IT Governance Effectiveness and its Antecedents: an Empirical Examination in Brazilian Firms

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Abstract

IT governance has become an important concern for business, receiving great attention from both practitioners and academics. Although some authors have stated that effective IT governance is crucial for any organization to achieve its corporate goals, little academic research is available that empirically supports the assumptions about the factors that determine the effectiveness of IT governance. In this sense, we proposed and examined a theoretical model that explains and predicts IT governance effectiveness, linking its domains and mechanisms. We empirically tested our hypotheses based on survey data gathered from 87 CIOs of large Brazilian companies. The results have implications about how IT governance domains and the adoption of different IT governance mechanisms can affect IT governance effectiveness, bringing implications from theory and practice.

1. Introduction

With the corporate focus on ensuring and increasing good returns on IT investments and the passage of the Sarbanes-Oxley Act (SOX) in the United States in 2002, the notion of IT governance became an important concern for business. Many organizations are implementing IT governance practices into day-to-day operations to strategically drive and control IT, particularly to ensure that IT investments are directed and implemented in a manner that achieves business value.

In fact, some studies have shown that companies with good IT governance models present superior results than their competitors [30,49] which make the issue of establishing and implementing effective IT governance crucial for any organization. However, the question of how to implement it in practice has intrigued both executives and academics.

Indeed, implementing a sound IT governance strategy is believed to be key for having a successful IT function [6]. Organizations design and arrange IT governance mechanisms as a means of rationalizing, directing and coordinating an organization’s IT-related decision making [20], expecting to extract business value from IT investments, benefiting the organization and impacting its performance.

The adoption of IT governance mechanisms formulate and formalize both the understanding and application of IT governance in a practical business environment, particularly regarding the alignment of IT with business, IT enablement of business processes, maximization of IT benefits, responsible use of IT resources, and appropriate management of IT risk [51]. Although some authors have stated that effective IT governance is crucial for any organization to achieve its corporate goals, little academic research is available that empirically supports the assumptions about factors that determine the effectiveness of IT governance. With this study, we hope to fill this important gap.

The IS literature highlights different domains that must be observed by organizations to govern their technology. The most frequently cited are IT Strategic Alignment, IT Value Delivery, IT Risk Management, IT Resource Management and IT Performance Measurement [24,45,48,51]. There are some insights that organizations which have good IT governance arrangements are those companies that have high performance in these domains, obtaining thus, better IT investment returns than firms that fail to govern their technology appropriately. These domains should be considered to create and foster an environment that promotes a better use of IT by the organization, which will enhance the IT governance effectiveness. So, we address the following research question:

Q1. To what degree do the main IT governance domains affect the IT governance effectiveness?

In evaluating the existent impacts of each of these domains on the IT governance effectiveness, it would be possible to identify which of them should receive more attention by the executives in order to obtain a better use of IT by organizations. According to Van Grembergen, De Haes and Guldentops [45], IT
governance can be deployed using a mix of structures, processes, and relational mechanisms. These mechanisms do not necessarily need to be adopted and used in their totality or in the same way by all organizations. Each of them serves specific or multiple goals in the complex IT governance challenge, where organizations adopt them expecting to create **IT business value**, mitigate the **risks associated with IT**, increase the **strategic alignment between business and IT**, and improve the **IT resource management** and **IT performance management**. In this sense, we propose a second research question:

Q2. To what degree does the adoption of IT governance mechanisms impact the way organizations govern their IT?

If IT governance impacts the organization, it would be important to know what kind of mechanisms improve the IT governance domains and in which intensity. We intend to answer the proposed questions by empirically proposing and examining a model that explains and predicts the effectiveness of the IT governance, linking its domains and mechanisms (Figure 1). We have argued that the adoption of IT governance mechanisms can bring several benefits to the organizations, affecting the IT performance and, consequently, the performance of the company. So, we suggest an indirect impact of these mechanisms on IT governance effectiveness, being mediated by the performance of the IT governance domains.

