IT Governance Maturity in Higher Education: A study in Brazilian and Portuguese Universities

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Abstract

The use of Information Technology has become prominent in teaching, learning, research, service and management activities in higher education institutions. Such prominent usage has caused a critical dependency on IT that demands adequate IT governance beyond simple and daily IT management. One way of achieving IT governance is through an appropriate set of structure, process and relational mechanisms. We have examined these types of mechanisms in six universities, four in Brazil and two in Portugal. This study was carried out using interviews to assess the level of implementation for seventeen structure, fifteen process and fourteen relational mechanisms. Findings show that the relational mechanisms were the most implemented in these six universities under study. Anyway, from this sample, we are led to the conclusion that IT governance maturity appears quite low in higher education.

Keywords: IT Governance Mechanisms; Universities, Case Study, Level of Implementation.

1. INTRODUCTION

The more complex is the work that people need to perform, the more people have to rely on information technology (March & Smith, 1995). IT is now pervasive to many ways of doing business and connecting partners in value chains to achieve and sustain competitive advantage (De Haes, Van Grembergen, & Debreceny, 2013; Wu, Straub, & Liang, 2015) Such a critical dependency on IT to do business and remain competitive requires appropriate IT governance (De Haes & Van Grembergen, 2015).

Structure, process and relational mechanisms can be set up to implement an adequate IT governance (Grama, 2015) in articulation with corporate governance in order to achieve and sustain the alignment between business and IT (Juiz & Toomey, 2015; Wu et al., 2015) An adequate balanced mix of different types of mechanisms is required to make the right decisions in a timely way when dealing with heterogeneous technologies in dynamic environments (I.S. Bianchi, Sousa, Pereira, & Luciano, 2017; Pereira, Silva, & Lapão, 2014; Wiedenhöft, Luciano, & Pereira, 2017).

In addition, the adoption of formal mechanisms at the highest level of the organization for governing IT, as claimed by several authors (Weill & Ross, 2004) and (Lunardi, Becker, Maçada, & Dolci, 2014), brings benefits and improves organizational performance. Universities are

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complex organizations that require adequate information systems to fulfill their mission by running a variety of on-premises and cloud applications, on different platforms, to what emerges as a rather heterogeneous technological environment (Wilmore, 2014). This environment should provide the right conditions for teaching and learning, research, and service activities as well as management activities (I. Bianchi, Sousa, Pereira, & Hillegersberg, 2017; Coen & Kelly, 2007; Wilmore, 2014). Provided it is an heterogeneous technological environment, it requires appropriate IT governance (I. Bianchi & Sousa, 2015; I. S. Bianchi & Sousa, 2016) with mechanisms at a high level of maturity (Yanosky & Caruso, 2008) for the effective and efficient use of IT by demanding professionals. However, few studies attempted to analyze the maturity level of IT governance, in particular, in universities. Thus, this study seeks to answer the following question: What is the maturity level of IT governance mechanisms in universities?

2. IT GOVERNANCE

Information Technology governance is an instrument to control and manage the IT resources such as infrastructure technology and people in any kind of organizations, including universities (Bajgoric, 2014; De Haes & Van Grembergen, 2009; Hicks, Pervan, & Perrin, 2012). Besides, IT governance helps the corporate governance of the organization assisting the strategy to fulfill the mission and achieve business objectives. A framework of IT governance may be deployed with a set of mechanisms combining structure, process, and relational mechanisms (De Haes & Van Grembergen, 2004, 2005, 2009; Peterson, 2004; Weill & Ross, 2004).

Structure mechanisms are responsible for defining roles and responsibilities. Steering committees are an example of those structures composed of directors, managers and executives, in other words, people responsible for decision-making in the organization (De Haes & Van Grembergen, 2008b; Webb, Pollard, & Ridley, 2006; Weill & Ross, 2004).

Process mechanisms refer to planning and strategic decision making of IT based on practices from ITIL, COBIT or Balanced Scorecard to name some examples, including techniques and appropriate tools to align business and IT for a good performance (De Haes & Van Grembergen, 2008a, 2008b; Webb et al., 2006; Weill & Ross, 2004).

