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AN INDICATORS-BASED APPROACH TO MEASURING INFORMATION TECHNOLOGY GOVERNANCE EFFECTIVENESS: A STUDY WITH BRAZILIAN PROFESSIONALS

Guilherme Wiedenhöft

Pontifical Catholic University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil, guilherme.wiedenhoft@pucrs.br

Edimara Mezzomo Luciano

Pontifical Catholic University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil, eluciano@pucrs.br

Mauricio Gregianin Testa

Pontifical Catholic University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil, mauricio.testa@pucrs.br

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AN INDICATORS-BASED APPROACH TO MEASURING INFORMATION TECHNOLOGY GOVERNANCE EFFECTIVENESS: A STUDY WITH BRAZILIAN PROFESSIONALS

Complete Research

Wiedenhöft, Guilherme, Pontifical Catholic University of Rio Grande do Sul, Brazil,
guilherme.wiedenhof@pucrs.br

Luciano, Edimara M., Pontifical Catholic University of Rio Grande do Sul, Brazil,
eluciano@pucrs.br

Testa, Mauricio G, Pontifical Catholic University of Rio Grande do Sul, Brazil,
mauricio.testa@pucrs.br

Abstract

Organisations have adopted information technology governance (ITG) practices to improve decision-making and accountability about decisions related to IT. Considering the resources and effort required for the adoption of these practices, it is important to measure ITG effectiveness, in particular by contributing to the increased transparency and IT accountability desired by stakeholders. The goal of this study is to identify a set of indicators to measure ITG effectiveness. Interviews and focus groups are the main techniques of data collection, which involved professionals linked to 45 companies: 11 Chief Information Officers (CIOs), 4 IT managers, 13 IT coordinators, 15 governance analysts and 2 IT researchers. Nine criteria for ITG effectiveness were obtained from semi-structured interviews, and 213 measurement indicators were identified using structured interviews. Content analysis was used to create a set of 48 indicators, based on similarities among the descriptions. This set of indicators was discussed in a focus group, and 27 of these indicators were considered to be especially important for measuring ITG effectiveness and the most applicable in different organisations. The main result of this study was the set of indicators to measure ITG effectiveness, which can be used independently within organisations' ITG frameworks.

Keywords: IT Governance, Effectiveness, Indicators, Measurement.

1 Introduction

Information Technology Governance (ITG) has been one of the ten most important topics on organisational strategy agendas and in discussions between CIOs worldwide (Mahoney, 2012). Over time, the main issues related to IT came to be no longer about the types of technologies to be adopted but about definitions and policies regarding how these technologies and their resources must be used to generate competitive advantage for organisations (Nfuka and Rusu, 2011). This shift occurred because IT became a means of leveraging organisations competitively and, at the same time, by virtue of the need to direct and govern IT, to meet the expectations of different stakeholders. ITG may be understood, according to Weill and Ross (2004), as a specification of decision-making rights and

responsibilities framework for encouraging desirable behaviour in the use of IT. ITG involves, according to Sambamurthy and Zmud (1999), the specification of the decision-making structures, processes and related mechanisms in accordance with the direction and control of IT operations.

The difficulty of effectively measuring ITG mechanisms is characterised as a problem for organisations. This task generates uncertainty regarding IT and raises doubts among stakeholders regarding IT's contribution to organisations. This situation is aggravated because of the strategic role that IT plays in organisations (Weill and Ross, 2004). Therefore, the adoption of methods that show the effectiveness of ITG mechanisms in a measurable way helps to increase investor confidence because these approaches clarify the relationship between ITG and its principles (Westerman; Mitra and Sambamurthy, 2010). In this sense, the focus of this study is on defining a set of indicators that may measure ITG effectiveness based on the relationships between the principles and objectives of IT Governance. More specifically, the study aims to identify the criteria for measuring ITG effectiveness and to define a set of indicators that enables the monitoring of these criteria.