![Figure 1. Research Framework](image)

We organized this paper as follows: in the next section, we review earlier literature about IT governance, its domains and mechanisms, in such a way we can develop our research hypotheses; then, we present our research methods, consisting of responses from 87 CIOs of large Brazilian companies listed on the Sao Paulo Stock Exchange (BOVESPA). Afterwards, we test the relationships and present the data analysis and results. Finally, we discuss the contributions and implications for theory and practice.

2. Theoretical development

IT governance has been subject of much debate and speculation among researchers and practitioners, and still remains a not well understood phenomenon, that is continuously evolving with increasing complexity. Some questions and issues related to IT governance have been discussed since the introduction of the first computers in organizations. However, over 30 years of empirical research there are still some gaps to be linked, motivated especially by the lack of a consistent and well-established research body about the topic.

Since IT has become crucial in the support, sustainability and growth of organizations, the most important decisions regarding to IT moved to the boards and senior management executives – calling for a specific focus on enterprise governance of IT [14]. This situation has strengthened the role of IT governance as an integral part of the corporate governance. Historically, IT governance has been strongly associated with the structure or configuration of the IT function, reflecting the locus of responsibility for IT decision-making [5,42]. However, focusing on IT structure alone ignores the sphere of IT activities that take place within these structures, making the adoption of different governance mechanisms an important way to improve the IT governance performance. In this sense, IT governance is defined as the system by which an organization's IT is directed and controlled; it describes the distribution of IT decision-making rights and responsibilities among different stakeholders in the organization, and the rules and procedures for making and monitoring decisions on strategic IT concerns [34].

2.1 IT Governance Domains

The IS literature has suggested that IT governance aims to ensure effective utilization of IT by focusing on five main domains: IT Strategic Alignment (SA), IT Value Delivery (VD), IT Risk Management (RK), IT Resource Management (RM) and IT Performance Management (PM). We discuss each of these domains and develop our research hypotheses as follows.

**IT Strategic Alignment**

As the foundation for IT governance, IT strategic alignment requires that IT strategies and plans are aligned with strategic business objectives so that IT provides capability to deliver business value [51]. IT strategic alignment appears as a key means of ensuring that investments in IT add value to the organization [45]. Before organizations invest in an IT solution, they should analyze the degree of alignment of this technology to their strategies, goals and business needs.
mechanisms that can help organizations to ensure that defining and monitoring performance metrics [17].

IT governance essentially places different structures around how organization’s IT strategy aligns with business strategy. The literature has suggested the existence of several IT governance mechanisms that can enrich this domain as IT steering committees, the IT governance structure, effective communication, Strategic Information Systems Planning (SISP) and shared understanding of business-IT [1,7,20,33,36,44, 51,54]. The presence of a better IT-business alignment will ensure that organizations continue to achieve their strategies and goals, supporting management and contributing to business performance [10,11], reflecting in their IT governance effectiveness. In light of these statements, we propose the following hypotheses:

**H1:** The level of IT strategic alignment will be positively associated with IT governance effectiveness.

**H2:** The level of presence of IT governance mechanisms will be positively associated with the level of IT strategic alignment.

**IT Value Delivery**

According to the ITGI [23], the value that IT brings to the business is a function of the degree which the IT organization is aligned with the strategic goals and achieves business expectations. The IT value should not be understood only as improvements in financial performance, but also taking into account other organizational aspects, such as improvements in operational and management processes [32]. The challenge is to identify how investments will result in measurable value to the business as a whole, once the IT benefits usually become absorbed into business processes.

IT governance seeks to ensure that IT investments are directed and implemented in a manner that achieves business value. Organizations have placed emphasis on strategically using IT governance mechanisms to build capability and improve business value by expending effort in creating agile structures, accompanying processes and relational mechanisms [50], which will enhance IT governance effectiveness. Delivering value requires strategically evaluating and comparing opportunities, considering risk and impact of IT activities on business processes and resources, clarifying roles and responsibilities for delivering IT capabilities and business benefits, management through an investment’s economic lifecycle, and defining and monitoring performance metrics [17].