Relational mechanisms include the participation and interaction between IT and the business requiring, among others, appropriate communication, knowledge sharing with learning and coaching (De Haes & Van Grembergen, 2008b; Webb et al., 2006; Weill & Ross, 2004).

2.1. IT Governance Maturity

The Capability Maturity Model from the Software Engineering Institute at Carnegie Mellon University was the first model to introduce the concept of measuring maturity. Since then, more

than 150 maturity models have been developed across several domains such as Strategic Alignment, Enterprise Architecture or Knowledge Management to name a few (Bruin & Freeze, 2005). IT governance is no exception. The maturity model provided by COBIT, a leading framework for the governance and management of enterprise IT for more than 20 years, has been used to measure how well developed the processes are with respect to internal controls. This maturity model allows an organization to grade itself from 0 to 5, as nonexistent (0), initial (1), repeatable (2), defined (3), managed (4), or optimized (5), going from a complete lack of any recognizable processes to processes that have been refined to a level of best practice.

Regardless of the importance we may give to a maturity level, it should not be the goal in itself just as a way of the organization to benchmark itself against best practices. More important is to find out how to improve and move from the present to a better position. Therefore, a fundamental feature of a maturity model should be how to identify the gaps and make improvements to go from an as-is to a to-be maturity level. Anyway, to start, it is important to pay close attention to the way the maturity should be measured.

Since higher education, particularly, at universities, is the context in our study for this attempt to assess IT governance maturity, the next section highlights the two studies that we have found in the literature.

2.2. Assessment of IT Governance Maturity in Universities

Few studies can be found regarding the assessment of IT governance maturity in universities. Table 1 compares the results from two studies, one in USA/Canada (Educause, 2008) and the other Spain (Fernández & Llorens, 2009), using the maturity levels as defined in COBIT.

Study	**Maturity Level**					
	0	1	2	3	4	5
USA and Canada (Educause, 2008)	1,6%	28,8%	29,7%	23,7%	10,5%	5,7%
Spain (Fernández & Llorens, 2009)	3,0%	56,0%	35,0%	6,0%	0,0%	0,0%

Table 1 - Maturity Levels of IT Governance at Universities

The first study allows for the determination of an average maturity level of 2.30 for American and Canadian universities while the second one leads to an average maturity level of 1.44 for Spanish universities. Less than half of the universities are in the upper half part of the scale. Even in the first study, the best scenario, almost 60% of the institutions were placed at the second and third least-mature levels in the six-level scale of increasing maturity.

The increasing pervasiveness of information technology and dependence on information, having in mind the potential for information technology to enable the transformation of universities in a digital economy, require higher maturity in IT governance.

3. RESEARCH METHODOLOGY

The case study method is particularly appropriate for studies that seek to capture knowledge and develop theories (Benbasat, Goldstein, & Mead, 1987). In the IT area, the case study gained special consideration as a valuable way of understanding what is under study in the appropriate context (Pereira, Almeida, & Silva, 2013). This research on maturity level is part of a study to better understand and analyze IT governance at universities. In this research, we particularly focused on assessing the maturity from the perspective of the level of implementation of a given practice or mechanism as we will be calling it (Yin, 2009).

3.1. Data Collection

We adopted a convenience sampling, but to reduce bias, we selected universities from contexts with differences in institutional size (extra-large, large and medium), type of control (public and private) and from different countries (Dubé & Paré, 2003).

We performed six case studies in Brazilian and Portuguese universities. Data were collected from different sources, making use of the information from the IT website and from documents such as the IT Strategic Plan as well as field notes to conduct semi-structured interviews to IT directors or coordinators. Table 2 provides information regarding the universities involved in the data collection.

#	Country	Universities			Data Collection	
		Size	**IT employees**	**Control**	**Interviewee**	**Other Sources**
1	Brazil	Extra Large	50-99	Public	IT Coordinator	IT strategic plan, IT website
2	Brazil	Extra Large	100-300	Public	IT Coordinator	IT strategic plan, IT website
3	Portugal	Medium	10-24	Public	IT Director	IT website, field notes
4	Portugal	Medium	10-24	Public	IT Director	IT website, field notes
5	Brazil	Large	100-300	Private	IT Coordinator	IT website
6	Brazil	Large	10-24	Private	IT Director	IT website

Table 2 - Information about the universities and data collection

"What is the level of implementation of the <IT Governance mechanism> in your institution?" is the question to which we seek an answer as a first step to assess IT governance maturity. The question was applied to a set of 17 structure, 15 process and 14 relational mechanisms to rank them in a 0 to 5 scale with 0 meaning "not implemented", 3 meaning "partially implemented" and 5 meaning "totally implemented". However, in order to assure the right understanding of the mechanism at stake and an appropriate answer from the interviewee, a definition and explanation for each mechanism was provided before the interview.

