively and significantly associated with BPP. This result helps us to understand the role that business processes plays in the value chain (Porter, 1987; Xue et al., 2012). This is obviously useful, given the presupposition that an organization exists to deliver tangible and intangible value to stakeholders (Kaplan, 2010). Efficient implementation of business processes helps to achieve this fundamental goal.

Fourth, and consistent with past research in this domain (see Daft, 2012; Grant, 2010; 2012; Kaplan, 2010; Melville et al., 2004, Tallon, 2008; Tarhan et al., 2015) we found BPP to be significantly and positively associated with FP.

Finally, our study showed the utility of VAF, $f^2$, $q^2$, and $Q^2$ to illustrate the mediating roles played by ITSA, BPP, and BUTI. The relationship between OKS and BUTI were partially mediated by ITSA. Similarly, the relationship between OKS and FP was partially mediated by BPP. Taken together, these mediator analyses help to show how business processes affect firm performance. In contrast to the mediated relationships described above, the relationship between OKS and BPP was not mediated by BUTI.

Ultimately, the results of this study show how organizations can leverage the strategic alignment of IT to create business value through the dissemination of organizational knowledge of strategy. As such, this study can help organizations achieve greater efficiency and effectiveness in their implementation of IT to realize their strategies. As a result of this increased efficiency and effectiveness, they can achieve greater corporate performance. Therefore, the current study justifies the adoption of IT alignment as appropriate and rational, even with limited resources available to facilitate such an adoption.

## 6. Study limitations

Although the study provided significant insight into the use of IT, it is important to acknowledge the study's limitations as well. Foremost, the large number of definitions for IT strategic alignment (see Coltman et al. 2015; Gerow et al., 2015) makes it difficult to generalize the results across different populations. In addition, our decision to use latent variables (which require some assumptions related to their measurement) may affect the degree to which the results presented here reflect the realities of executive perceptions of IT use.

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**APPENDIX A: Cross-loadings to determine discriminant validity of first model**.