This study is opportune because organisations have been encouraged to adopt principles such as transparency, equity and accountability (Westerman; Mitra and Sambamurthy, 2010; Van Grembergen and De Haes, 2009). To achieve this objective, IT sectors must analyse their information systems, infrastructures, processes and procedures to adopt mechanisms that contribute to fulfilling these principles (Peterson, 2004).

According to Weill and Ross (2004), the value added by IT to the business is a consequence of adopting effective ITG mechanisms. The need for a set of specific and effective indicators that are easy for organisations to use has become evident because in many cases, organisations rely on market models with very large and complex items that contain a very broad range of suggested metrics and indicators, such as ITIL, COBIT or ISO standards (Nfuka and Rusu, 2011). However, organisations' adoption of market frameworks is not always possible or aligned with the goals of these organisations. However, there is the possibility of adopting ITG mechanisms that do not necessarily relate to a market practice (Nfuka and Rusu, 2011). Therefore, a set of indicators with this purpose may contribute significantly to IT Governance adoption and improvement because these indicators may be used regardless of the practice models adopted by the organisations.

2 Measurement of IT Governance Effectiveness

IT Governance may be considered a set of organisational arrangements and patterns of authority for primary IT activities, including in its scope IT infrastructure issues and desirable IT use and management (Sambamurthy and Zmud, 1999). IT Governance is characterised as a set of mechanisms associated with the structure, processes and relationships of IT. These mechanisms must be associated with one or more of the organisation's objectives (Van Grembergen, De Haes and Guldentops, 2004). According to Weill and Ross (2004), ITG is defined as the decision-making structure, rights and responsibilities for encouraging desirable behaviour in the use of IT.

There are two major perspectives that may be considered when defining ITG effectiveness. The first perspective refers to the functional aspects of IT and its feature as an operational area, considering characteristics of its configuration such as hardware, software, infrastructure to guarantee continuity, availability, resources, people and financial and economic assets (Sambamurthy and Zmud, 1999). The business perspective focuses on the links between the results of IT and organisational success in the quest to understand organisational context and IT effectiveness. This perspective encompasses the external environment, the sectoral characteristics of each organisation, their internal functional structures and the meeting of stakeholder requirements (Van Grembergen, De Haes, 2009).

ITG is considered part of the scope of corporate governance (Weill and Ross, 2004; Peterson, 2004), related to organisational effectiveness, compliance with laws and regulations, meeting stakeholder

interests and pressure to show returns on IT investments. In this research, ITG effectiveness is considered to be the relationship between ITG mechanisms and their goals and principles, as well as the degree to which these mechanisms meet and support the principles and objectives of ITG (Wiedenhöft, Luciano and Testa, 2013). According to the authors, ITG effectiveness is achieved when the ITG principles and the ITG objectives are met and supported by ITG mechanisms. ITG mechanisms concern the arrangements necessary to implement and manage ITG.

However, developing a method for measuring ITG effectiveness has not been easy for organisations. This fact has motivated several studies over the years, such as the studies conducted by Weill and Ross (2004) and Van Grembergen and De Haes (2009). According to Weill and Ross (2004) - one of the precursor studies - ITG effectiveness evaluation consists of measuring the importance of four IT objectives through the top manager's perception and the success in meeting these goals. These four IT objectives are the cost-effective use of IT; effective use of IT for asset utilisation; effective use of IT for growth; and effective use of IT for business flexibility. In a more recent study, Van Grembergen and De Haes (2009) analysed the effectiveness and ease of implementation of different ITG mechanisms. The authors obtained a set of 33 generic mechanisms for implementing an effective ITG model. Despite the significant contributions of these studies for ITG evaluation, the need persists to develop a method for measuring ITG effectiveness. This objective may be achieved by using indicators that may show the ways and degree to which ITG mechanisms meet and comply with ITG objectives and principles and the relationship between these three elements (objectives, principles and mechanisms) to monitor predefined criteria. These criteria may be considered as the dimensions used to understand a complex concept such as, for example, ITG effectiveness. In this sense, effectiveness monitoring systems seek criteria that best represent stakeholder expectations, and they use metrics and indicators to evaluate the difference between the current status and the status required by stakeholders (Austin, 1996). ITG effectiveness mechanisms are related to critical organisational factors and to how IT contributes to organisational success, through the monitoring of these factors using indicators that reflect them in the organisation, allowing the evaluation of the effectiveness of IT (MacDonald, 2005).