Table 3 presents the results from the data collection.

Universities	1	2	3	4	5	6	Average
Structure Mechanisms							
IT strategy committee	0	0	3	0	3	1	**1,2**
IT audit committee at level of board of directors	0	0	0	0	0	0	**0,0**
CIO on executive committee	0	0	0	0	5	0	**0,8**
CIO reporting to CEO and/or COO	2	5	5	5	5	5	**4,5**
IT steering committee	2	0	5	5	3	0	**2,5**
IT governance function / officer	5	5	5	5	5	5	**5,0**
Security / compliance / risk officer	0	0	4	5	3	0	**2,0**
IT project steering committee	1	0	0	0	0	0	**0,2**
IT security steering committee	0	5	5	0	3	0	**2,2**
Architecture steering committee	0	5	0	0	5	0	**1,7**
Integration of governance/alignment tasks in roles & responsibilities	4	0	5	5	4	5	**3,8**
IT councils	4	0	0	0	5	0	**1,5**
IT leadership councils	0	0	0	0	0	0	**0,0**
Business/IT relationship managers	3	0	5	0	3	0	**1,8**
IT investment committee	0	0	0	0	3	0	**0,5**
IT expertise at level of board	3	0	5	0	4	0	**2,0**
IT organization structure	3	5	5	5	5	5	**4,7**
						Structure Average	**2,0**
Process Mechanisms							
Strategic information systems planning	4	5	5	3	5	5	**4,5**
IT performance measurement (BSC)	0	1	5	3	0	0	**1,5**
Portfolio management	4	0	3	3	1	3	**2,3**
Charge back	2	0	5	3	5	0	**2,5**
Service level agreements	1	3	3	0	3	3	**2,2**
IT governance frameworks / standards	2	1	5	0	3	4	**2,5**
IT governance assurance and self-assessment	1	3	4	4	0	5	**2,8**
Project governance / management methodologies	2	1	5	0	3	3	**2,3**
IT budget control and reporting	0	1	5	0	2	4	**2,0**
Benefits management and reporting	0	0	5	3	2	3	**2,2**
Business/IT alignment model	0	0	0	3	2	0	**0,8**
ITG maturity models CMM	0	0	0	3	0	2	**0,8**
Project tracking	2	1	0	0	2	2	**1,2**
Demand management	4	2	5	5	4	3	**3,8**
Architectural exception process	0	0	5	3	3	3	**2,3**
						Process Average	**2,2**
Relational Mechanisms							
Job-rotation	2	4	0	0	3	0	**1,5**
Business/IT co-location	3	4	0	0	3	5	**2,5**
Cross-training	2	3	5	0	4	4	**3,0**
Knowledge management (on IT governance)	4	3	5	5	1	5	**3,8**
Business/IT account management	0	0	5	0	4	4	**2,2**
Executive / senior management giving the good example	0	2	4	5	3	4	**3,0**
Informal meetings between business and IT executive/ senior management	5	4	5	5	5	5	**4,8**
IT leadership	1	2	5	5	3	4	**3,3**
Corporate internal communication addressing IT on a regular basis	4	4	5	5	4	5	**4,5**
IT governance awareness campaigns	2	1	5	5	5	3	**3,5**
Partnership rewards and incentives	0	1	0	0	4	0	**0,8**
Shared understanding of business/IT objectives	2	1	4	3	2	3	**2,5**
Senior management announcements	2	3	5	2	3	3	**3,0**
Office of CIO or ITG	5	5	5	5	5	5	**5,0**
						Relational Average	**3,1**
						Total Average	**2,4**

Table 3 - Level of Implementation of IT Governance Mechanisms

During the interview, the researcher played an important role to get to the right score in each mechanism, namely, in situations when scores above or below the expectations were provided. To be better prepared, the researcher sought previous access to information in order to confront the interviewee and make sure the answer provided was the correct one.