The literature has suggested the presence of some mechanisms that can help organizations to ensure that IT is meeting its promised benefits, optimizing the cost of IT investments and the return thereof as IT steering committees, SLA, business cases evaluation and IT chargeback systems, Itil, post-implementation reviews, effective communication, and shared understanding of business-IT [1,15,16,20,35,36]. Based on these, we propose the following hypotheses:

**H3:** The level of IT value delivery will be positively associated with IT governance effectiveness.

**H4:** The level of presence of IT governance mechanisms will be positively associated with the level of IT value delivery.

**IT Risk Management**

Since organizations have faced a greater dependence on IT, the chance that an event will interfere with the achievement of organizational objectives increases a lot. Risks related to the Internet and other computer systems become more visible and significant, making this a growing concern for Boards and top management [1]. Gaps or failures in these systems may cause serious crises in business, including damage to reputation and image, loss of business and even damage liability [22].

In the IT domain, risk management must address the protection of IT assets, disaster recovery and continuity of operations. These risks are present in the systemic and operational areas where security of information and IT infrastructure are crucial [31]. While IT value delivery is focused on creating business value, IT risk management focuses on the preservation of the business value [45]. Some researchers have identified IT governance as a viable means to manage risk [49]. For IT to be effectively governed, top management must be able to recognize IT risks and ensure that significant risks are managed. In this sense, effective IT governance ensures the right management of risks, which means implementing controls to identify possible causes of future problems, trying to eliminate, transfer or mitigate these events, ensuring that the strategic objectives of the business are not jeopardized by IT failures.

As mentioned by Calder apud [2], companies with good IT governance strategies stand a much better chance of managing risks, as compared to those without such strategies. By implementing such mechanisms, it has been shown that risks can be proactively managed [47]. Mechanisms like CobiT and Enterprise Risk Management/ERM are some examples that can help organizations to manage their IT-related risks [21]. So, we suggest the following hypothesis:

**H5:** The level of IT risk management will be positively associated with IT governance effectiveness.
H6: The level of presence of IT governance mechanisms will be positively associated with the level of IT risk management.

IT Resource Management

The management of IT resources is also an important means of ensuring that the investments in IT have been appropriate to the goals and needs of the organization. IT resources include the set of hardware, software, human skills and management processes that serve to translate IT investments in IT performance [9]. A good IT resource management seeks to optimize the organization’s IT knowledge and infrastructure, including the IT investments, the IT use and the right allocation of these resources (staff, applications, technology, support structure and data).

In this sense, IT governance can help to establish and deploy the correct IT capabilities according to identified business needs [25]. Effective management of IT resources concerns formulation, enactment, and adherence to processes, budgets, and tactical plans for applying IT strategies to support, enhance, and complement business strategies [51] in such a way the organization will present a more efficient use of internal and external IT resources.

The IS literature has shown some IT governance mechanisms that can help to manage IT resources like IT steering committees, SISP, SLA, business cases evaluation and IT chargeback systems, PMBok, Itil and effective communication [15,33,35,36,52]. Based on these statements, we propose the following hypotheses:

H7: The level of IT resource management will be positively associated with IT governance effectiveness.
H8: The level of presence of IT governance mechanisms will be positively associated with the level of IT resource management.

IT Performance Management

IT performance management is recognized as an imperative to evaluate IT operational performance and value [43]. The idea of monitoring IT performance serves as an important tool to make sure that what it was planned to be done is actually being done, in addition to identify whether more needs to be done in the future [24]. Checking if the IT projects are following the schedule, budget and achieving their intended goals, as well as if the IT infrastructure is satisfying the user’s needs, among other things, is a way to help the organization to identify the contribution of IT towards the achievement of the strategic objectives [27]. Measuring IT performance is an essential part of any IT governance program, especially because it verifies the achievement of strategic IT objectives and provides a review of IT performance and the contribution of IT to the business (i.e. delivery of promised business value). It also provides a transparent assessment of IT’s capability and an early warning system for risks and pitfalls that might otherwise have been missed.

In this sense, measuring IT performance can affect the IT governance effectiveness. Several mechanisms can be used to track and monitor the implementation of the IT strategy and IT projects, besides resources and related services of IT. They are SISP, SLA, business cases evaluation and IT chargeback systems, PMBok, CobiT and Internet Portal [1,15,21,33,52]. Based on these findings, we propose the following hypotheses:

H9: The level of IT performance management will be positively associated with IT governance effectiveness.
H10: The level of presence of IT governance mechanisms will be positively associated with the level of IT performance management.