Indicator-monitoring systems adopt two distinct approaches. The first focuses on measuring productivity and financial items, showing a partial view of the organisation because it disregards other factors that are relevant to understanding the organisational context. According to Neely and Adams (2001), this approach is myopic because the organisation does not consider all factors necessary for decision making. The second approach stands out for its requirement of financial and non-financial measures in addition to productivity. Embedded in this approach is a belief that everything should be observed in an integrated manner to support organisations' new internal and external operating conditions (Ghalayini and Noble, 1996). According to Neely and Adams (2001), this belief is related to the "madness of measurement", where companies are obsessed with measuring and attempt to measure everything.

Both views provide evidence of the importance of defining the criteria to be used to create an effectiveness measurement system. There is a common confusion between the concepts of measurement, metrics and indicators. According to Ceschi et al. (2005), a measure is an assessment or evaluation of a universal or local unit of comparison. The systematisation of measurements concerning a particular attribute would be a metric. However, a metric examined in isolation is meaningless. It is necessary to identify a context to attach significance to this value. An indicator is a device that may be adjusted to the current state, based on the results of a process or the occurrence of a specific condition to attach significance to a metric (Ceschi et al., 2005).

3 Methodological Procedures

This research is characterised as a descriptive, exploratory, cross-sectional study with a qualitative approach because of the data collection and analysis techniques used during the research process,

particularly considering the definitions offered by Flick (2004). This research was divided into two distinct stages to facilitate its management. Each stage resulted in the milestone for the next stage, and the integration of the results obtained in each stage was the basis for obtaining the final objective. Figure 1 demonstrates schematically the research stages.

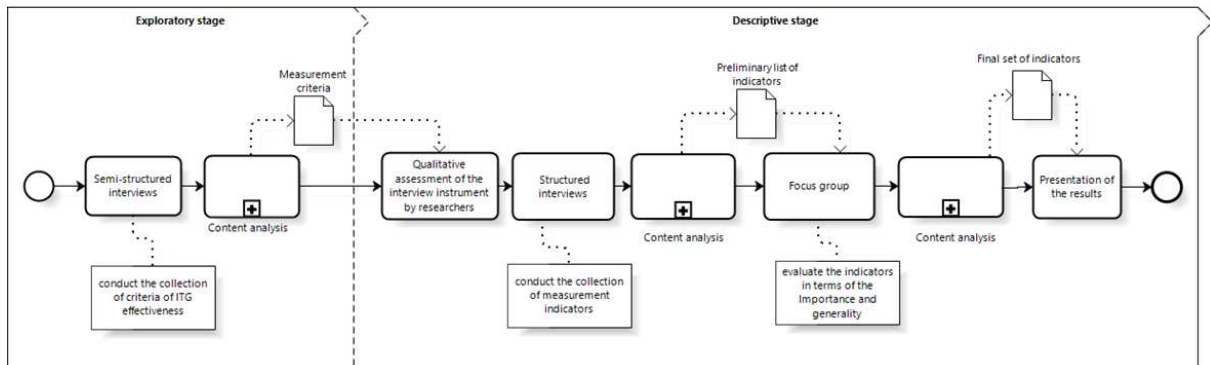


Figure 1 – Research Design

The first stage used an exploratory strategy. The aim was to define the most relevant criteria for measuring ITG effectiveness based on IT professionals' perceptions. This purpose was achieved using a literature review and semi-structured face-to-face interviews with experts complemented by documents provided by the interviewees (such as BSC maps, indicators description maps, IT strategic plans) that were posteriorly analysed. The participants in the semi-structured interviews were ITG professionals at organisations situated in the two most economically active regions of Brazil. The interviewees' companies constituted a heterogeneous group in terms of market sectors, although the focus of the research was not to analyse a specific economic sector but rather to understand how organisations adopt IT Governance mechanisms as well as to understand their expectations regarding this process. In these terms, business heterogeneity contributes to obtaining indicators that are applicable to different organisational contexts.