For example, before the interview, the researcher analyzed, whenever possible, the strategic plan for information systems and some documents available in the website leading to the conclusion that the level of implementation for that particular mechanism would be probably high. However, if during the interview, that mechanism received a score below the researcher expectation, the interviewee would be confronted with previously analyzed sources to make sure the reasoning was appropriate. In return, we got justifications like this one: "The document or what is there effectively is not in execution and implemented. Many things, that are described there as committees and other processes, should be implemented. But, unfortunately, the plan is only a beautiful document in the website. The plan is a tool to justify things. The board should pay attention to this plan and what is required". This same strategy was adopted in each interview for all the mechanisms whenever possible.

4. DATA ANALYSIS AND FINDINGS

The previous section presented the collected data regarding the level of implementation on IT governance mechanisms in six universities, four in Brazil and two in Portugal. In this section, the collected data, presented in Table 3, are analyzed, having determined the average for each mechanism in the structure, process and relational dimensions. The next three sub-sections compare the level of implementation between Brazil and Portugal and discuss the findings the most important issues.

4.2 Structure Mechanisms

A radar chart (Figure 1) compares Brazil to Portugal regarding the average level of implementation in seventeen structure mechanisms.

The average of implementation for structure mechanisms in Brazilian universities, as can be calculated from data presented in Table 3, is (1.9) while in Portugal is (2.3). In other words, the structure mechanisms are at a similar average level of implementation in both countries. Three structure mechanisms with the highest average level of implementation in both countries call our attention.

The first structure mechanism that calls the attention is "IT governance function / officer" that had an average of (5.0) in both countries, which already reveals the great importance given to a formal function for IT governance issues. The second mechanism, "IT organization structure", had an average of (4.5) in Brazil and (5.0) in Portugal reinforcing once more the importance given to a

formal structure for IT governance. The third mechanism, "CIO reporting to CEO and/or COO", received a significant score in both countries, (4.3) in Brazil and (5.0) in Portugal. In practice, it is easy to implement because it is mandatory and IT follows a hierarchical organizational structure once IT is not at the same level as teaching, research and other areas.