2.2 IT Governance Mechanisms

According to Ribbers et al. [39], IT governance can be coordinated using a mix of various structures, processes, and relational mechanisms. Structure mechanisms consist of organizational units, roles, and responsibilities for making IT decisions between management and different committees involving IT cooperation [49]. The governance structure describes the way IT function is organized and the organizational structure of the IT division in the organization [37]. These formal structures usually formed by different committees have the purpose of determining the core processes and funding priorities regarding to IT. Some examples are the presence of IT steering committees, CIO on Board of directors, IT project committees, and project management offices (PMO).

Processes refer to strategic decision-making, metric and compliance tools. SISP, IT demand management and IT portfolio management are some mechanisms that help organizations to plan, organize and control IT strategic decisions. Metric and compliance processes pertain to the joint estimation and measurement of the value of IT-enabled business processes [49], including monitoring key performance indicators (such as service level agreements), IT balanced scorecards, project tracking systems and IT chargeback systems.

In addition, different frameworks (i.e. CobiT, Itil, PMBoK, ERM, CMM, ISO27001) have been proposed by business associations and regulatory bodies to support IT governance implementation and monitoring performance. There is a growing tendency towards using some of these frameworks as a way of combining practices and guidelines aiming to obtain the benefits of each of them without necessarily incorporating
details that are not relevant. These frameworks tend to be made up of other mechanisms, involving the management of projects, the elaboration of service level agreements and their monitoring, as well as the use of post-implementation evaluation methods (all indicated in the literature as important IT governance mechanisms, mostly classified as processes).

Relational mechanisms, in turn, manage the soft side of IT governance that covers announcements, advocates, channels, and educational efforts that disseminate IT governance principles, policies, and outcomes of IT decision-making processes [49]. In this direction, mutual participation of IT and business personnel, strategic dialogue, shared learning and proper communication are some examples.

The IS literature has presented some empirical cases showing the adoption of IT governance mechanisms have a great potential to improve different aspects of both governance and management of IT.

3. Research Method

3.1 Measurement Development

The questionnaire was developed and validated following the sequence of steps suggested by Koufteros [26]. Measurement items regarding to the five IT governance domains emerged from a deep literature review about IT governance. We initially grouped them according their theoretical association with the proposed constructs. Prior to administering the survey, we conducted a Q-sorting with two IT managers and eight IS scholars aiming to confirm the adequacy of the developed scale items, the clarity of the questions, and the consistency of the terminology used in the questions. Minor changes were needed. To measure IT governance effectiveness, we adapted the measurement items proposed by Weill and Ross [49].

Regarding to the IT governance mechanisms, we prepared a list containing several mechanisms as identified in De Haes and Van Grembergen’s paper [12]. To analyze them, we selected the most common mechanisms (those that had been adopted by at least 30 firms) and grouped them in Structure, Process and Relational mechanisms as suggested by De Haes and Van Grembergen [12], as follows:

- Structure: CIO on Board (n=70), IT project Committee (n=73), IT Steering Committee (n=61);
- Processes: SISP (n=78), Portfolio Management (n=75), SLA (n=69), Project Management (n=56), CobiT (n=48), IT balanced scorecard (n=38);
- Relational: internal corporate communication (n=72), Business-IT participation (n=57), knowledge management (n=51).

The survey items were measured on a Likert-type scale anchored by ‘strongly disagree’ (1) and ‘strongly agree’ (5), with the exception of the level of the presence of IT governance mechanisms, that was measured by the ratio of adopted mechanisms by the total of listed mechanisms for each of the three groups. Appendix A shows the measurement items used in the current study.

3.2 Data Collection

We sent an e-mail to the Investors Relations department of all Brazilian companies listed on BOVESPA (the main Brazilian stock exchange), giving instructions about the study and requesting to redirect the email to the CIO for completing the survey. Of 405 public firms in the sample, 87 valid responses were received (21.5%).