| First Latent Variable | Items | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | *p* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 - COLE | COLE_1 | 0.601 | 0.382 | 0.379 | 0.363 | 0.121 | 0.247 | 0.266 | 0.294 | 0.210 | 0.000 |
| | COLE_2 | 0.731 | 0.487 | 0.574 | 0.506 | 0.181 | 0.340 | 0.313 | 0.380 | 0.276 | 0.000 |
| | COLE_3 | 0.802 | 0.444 | 0.569 | 0.575 | 0.238 | 0.487 | 0.432 | 0.437 | 0.386 | 0.000 |
| | COLE_4 | 0.783 | 0.460 | 0.545 | 0.484 | 0.279 | 0.462 | 0.414 | 0.535 | 0.519 | 0.000 |
| 2 - COMM | COMM_1 | 0.443 | 0.706 | 0.518 | 0.492 | 0.235 | 0.404 | 0.412 | 0.381 | 0.330 | 0.000 |
| | COMM_2 | 0.350 | 0.661 | 0.372 | 0.351 | 0.167 | 0.221 | 0.225 | 0.296 | 0.284 | 0.000 |
| | COMM_3 | 0.388 | 0.685 | 0.350 | 0.361 | 0.154 | 0.247 | 0.270 | 0.331 | 0.290 | 0.000 |
| | COMM_4 | 0.493 | 0.753 | 0.624 | 0.524 | 0.305 | 0.436 | 0.431 | 0.399 | 0.271 | 0.000 |
| 3 - COMP | COMP_1 | 0.530 | 0.569 | 0.803 | 0.604 | 0.259 | 0.426 | 0.460 | 0.394 | 0.279 | 0.000 |
| | COMP_2 | 0.517 | 0.567 | 0.804 | 0.567 | 0.282 | 0.350 | 0.318 | 0.427 | 0.381 | 0.000 |
| | COMP_3 | 0.560 | 0.513 | 0.757 | 0.524 | 0.136 | 0.361 | 0.338 | 0.411 | 0.326 | 0.000 |
| | COMP_4 | 0.641 | 0.510 | 0.800 | 0.572 | 0.291 | 0.474 | 0.453 | 0.479 | 0.358 | 0.000 |
| 4 - PART | PART_1 | 0.422 | 0.478 | 0.595 | 0.765 | 0.187 | 0.335 | 0.356 | 0.226 | 0.182 | 0.000 |
| | PART_2 | 0.500 | 0.416 | 0.476 | 0.701 | 0.146 | 0.350 | 0.302 | 0.338 | 0.272 | 0.000 |
| | PART_3 | 0.428 | 0.476 | 0.476 | 0.709 | 0.164 | 0.276 | 0.319 | 0.337 | 0.285 | 0.000 |
| | PART_4 | 0.541 | 0.423 | 0.497 | 0.679 | 0.248 | 0.380 | 0.409 | 0.344 | 0.336 | 0.000 |
| 5 - OPER | OPER_1 | 0.357 | 0.313 | 0.299 | 0.225 | 0.665 | 0.505 | 0.507 | 0.361 | 0.280 | 0.000 |
| | OPER_2 | -0.003 | 0.125 | 0.062 | 0.048 | 0.677 | 0.273 | 0.302 | 0.035 | 0.056 | 0.000 |
| | OPER_3 | 0.104 | 0.143 | 0.149 | 0.113 | 0.734 | 0.421 | 0.438 | 0.172 | 0.159 | 0.000 |
| | OPER_4 | 0.044 | 0.063 | 0.071 | 0.102 | 0.689 | 0.352 | 0.356 | 0.128 | 0.102 | 0.000 |
| | OPER_5 | 0.315 | 0.248 | 0.344 | 0.260 | 0.664 | 0.546 | 0.595 | 0.363 | 0.235 | 0.000 |
| | OPER_6 | 0.429 | 0.439 | 0.398 | 0.357 | 0.642 | 0.650 | 0.644 | 0.401 | 0.338 | 0.000 |
| | OPER_7 | -0.018 | 0.091 | 0.097 | 0.063 | 0.604 | 0.307 | 0.371 | 0.113 | 0.015 | 0.000 |
| | OPER_8 | 0.096 | 0.127 | 0.063 | 0.104 | 0.682 | 0.365 | 0.403 | 0.153 | 0.147 | 0.000 |
| 6 - STRAT | STRA_1 | 0.161 | 0.187 | 0.178 | 0.159 | 0.581 | 0.553 | 0.480 | 0.190 | 0.117 | 0.000 |
| | STRA_2 | 0.466 | 0.380 | 0.441 | 0.411 | 0.511 | 0.854 | 0.783 | 0.471 | 0.337 | 0.000 |
| | STRA_3 | 0.525 | 0.446 | 0.487 | 0.432 | 0.549 | 0.863 | 0.742 | 0.464 | 0.412 | 0.000 |
| | STRA_4 | 0.469 | 0.457 | 0.445 | 0.427 | 0.477 | 0.818 | 0.699 | 0.464 | 0.365 | 0.000 |
| 7 - TACT | TACT_1 | 0.122 | 0.135 | 0.117 | 0.129 | 0.568 | 0.487 | 0.546 | 0.202 | 0.146 | 0.000 |
| | TACT_2 | 0.451 | 0.480 | 0.453 | 0.444 | 0.527 | 0.710 | 0.830 | 0.460 | 0.332 | 0.000 |
| | TACT_3 | 0.408 | 0.345 | 0.401 | 0.373 | 0.505 | 0.647 | 0.768 | 0.416 | 0.298 | 0.000 |
| | TACT_4 | 0.446 | 0.461 | 0.468 | 0.464 | 0.531 | 0.757 | 0.824 | 0.509 | 0.354 | 0.000 |
| 8 - BPP | BPP_1 | 0.395 | 0.420 | 0.445 | 0.316 | 0.306 | 0.374 | 0.458 | 0.741 | 0.509 | 0.000 |
| | BPP_2 | 0.434 | 0.370 | 0.422 | 0.350 | 0.248 | 0.317 | 0.323 | 0.786 | 0.559 | 0.000 |
| | BPP_3 | 0.474 | 0.367 | 0.370 | 0.330 | 0.253 | 0.499 | 0.458 | 0.757 | 0.533 | 0.000 |
| 9 - FP | FP_1 | 0.396 | 0.292 | 0.386 | 0.317 | 0.217 | 0.356 | 0.300 | 0.435 | 0.797 | 0.000 |
| | FP_2 | 0.413 | 0.353 | 0.376 | 0.319 | 0.236 | 0.398 | 0.350 | 0.524 | 0.805 | 0.000 |
| | FP_3 | 0.404 | 0.385 | 0.372 | 0.341 | 0.253 | 0.386 | 0.357 | 0.516 | 0.810 | 0.000 |
| | FP_4 | 0.246 | 0.275 | 0.153 | 0.184 | 0.092 | 0.131 | 0.114 | 0.441 | 0.594 | 0.000 |
| | FP_5 | 0.278 | 0.265 | 0.270 | 0.212 | 0.211 | 0.225 | 0.245 | 0.570 | 0.633 | 0.000 |
| | FP_6 | 0.345 | 0.205 | 0.235 | 0.231 | 0.143 | 0.217 | 0.257 | 0.520 | 0.636 | 0.000 |

**APPENDIX B: Abbreviated questionnaire**

All items were presented in the firm of five-point Likert-type scales ranging from 1 (strongly agree) to 5 (strongly disagree).