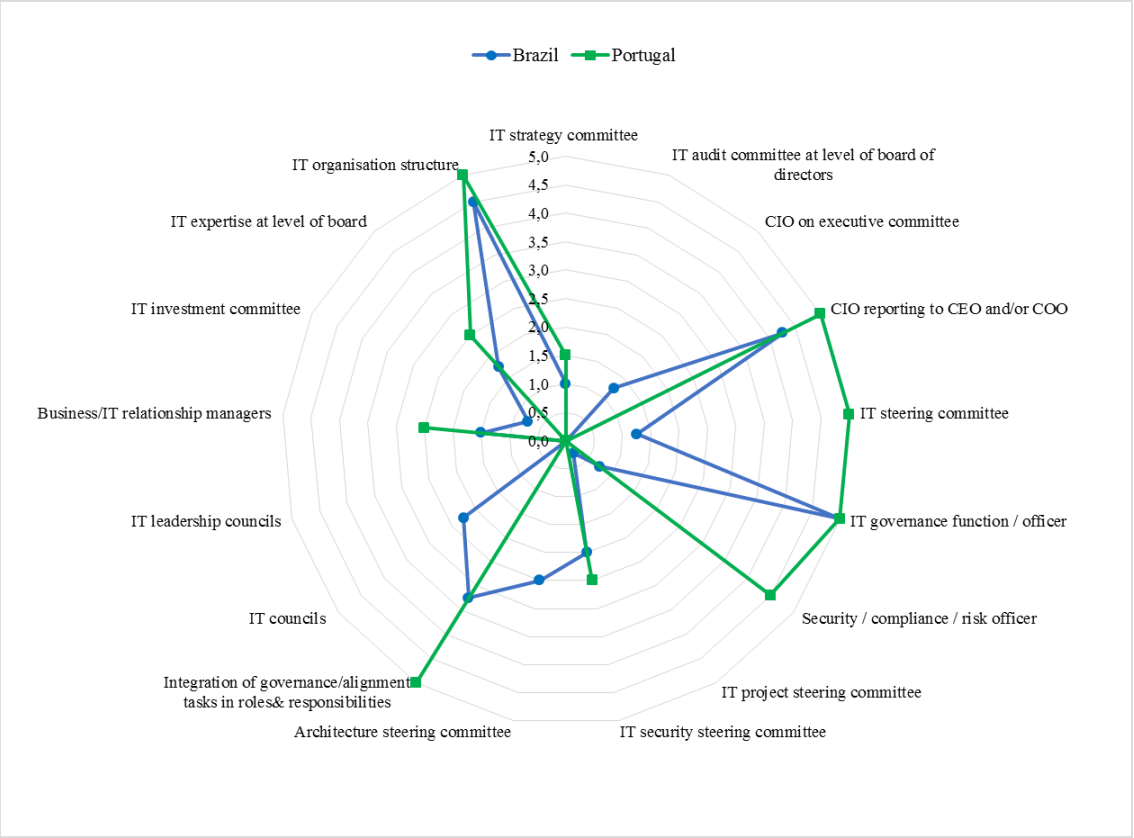

Figure 1 - Level of Implementation for Structure Mechanisms

The fourth mechanism is "Integration of governance/alignment tasks in roles & responsibilities" had the score (3.3) in Brazil and (5.0) in Portugal. It is definitely important to have well defined roles and responsibilities for better performance in ITG in the institution. Another conclusion is that most IT departments are divided into formal IT areas, for example, developing systems, hardware, and network management, among others. Each one of these functions in an IT department has roles with experts in this area and is detailed in a document.

In contrast, several other structure mechanisms are not implemented or received a low score in the level of implementation. Universities have few committees and councils implemented, for instance, IT steering committee, IT audit committee at the level of the board of directors, IT project steering committee and IT leadership councils. This is something to study in-depth looking for the reasons why such mechanisms show a low level of implementation.

To summarize, the average level of implementation in structure mechanisms for universities in both countries is (2.0), what is quite low.

4.2 Process Mechanisms

A radar chart (Figure 2) compares the average level of implementation for fifteen process mechanisms in Brazil and Portugal.