The second stage of the study was descriptive and aimed to define and validate a set of indicators of how well the criteria measured ITG effectiveness. This stage used two different techniques applied separately to achieve the aforementioned results. With a focus on identifying the indicators, an electronic structured instrument was administered to present to the respondents the concepts of ITG effectiveness used in this study and the set of nine criteria identified at the exploratory stage. We then asked the respondents to list relevant indicators for the measurement criteria based on their professional experiences. The respondents were selected based on the following criteria: a) qualification and expertise in the research area; b) leadership position in an organisation with an established ITG model; c) not having participated in the first stage. The initial result of this stage was a list of 213 indicators, resulting from the open coding technique, which were grouped based on similarities in their descriptions into 48 indicators after a process of thematic categorisation.

The set of 48 indicators was taken into consideration by a focus group of IT professionals that aimed to qualify a set of indicators. As a result of this procedure, 27 indicators were considered by the focus group participants to be the most important and most applicable in different contexts. The focus group participants were selected based on the following criteria: a) qualification and expertise in the research area; b) holding a leadership position in an organisation with an ITG model; c) not having participated in any of the previous stages.

The profiles of the professional participants in the semi-structured interviews, the structured interviews and the focus group are shown in Table 1.

Data collection techniques (number of participants)	Gender	Education	Current position	IT Experience (average years)
Semi-structured Interviews (14)	Masculine (93%) Feminine (7%)	Master's degree (2) Specialization/Expertise (8) Graduation/Associate (4)	IT Director /CIO (7) IT Manager (4) ITG Coordinator (1) ITG Analyst (2)	16,1
Structured Interviews (19)	Masculine (85%) Feminine (15%)	Master's degree (1) Specialization (13) Graduation (5)	IT Director /CIO (2) ITG Coordinator (7) ITG Analyst (10)	8,1
Focus Group (12)	Masculine (75%) Feminine (25%)	PhD (5) Master's degree (4) Graduation (3)	IT Director /CIO (2) ITG Coordinator (5) ITG Analyst (3) Researcher in IT area (2)	10,6

Table 1. Characterisation of the respondents

Table 2 shows the characterisation of the organisations where the respondents worked, organised by data collection technique.

Data collection techniques	SECTOR	Formalized ITG Model		Market Performance			Type of control				% of annual revenues *					TOTAL	
		Yes	No	Regional	National	Multinational	Public	Private	Mixed Economy	Third Sector	Less than 2,5%	2,5% to 5%	5% to 7,5%	7,5 % to 10%	Above 10%		No information
Semi-structured Interviews (14)	Commerce	2	0	0	2	0	0	2	0	0	0	2	0	0	0	0	2
	Service	9	0	2	5	2	2	6	1	0	0	7	2	0	0	0	9
	Industry	3	0	0	2	1	0	2	0	0	0	3	0	0	0	0	3
Structured Interviews (19)	Commerce	1	2	3	0	0	1	2	0	0	1	0	0	0	0	2	3
	Service	9	2	2	3	6	2	5	3	1	0	1	1	0	4	5	11
	Industry	3	2	2	0	3	0	3	1	1	1	0	1	1	0	2	5
Focus Group (12)	Commerce	2	0	1	1	0	1	1	0	0	1	1	0	0	0	0	2
	Service	3	6	6	3	0	3	5	1	0	0	2	0	0	2	5	9
	Industry	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	1
Total		33	12	16	16	13	9	27	6	2	3	17	4	1	6	14	45

Table 2. Characterisation of the organisations where respondents worked

Agile methods, which are frequently used by IT professionals, were selected as the main way to conduct the focus group. Agile methods are appropriate when searching for swift and consensual decision-making (HIGHSMITH, 2009) because they allow for obtaining participant testimony and encourage organised discussions managed by experienced professionals (LARMAN and VODDE, 2010). To mediate the process, an agile methods coach was requested.