The participating organizations represented a variety of industry (52.8%) and service (46.0%) firms including banks (12.6%), electric utilities (11.5%), machines and equipments (8.0%), chemicals (6.9%) and transportation equipment and manufacturer (6.9%) as the most predominant economic sectors. All the studied companies are classified by BOVESPA as large ones, according to the number of employees and annual revenue. Regarding to experience of the responding CIOs, 70% has more than six years in the same company and 90% works as the CIO for more than one year.

3.3. Measurement Validation

The data were analyzed using both descriptive measures and exploratory factor analysis to identify and validate the items contributing to each construct in the model. Partial least squares (PLS) structural equation modeling was used to test the hypothesized relationships in the study. We considered all constructs as reflective. The validity and reliability of the items and constructs were assessed by examining the loadings of items on their respective latent variables. In Table 1, all items loaded heavily and significantly (at p<0.05) on their respective construct; the results are indicative of individual item reliability.

We assessed the reliability of scales using composite reliability (CR). CR is preferable over Cronbach’s alpha because it offers a better estimate of variance shared by its indicators and because it uses the item loadings obtained within the nomological network [18]. As indicated in Table 2, CR scores for all scales exceed the minimum threshold level of .70, indicating the reliability of the scales used in this study.
We also assessed the convergent validity of the constructs using the average variance expected (AVE) criterion. The AVE for each construct exceeded the minimum threshold level of .50. Factor loadings and AVE values provide the basis for our confidence that the reflective constructs in our research model demonstrate convergent validity.

### Table 1. Factor Loadings

<table>
<thead>
<tr>
<th>Item</th>
<th>VD</th>
<th>ITG</th>
<th>PM</th>
<th>RK</th>
<th>RM</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>DV1</td>
<td>0.76</td>
<td>0.39</td>
<td>0.35</td>
<td>0.52</td>
<td>0.33</td>
<td>0.36</td>
</tr>
<tr>
<td>DV2</td>
<td>0.83</td>
<td>0.50</td>
<td>0.50</td>
<td>0.37</td>
<td>0.34</td>
<td>0.35</td>
</tr>
<tr>
<td>DV3</td>
<td>0.78</td>
<td>0.44</td>
<td>0.36</td>
<td>0.27</td>
<td>0.33</td>
<td>0.40</td>
</tr>
<tr>
<td>DV4</td>
<td>0.75</td>
<td>0.37</td>
<td>0.26</td>
<td>0.29</td>
<td>0.32</td>
<td>0.26</td>
</tr>
<tr>
<td>ITG1</td>
<td>0.38</td>
<td>0.76</td>
<td>0.51</td>
<td>0.29</td>
<td>0.23</td>
<td>0.50</td>
</tr>
<tr>
<td>ITG2</td>
<td>0.45</td>
<td>0.87</td>
<td>0.62</td>
<td>0.48</td>
<td>0.50</td>
<td>0.61</td>
</tr>
<tr>
<td>ITG3</td>
<td>0.46</td>
<td>0.79</td>
<td>0.41</td>
<td>0.37</td>
<td>0.40</td>
<td>0.48</td>
</tr>
<tr>
<td>ITG4</td>
<td>0.44</td>
<td>0.72</td>
<td>0.45</td>
<td>0.48</td>
<td>0.51</td>
<td>0.51</td>
</tr>
<tr>
<td>PM1</td>
<td>0.38</td>
<td>0.50</td>
<td>0.79</td>
<td>0.32</td>
<td>0.53</td>
<td>0.50</td>
</tr>
<tr>
<td>PM2</td>
<td>0.41</td>
<td>0.55</td>
<td>0.77</td>
<td>0.20</td>
<td>0.40</td>
<td>0.53</td>
</tr>
<tr>
<td>PM3</td>
<td>0.37</td>
<td>0.41</td>
<td>0.74</td>
<td>0.36</td>
<td>0.28</td>
<td>0.30</td>
</tr>
<tr>
<td>PM4</td>
<td>0.32</td>
<td>0.47</td>
<td>0.76</td>
<td>0.39</td>
<td>0.36</td>
<td>0.35</td>
</tr>
<tr>
<td>RK1</td>
<td>0.26</td>
<td>0.25</td>
<td>0.76</td>
<td>0.29</td>
<td>0.23</td>
<td>0.23</td>
</tr>
<tr>
<td>RK2</td>
<td>0.46</td>
<td>0.50</td>
<td>0.39</td>
<td>0.93</td>
<td>0.44</td>
<td>0.32</td>
</tr>
<tr>
<td>RK3</td>
<td>0.45</td>
<td>0.54</td>
<td>0.39</td>
<td>0.93</td>
<td>0.51</td>
<td>0.32</td>
</tr>
<tr>
<td>RM1</td>
<td>0.37</td>
<td>0.45</td>
<td>0.40</td>
<td>0.52</td>
<td>0.82</td>
<td>0.34</td>
</tr>
<tr>
<td>RM2</td>
<td>0.32</td>
<td>0.27</td>
<td>0.22</td>
<td>0.27</td>
<td>0.73</td>
<td>0.31</td>
</tr>
<tr>
<td>RM3</td>
<td>0.34</td>
<td>0.50</td>
<td>0.55</td>
<td>0.36</td>
<td>0.86</td>
<td>0.43</td>
</tr>
<tr>
<td>SA1</td>
<td>0.36</td>
<td>0.53</td>
<td>0.48</td>
<td>0.31</td>
<td>0.38</td>
<td>0.82</td>
</tr>
<tr>
<td>SA2</td>
<td>0.31</td>
<td>0.63</td>
<td>0.45</td>
<td>0.23</td>
<td>0.41</td>
<td>0.89</td>
</tr>
<tr>
<td>SA3</td>
<td>0.47</td>
<td>0.57</td>
<td>0.51</td>
<td>0.33</td>
<td>0.38</td>
<td>0.86</td>
</tr>
</tbody>
</table>