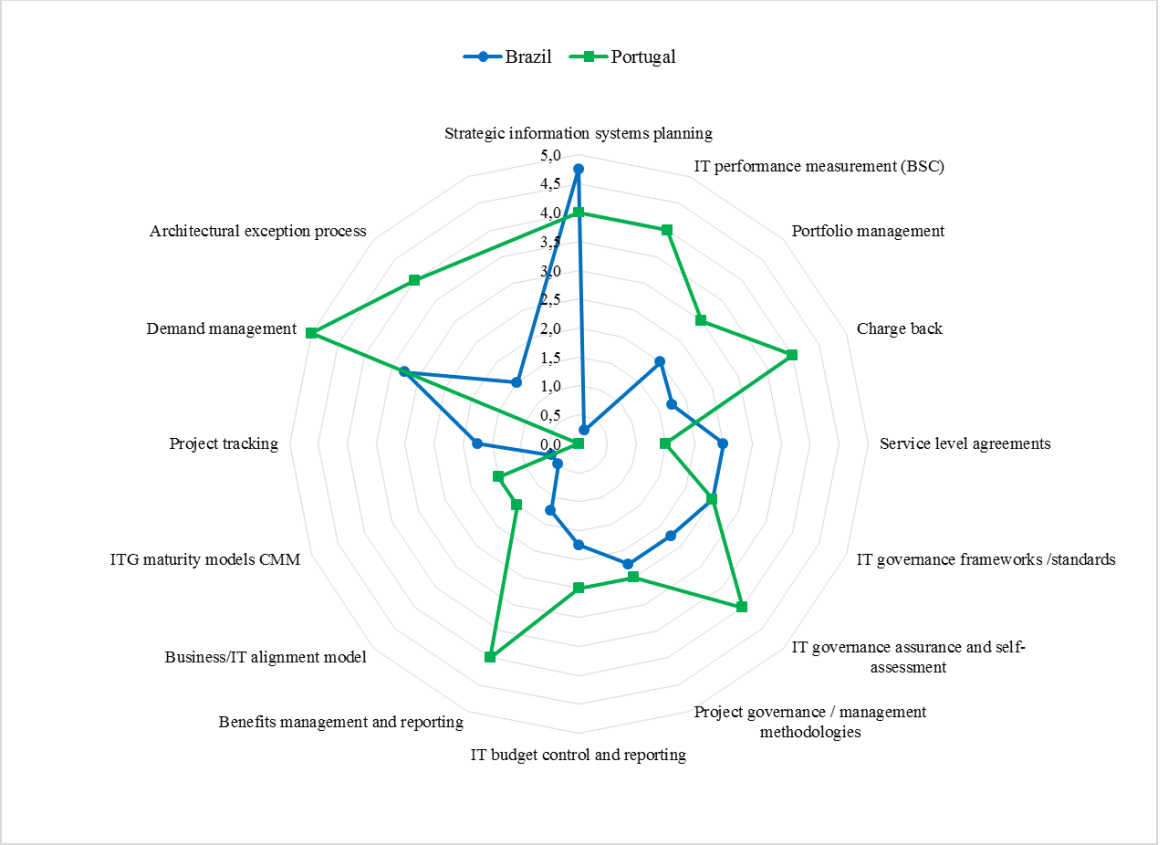

Figure 2 - Level of Implementation for Process Mechanisms

"Strategic information systems planning" with an average of (4.8) for Brazil and (4.0) for Portugal shows that strategic plan is the main document for strategy on IT at the university and all the universities had the awareness to implement it. Indeed, the universities as complex organizations need to develop long-range strategic planning to justify funding requests for research and teaching projects.

"Demand management" had the average of (3.3) for Brazil and (5.0) for Portugal. The high level of implementation may be enforced by operational issues from serving thousands of users.

To summarize, the average of the level of implementation of process mechanisms in Brazilian universities is (1.9) while in Portuguese universities is (2.9), a significant difference in the level of implementation.

4.3 Relational Mechanisms

Figure 3 compares the average level of implementation for fourteen relational mechanisms in Brazil and Portugal. The average level of implementation in Brazil is (3.0) while in Portugal is (3.3). It is quite clear that the relational mechanisms are the most implemented in the universities.

There are several relational mechanisms with a high level of implementation in both countries such as "Informal meetings", "Office of CIO or ITG", "Corporate communication" and "Knowledge management on ITG".