To implement the dynamic, the researchers developed three panels to guide the decision making about which of the identified indicators were the most important and applicable in any type of organisation. On the first panel (Figure 2, Initial Panel) were placed self-adhesive labels in different colours where each colour represented a specific criterion for measuring ITG effectiveness. A tag for each of the 48 indicators, with the colour corresponding to the criterion for the respective indicator, was placed on the panel. The second panel (Figure 2, Evaluation Panel) was developed to evaluate the indicators

using two rules. The first rule, stated on the horizontal axis, evaluated the relevance of the indicator for ITG monitoring, regardless of industry or type of organisation. The second rule, stated on the vertical axis, evaluated the usefulness of the indicator in relation to its generality or specificity, i.e., how the indicator could be used for organisations in general or for a sector of organisations with specific characteristics. The third and last panel (Figure 2, Exclusion Panel) was developed so that participants could place any non-ITG indicators on it if they so chose.

In addition to the expert who was invited to moderate the procedures and techniques used, the procedure included two other moderators. One was responsible for explaining the concepts used in the study, and the other was responsible for maintaining the focus of the discussion and taking notes of the most relevant issues during the focus group. The entire procedure was recorded on video and audio.

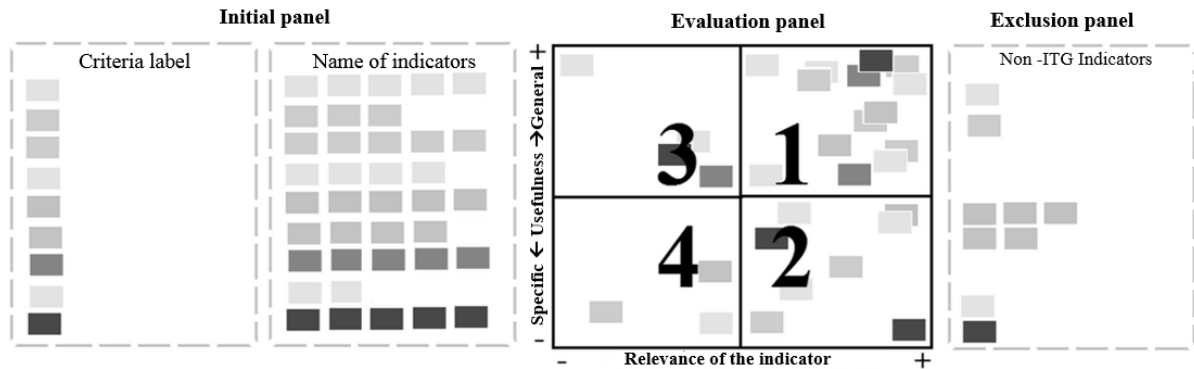


Figure 2 – Structure of the Focus Group

The data analysis in all stages was conducted mainly using thematic content analysis. All of the documents produced were inserted into NVIVO qualitative data analysis software. According to Gibbs (2008), the use of software for qualitative data analysis provides better organisation of the *corpus* under analysis and enhances the traceability of the encoding process and, consequently, the quality of qualitative research. The authors adopted, as a reference for conducting the content analysis, the approach used by Bardin (2009). Therefore, the process of content analysis was divided into three steps, the first dedicated to the pre-analysis of all documents produced during the research. The second step was to apply the procedures and techniques for recording and counting codes, used as a criterion for listing the frequency of the context units for clipping in the analysed documents (Bardin, 2009). Finally, the last stage entailed the authors' compiling and presenting the results, implementing the processing step and interpreting the results through discussion. The purpose of this procedure was to provide greater reliability in content analysis and to reduce individual researcher bias in the analysis, as recommended by Flick (2008).