The discriminant validity was assessed via cross loadings criterion (each indicator is expected to be greater than all of its cross loadings) and AVE (the square-root of the AVE is greater than the correlations between constructs in the model), which indicates the constructs demonstrate discriminant validity.

4. Results and Discussion

We analyzed the research model with SmartPLS 2.0 M3 [40]. For simplicity, we present the test results through three different models, one for each group of IT governance mechanisms: (a) structures, (b) processes and (c) relational mechanisms. We used the bootstrap resampling technique with 500 samples to estimate the significance of the path coefficients. Results indicate that the $R^2$ for all the three models was the same, 0.63. The PLS path coefficients for the research model are in Figure 2.

First, we found that the level of IT strategic alignment has a significant and positive effect on IT governance effectiveness ($\beta = .38; p<.000$), thereby supporting Hypothesis 1. This suggests that the more aligned IT and corporate strategies, the more effective the use of IT by the organization. Once strategic alignment is obtained, organizations are better positioned to embed core business processes in their IT infrastructure [3]. The IT strategic alignment is an important component to attain higher levels of IT effectiveness which in turn could help organizations to obtain better business performance [29].

Regarding to the presence of different IT governance mechanisms and its association with the level of IT strategic alignment, we found that the presence of structure, process and relational mechanisms have a significant and positive impact on perceptions of IT alignment ($\beta = .22 - .29; p<.05$), supporting Hypothesis 2. Thus, as firms adopt more and more IT governance mechanisms, perceptions of the level of IT strategic alignment increase. Wong et al. [54], for example, found that employee communication has a direct and positive relationship with business–IT alignment in such a way that can be used to foster and drive the implementation of business–IT alignment to a desired state. Bowen et al. [1] found that higher levels of IT governance effectiveness is associated with a shared understanding of IT and business objectives among the members and a more active IT steering committee. Process mechanisms as SISP may improve and facilitate communication on IT and projects throughout the company, from the executive to the operational level, which can cause a corporate-wide alignment of the business unit goals and associated IT [33].