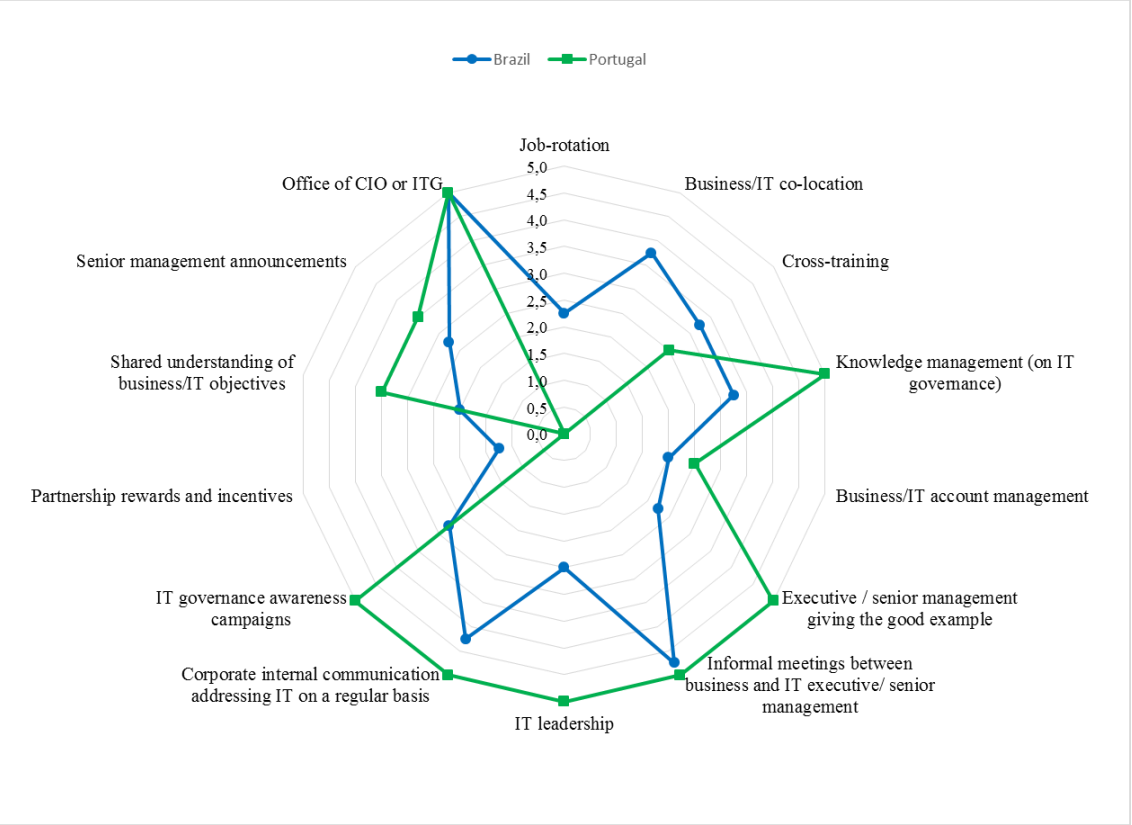

Figure 3 - Level of Implementation for Relational Mechanisms

These mechanisms are the ones, among other relational mechanisms that may depend more on the personal initiative, namely at the IT department level, than on the concerted initiative of people from different areas in the institution, something more difficult to accomplish.

The mechanism "Partnership rewards and incentives" received a low average of implementation and it is not present in most of the universities involved in this study. Such evidence may be related to the fact that public universities are predominant in this sample. Despite some flexibility to attend conferences, courses and other similar events, a kind of reward or incentive, public universities have some legal contingencies and restrictions to operate. These conclusions must be further explored in a study where we intend to confront public with private universities.

5. CONCLUSION AND FINAL REMARKS

This study is a first step to assess the maturity of IT governance starting by looking at the level of implementation of a set of mechanisms across the structure, process and relational dimensions of an IT governance framework. The study involved six universities, four universities in Brazil and two universities in Portugal. We would like to highlight some points:

- The structure mechanisms are basically at the same level of implementation for the universities in both countries with an overall average of (2.0), a low score that is a result from the absence of the implementation of many committees;
- The process mechanisms had an overall average level of implementation of (2.2), a low score, but with Portuguese universities showing clearly a higher level of implementation;
- The relational mechanisms had an overall average level of (3.1) with Brazilian and Portuguese universities basically are the same level, but both realities showing that these mechanisms are the most implemented, one level up when comparing to structure and process mechanisms, although they may be the easier ones, initiated at the IT department level;
- The mechanism "Partnership rewards and incentives" is at a low level of implementation suggesting further research to understand the program of rewards and incentives for employees in private and public institutions.

This study shows that the level of maturity in universities, when looking at the level of implementation of a broad set of mechanisms, is still low. It poses the universities some particular challenges, calling their attention, namely, to structures and processes for IT governance. After performing an extensive literature review, we did not identify many studies using the same approach to analyze the level of implementation of structure, process and relational mechanisms. Those studies are focused on the maturity using the levels as defined, for example, in COBIT as generic levels.

There is a lack of empirical research addressing the context of universities. This work seeks to increase the knowledge in this context that seems to reveal, so far, a low maturity for IT governance in universities. It should provide the decision makers with a global perception of which type of mechanisms are less implemented and which specific mechanisms have received little attention, such as IT leadership councils, business/IT alignment or partnership rewards and incentives, to name a few.

This work has some limitations. First of all, the collected data was limited to six universities, four in Brazil and two in Portugal. The questionnaire was applied while performing semi-structured

interviews. So, we cannot forget that even we analyzed quantitative data, that data was tempered by the interaction between interviewer and interviewee.

The researchers intend to use that data to present and discuss further research. More interviews to collect data in universities from different countries with a larger sample in order to improve and strengthen the outcomes should follow. Even though this study has a reduced and convenience sampling, it provides a first glimpse at what may be representative of the status quo in the universities in consonance with what we have found so far in the literature.

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