4 Results

The following sections show the results of the two stages of this research. The first of these sections (4.1) identifies the criteria for measuring ITG effectiveness, which corresponds to the exploratory stage of the research. The second section (4.2) includes the analysis of the views from the list of indicators defined in the previous step by IT professionals, corresponding to the descriptive stage listed in the previous section to understand the relationships perceived by these professionals about which were the most suitable indicators for measuring ITG effectiveness.

4.1 Defining the criteria for measuring ITG effectiveness

The results of the content analysis showed a set of nine significant criteria for monitoring ITG effectiveness. The criteria (thematic categories) used could be divided into two dimensions of

effectiveness. The first dimension considers IT by its features such as operational area, called the internal dimension of effectiveness. This dimension considered the parameters of IT components (hardware, software, infrastructure) in the attempt to ensure IT service continuity and availability, in addition to IT resources and people, financial and economic assets (Aguilera and Jackson, 2011). The second dimension, called the external dimension, comprised the criteria intended to align the results of IT and organisational success and in turn to understand effectiveness through a lens of organisational context, sectoral characteristics and stakeholder expectations.

Table 3 presents a summary of the main criteria, indicating the effectiveness dimension (internal or external) to which each criterion belonged, as well as a brief description of each criterion followed by the results of the content analysis, namely, frequency of observations (number of times a category appeared; maximum of 14) and evidence (number of open codes cited).

Criteria (Dimensions)	Description	Frequency	Total evidence
Quality of IT services (Internal)	Criteria used to measure the delivery of IT services, such as compliance with deadlines, change controls, incident management and problem management.	11	25
Economic and financial (Internal)	Criteria used to measure the financial and economic cost of IT. Its scope covers the measurement of care of the budget, operational costs of IT, maintenance cost, return on investment from IT.	9	31
Physical and logical IT infrastructure (Internal)	Criteria used to measure the availability of infrastructure and applications, the state and the conditions of the hardware and software, as well as physical installations. This criterion includes monitoring the availability of links and hosts, disk utilization, IT and CMDB inventory issues.	9	23
Information security (Internal)	Criteria used to measure access and control of information in its physical and logical aspects associated with the ISO/27001 control items.	8	14
Strategic alignment (External)	Criteria used to monitor and give understanding between the results of the processes in the IT area and the strategic objectives of the organisation. Usually associated with the fulfilment of the goals and objectives of IT strategic planning	8	10
Stakeholder satisfaction (External)	Criteria used to give an understanding of the different stakeholders ' satisfaction in their expectations with the adoption of ITG mechanisms.	3	4
Training and Knowledge (External)	Criteria used to measure the level of knowledge and training of IT employees and business.	2	2
Risk management (External)	Criteria used to measure the effectiveness of risk management. Associated with the control and mitigation of risks offered by IT to business.	2	2
Internal and external compliance (External)	Criteria used to measure the level of compliance of IT with the regulations of the organisation and external laws. Contributes in evaluation of the degree of contribution of IT into organisation's compliance with the applicable rules and regulations.	2	2

Table 3. Description of the criteria for measuring ITG effectiveness

It is important to note that the most widely used criteria, according to respondents, were part of the internal dimension of organisational effectiveness. The most cited monitoring criterion identified through content analysis was the quality of IT services. Respondents believed that the issues related to meeting deadlines, change control, IT availability, configuration management and fulfilment of service-level agreements were the most relevant criteria for measuring the effectiveness of the ITG mechanisms. The criterion that was the second-most frequently concerned financial issues related to cost control, budgeting and, mainly, return on IT investment. The literature on organisational effectiveness indicated that these criteria were the first to be used to monitor organisational effectiveness and, despite criticism that these criteria fail to observe important factors of the organisational context, they remain widely used to monitor organisational effectiveness on its various levels (Aguilera and Jackson, 2011). These criteria arose mainly from the fact that IT was being understood by the respondents from an operational perspective, focusing on the functional nature of organisations. Notably, none of the respondents from the financial organisations mentioned the criteria related to compliance issues as important. These criteria aimed to assess the degree of compliance with internal and external regulations and conformity with the applicable laws. They were also considered to be different from the expected criteria for these organisations because financial institutions are exposed to many regulatory agency laws and actions, and non-compliance will not only cause financial loss but also undermine the credibility of their stakeholders.