Second, we found that the level of IT value delivery has a significant and positive effect on IT governance effectiveness ($\beta = .15; p<.05$), supporting Hypothesis 3. In this sense, the higher the delivery of business value through IT, the higher the effective use of IT by the organization. In fact, organizations that realize benefits from their IT investments are more apt to have effective IT governance [41]. Against our expectations, no one of the different IT governance mechanisms group showed positive associations with the level of IT value delivery, not supporting Hypothesis 4. Apparently, the mere presence of these mechanisms do not impact directly on the company’s results in terms of cost reducing, products and services quality improvement, competitive advantage gains, and
operational efficiency enhancements. De Haes and Grembergen [13] state that there is no business value created when IT delivers a new application on time, on budget and within functionalities if afterwards the business does not integrate the new IT system into its business operations. In fact, measuring the value of IT has been a complex challenge for organizations [14].

Hypothesis 5. So, the higher the risk management of IT, the higher the effective use of IT by the organization. In this sense, the presence of a controlled environment for desirable actions and behaviors regarding to IT can drive to a better use of IT [49].

As the same as IT value delivery, we could not find a significant association between the presence of different IT governance mechanisms and the level of IT risk management, not supporting Hypothesis 6. We have not identified in our research the adoption of information security guidelines like ERM and RISK IT, specific frameworks addressed to risk management, that could suggest some association between the mechanisms and this domain.

Rather surprisingly, there was found no significant effect between the level of IT resource management and IT governance effectiveness, not supporting Hypothesis 7. The results show that optimizing the organization’s IT infrastructure and knowledge, and critical IT capabilities (applications, information and personnel) do not guarantee an effective use of IT in the organization. In fact, if the IT resources are well managed but they are not adequate to support business operations, for example, their impact on organization will not be effective.

On the other hand, we found that the presence of different IT governance mechanisms have significant and positive impacts on perceptions of IT resource management, being the process mechanisms ($\beta = .37; p<.000$) the most influential, followed by the relational ($\beta = .21; p<.05$) ones. Wilkin and Riddett [52] analyzed the implementation of some IT governance mechanisms in a not-for profit healthcare organization, finding that the use of project management frameworks helps the organization to manage IT resources and IT project performance. They still found that the use of communication mechanisms like the intranet system helped the organization to manage the IT projects and their performance. The presence of these mechanisms have a direct impact on company’s IT services and resources management, helping the company to resist and recover from failures, and to support business operations and applications. Still, we did not find a significant association with the presence of structure mechanisms, partially supporting Hypothesis 8.

Finally, we found a significant and positive association ($\beta = .24; p<.05$) between the level of IT performance management and IT governance effectiveness, supporting Hypothesis 9. So, as firms enhance checking if the IT projects are following the schedule, budget and achieving their intended goals, as well as if the IT infrastructure is satisfying the user’ needs, perceptions about more effective use of IT increase. When you use performance measures to evaluate the performance of the IT function, you can

![Figure 2. Research model results](image)

Note: *** $p < .001$; ** $p < .01$; * $p < .05$
make sure that what it was planned to be done is actually being done, fixing them if necessary [24].

Regarding to the association between the presence of different IT governance mechanisms and the level of IT performance management, we found that only the relational mechanisms are significant and positive associated ($\beta = .27; p<.01$), partially supporting Hypothesis 10. The use of relational mechanisms facilitates the delivery and execution of IT governance, creating an environment where project workers, for example, are guided through the organization by some of these mechanisms with a minimum amount of support and training which help to manage the projects and their performance [20].

5. Final Remarks

In this paper, we aimed to examine the antecedents of IT governance effectiveness, considering both the main IT governance domains and its mechanisms. We found that IT strategic alignment (SA), IT value delivery (VD), IT risk management (RK) and IT performance management (PM) are positive and significant associated to IT governance effectiveness (ITG), indicating that the higher the performance of these domains, the higher the IT governance effectiveness. IT strategic alignment, in turn, appears as the main predictor. These results corroborate with the study of Wilkin and Chenhall [51] that, in a recent survey about IT governance, identified the concepts of strategic alignment, performance measurement, risk management and value delivery as the most significant enablers of IT governance.