*Organizational knowledge of strategy*

Employees participate in...

- (PART_1) teams that affect how company strategic objectives are attained.
- (PART_2) the generation of solutions to achieve common goals.
- (PART_3) teams to develop actions that promote effective results.
- (PART_4) various levels of decision making to analyze, plan, and implement actions and strategic initiatives.

The company engages in strategic communication…

- (COMM_1) through collaborative meetings and discussions on strategic objectives.
- (COMM_2) through systematic strategic guidelines disseminated among employees.
- (COMM_3) through continuous and open collaboration.
- (COMM_4) that informs what is expected of each employee in relation to established objectives.

Employees comprehend…

- (COMP_1) the main goal (common vision) to be achieved in the medium and long term.
- (COMP_2) senior management's prioritization of objectives and targets.
- (COMP_3) the organization's mission.
- (COMP_4) the organization's philosophy and corporate belief system.

The company promotes continuous learning…

- (COLE_1) through systematic processes that analyze organizational successes and failures.
- (COLE_2) to employees rethink the old and creating the new.
- (COLE_3) by developing skills needed to create ideas that solve old problems and create new paradigms.
- (COLE_4) by analyzing stakeholder demands and rethinking, improving, and restructuring the company.

*Strategic Alignment of Information Technology*

- (ITSA_1) The base foundation of IT infrastructure is aligned with the business' strategy to share IT services across multiple applications.
- (ITSA_2) The IT transactions application portfolio is aligned with the business' strategy to execute business processes associated with the value chain.
- (ITSA_3) The IT informational application portfolio is aligned with the business' strategy to provide information needed to optimize business processes.

- (ITSA_4) The IT strategic application portfolio is aligned with the business' strategy to gain competitive advantages and achieve business goals.
- (ITSA_G) The IT assets portfolio is aligned with the business' strategy.

*Benefits of IT use*

The use of IT creates operational benefits…

- (OPER_1) to execute operational activities geared towards achieving targets and business goals through broad IT infrastructure.
- (OPER_2) to generate high-scale, mobile access to business information through public IT infrastructure.
- (OPER_3) to enable the firm to reconfigure and adapt to new environmental requirements through broad IT infrastructure.
- (OPER_4) to enable the firm to integrate and share data, information, and knowledge across different business process and sites.
- (OPER_5) to execute and support of operational activities in the value chain.
- OPER_6) to reduce operational costs associated with the support and execution of operational activities in the value chain.
- OPER_7) to improve the quality of products and services.
- (OPER_8) to optimize operation capacity.

The use of IT creates tactical benefits…

- (TACT_1) to improve the accuracy of decision related to the company's routine activities.
- (TACT_2) to improve the management of planning, execution, and control.
- (TACT_3) to improve the efficiency and effectiveness of operational activities in the value chain.
- (TACT_4) to improve management's analytical capabilities, allowing for better decision making.

The use of IT creates strategic benefits…

- (STRAT_1) to facilitate organizational transformation and the creation of new methods of running organizational processes.
- (STRAT_2) to develop competitive advantages.
- (STRAT_3) to satisfy customers' needs.
- (STRAT_4) to support strategy management

Business process performance as measured by activities on the value chain is efficient and effective means of promoting…

- (BP_1) business process innovation to create new products and services.
- (BP_2) business process operations.to transforming and delivering products and services
- (BP_3) business process post-sale to create loyal customers

*Firm Performance:*

- (FP_1) The company reaches its goals for profitability to satisfied shareholders
- (FP_2) The business is efficient in terms of spending (cost management, expenses and investments) to meets goals for productivity.
- (FP_3) The company reaches its goals with respect to revenues.
- (FP_4) Customers are satisfied with the value delivered by the company.
- (FP_5) Customers remain loyal to the company.
- (FP_6) The market recognizes the company's image (brand) for the quality of the services and/or products it represents.