The criteria that should be included in a system for measuring the effectiveness of ITG served as the main result of this stage of the research. These criteria were used to build the instrument for defining the indicators in the structured interviews, which results of which follow.

4.2 Defining indicators to measure ITG effectiveness

The analysis of structured interviews began with reading all of the transcribed interviews. In this sequence began the encoding process, in which the names of the indicators were used as the criteria for selecting the context units. In this way, 213 codes were identified in 19 interviews. After this step, the categorisation of the indicators began, using as a criterion the similarities between descriptions of these indicators. This step resulted in 48 indicators (thematic categories) distributed across 10 measurement criteria. Table 4 below shows the distribution of these indicators in relation to the measurement criteria.

Dimension	Criteria	Indicators	Codes	Total evidence
Internal	Quality of IT Services (QUAL)	5	33	50
	Economic and financial (ECO&FIN)	6	37	50
	Physical and logical IT Infrastructure (INFR)	5	24	28
	REC – Resource Management*	6	14	17
	Information security (SI)	5	14	16
External	Strategic alignment (AE)	4	20	26
	Stakeholders satisfaction (SS)	5	31	38
	Training and knowledge (AC)	4	13	18
	Risk Management (RISC)	4	11	16
	Internal and External Conformity (CONF)	4	16	17
Total		48	213	276

Table 4. Preliminary research on indicators.

* Measurement criterion not identified in the semi-structured interviews

The Indicators column shows the total number of thematically categorised indicators in each measurement criterion. The Codes column displays the number of axial codes found through content

analysis, and the Total Evidence column shows the number of context units extracted from the documents under analysis. It should be noted that the criterion Resource Management was not revealed during the content analysis of the semi-structured interviews, instead appearing during the content analysis of the structured interviews.

Based on the results of the structured interview content analysis, the focus group was organised. This step began with introducing the concepts and presenting the dynamic goals. A mediator who was an expert in agile methods began the indicator classification, requesting that participants, on their panels, move the initial panel labels to the positions they considered most appropriate on the Evaluation Panel and, if that was the case, on the Exclusion Panel. Table 5 shows the indicators that were placed on the Exclusion Panel by participant consensus, indicating that these indicators were not recognised as means of measuring ITG effectiveness.

Criterion	Not validated Indicators
Information Security	% of hardware without antivirus
	Total number of errors in performing backups
	Total errors in the critical data recovery
	Total of attempts of unauthorized access in websites and applications
Stakeholders Satisfaction	Total complaints of IT services
Quality of IT Services	% of services in service catalogue
	Total errors, accidents and problems with IT services
	Total new solutions, offered by IT
Physical and Logical Structure	% of infrastructure update
	% Availability
Resource Management	Technical team performance index
	% of outsourced employees
	Index of productivity per employee
Economic and Financial	Total IT cost per user
	Total operating cost
	Total outsourcing costs
Internal and External Conformity	Social responsibility index
	Level of compliance with good IT practices
Training and Knowledge	% of new IT projects used in knowledge management
	Total hours of training per employee
Strategic Alignment	Level of recognition of IT

Table 5. Unclassified indicators for measuring the effectiveness of ITG.