Regarding to the level of presence of IT governance mechanisms and its relationship with the IT governance domains, our research offers insights about the association between IT strategic alignment and the presence of all three groups of IT governance mechanisms, indicating that their adoption increases the level of integration between business and IT (SA). We also found that IT resource management (RM) is associated to the presence of relational and processes mechanisms. SISP, SLA/SLM, business cases, project management tools and communication practices, for example, can help organizations to manage IT in terms of allocating resources, planning strategies, and prioritizing IT projects and investments. IT performance management (PM), in turn, is associated only to the presence of relational mechanisms, suggesting that the active participation of, and collaborative relationship among IT and business executives help organizations to better track and monitor the implementation of IT strategy and projects, besides IT resources and IT related services.

Surprisingly, we could not find a significant association between the presence of these mechanisms and IT risk management and IT value delivery domains. De Haes and Van Grembergen [14] argue that many organizations struggle with implementing and embedding these governance practices into their organizations, making harder to measure the value of IT. It is certain that business value from IT investments is not realized by IT itself, but only when organizations can apply it at the business side, which has been quite difficult to organizations measure and show the intensity of these benefits.

The proposed model has considerable explanatory power with a $R^2$ statistic of 0.63, indicating that 63 percent of the total variance of the overall level of IT governance effectiveness is explained by the five IT governance domains and each group of mechanisms. Regarding to the results of the structural model in this study, five hypotheses were confirmed, two were partially confirmed and three hypotheses were not confirmed. These results have implications for both practitioners and researchers. First, we suggest that adopting IT governance mechanisms can improve the way organizations govern their IT in several aspects, especially ensuring the alignment of IT and business, managing IT in an effective way, and monitoring the performance of IT. The adoption of these mechanisms and frameworks have been mostly motivated by specific regulatory pressures (for example, SOX, Basel II, and other regulatory bodies), rather than by IT value-added initiatives – helping to explain why no significant association was found with the presence of these mechanisms and IT delivery value. Second, the study provided insights about the IT governance domains and how they affect the IT governance effectiveness. We showed that four from the five most common elements of IT governance have a positive and significant impact on IT governance effectiveness, suggesting the higher the performance of these domains, the higher the effectiveness of IT governance. Finally, we proposed and validated a framework to evaluate the performance and the effectiveness of IT governance that can help executive to govern their IT and guide them in the implementation of different IT governance mechanisms.

Two limitations of the study merit consideration. First, we use a single item to evaluate the level of presence of IT governance mechanisms which was calculated as a ratio of their adoption. This happened because we evaluated the level of presence of each mechanism as a binary variable. Other studies should consider the maturity level of the adopted IT governance practices to verify if companies with higher maturity present better IT performance than less mature firms. Another interesting study could consist
References


[40]Ringles C, Wende S, Will A. SmartPLS 2.0 (M3) beta. Hamburg, Germany, 2005.

Appendix A. Measurement items

**IT Strategic Alignment**

SA1 - IT projects are aligned with the company's business strategies [8]
SA2 - IT is in harmony with business strategies, goals and needs established by senior management [28]
SA3 - Implemented IT solutions are aligned with the company’s business [46]

**IT Value Delivery**

VD1 - IT helps the company to reduce costs [42]
VD2 - IT helps the company to achieve competitive advantages [45]
VD3 - IT increases the quality of products and services produced by the company [4]
VD4 - IT increases operational efficiency [42]

**IT Risk Management**

RK1 - Confidential information is prevented from being accessed by unauthorized persons [23]
RK2 - IT infrastructure and business information are well protected and safe [22]
RK3 - IT infrastructure ensures and maintains the integrity of information [23]

**IT Resource Management**

RM1 - IT services and infrastructure can resist and recover from failures due to error, deliberate attack or disaster [23]
RM2 - IT infrastructure supports business operations [4]
RM3 - IT resources (hardware, software, personnel) are adequate to support business applications [3]

**IT Performance Management**

PM1 - IT Outsourcing services performance are constantly monitored and adjusted when necessary [53]
PM2 - IT projects achieve desired business results [45]
PM3 - IT projects are delivered on time and on budget [45]
PM4 - IT services and solutions are delivered without failures [23]

**IT Governance Effectiveness**

ITG1 - cost-effective use of IT [49]
ITG2 - the effective use of IT for asset utilization [49]
ITG3 - the effective use of IT for growth [49]
ITG4 - the effective use of IT for business flexibility [49]