The activity occurred in an orderly manner; all participants had the opportunity to argue regarding the evaluation and to explain their arguments to the group. During the focus group activity, the researchers conducted participant observation of the procedure. The focus group participants felt that the Table 5 indicators were linked to IT management or corporate governance but were insufficiently specific to measure ITG effectiveness. An additional result of the focus group activity was the perception that these criteria addressed the same subject and should be unified, as seen in the testimony of participant P3 "[...] Physical or logical infrastructure is the amount of human resource or investments [...]" or in participant P10's statement that: "[...] equipment; hardware; software; human resource and money. All this is resource management [...]". In this sense, the name "Resource Management" was maintained, and the criterion included the indicator "Physical and Logical Infrastructure". This finding, made by the members of the focus group, may explain why only the criterion of physical and logical infrastructure was highlighted during the semi-structured interviews.

The final set of indicators resulting from the focus group contained 27 items; the highest-rated (that is, most important and most applicable) item in the judgment of the group was the indicator "% of satisfaction of shareholders and sponsors". This classification was followed with comments similar to

the declaration of participant P1 that "[...] nothing else matters in the organisation if shareholders and sponsors are not satisfied [...]" or to that of P6: "[...] this is the main indicator in my opinion [...]", referring to the aforementioned indicator. Table 6 presents the final list of indicators considered applicable to measuring ITG effectiveness according to the focus group participants; the first two columns reflect the effectiveness criterion and the indicator used to measure it. The Importance and Generality columns represent the positions of the indicators on the x and y axes of the evaluation chart (Figure 2). The axes were numbered from 1 (lower degree) to 10 (higher degree) in relation to the assessment criteria. In this way, the table presents the complete evaluation of the qualified indicators for measuring ITG effectiveness based on focus group participants' perceptions of the generality of applying the criteria to organisations and the criterion's importance for measuring ITG effectiveness.

Criterion	Indicator	Generality	Importance*
Stakeholder Satisfaction	1. Satisfaction of <i>shareholders e sponsors</i>	10	10
Training and Knowledge	2. Sharing knowledge between business and IT	7	10
Strategic Alignment	3. Objectives of IT complied with strategic objectives of business	9	9
Resource Management	4. Balance between the demand and capacity	6	9
Internal and External Compliance	5. IT actions addressing the corporate governance model	9	8
Economic and Financial	6. Average rate of return on investment	8	8
Resource Management	7. Performance level of management and executive teams	7	8
Stakeholder Satisfaction	8. Satisfaction of users and customers	7	8
Resource Management	9. IT staff turnover	3	8
Training and Knowledge	10. Participation of stakeholders in IT decisions	10	7
Resource Management	11. IT service continuity	9	7
Economic and Financial	12. IT expenses	8	7
Risk Management	13. Occurrence of identified risks	7	7
Risk Management	14. Projects with risk analysis	7	7
Risk Management	15. Total preventive measures against risks	7	7
Stakeholder Satisfaction	16. IT employee satisfaction	3	7
Strategic Alignment	17. Participation of IT in business	10	6
Quality of IT Services	18. Compliance of SLA and OLA	8	6
Risk Management	19. Total measures of risk mitigations	7	6
Stakeholder Satisfaction	20. Satisfaction with IT vendors	5	5
Economic and Financial	21. Compliance of the IT budget-planned x executed	9	3
Resource Management	22. IT Investment	8	3
Internal and External Compliance	23. % of compliance with external audits	7	3
Internal and External Compliance	24. % of compliance with internal audits	6	3
Strategic Alignment	25. Total new business implemented by IT	5	3
Quality of IT Services	26. Total errors of analysis and gathering requirements for IT services	3	3
Information Security	27.% of information security incidents	6	2

Table 6. Classification of the indicators. * Listed by the importance of the indicator

The adoption of ITG frameworks is, in many cases, complex and costly, mainly because of the difficulty of defining a unique approach to ITG effectiveness in organisations. Organisations have different motivators for adopting ITG mechanisms, and these organisations do not always address the objectives or comply with the principles of corporate governance (Nfuka and Rusu, 2011). The set of 27 indicators proposed by this study may contribute to organisations' ability to monitor how well ITG initiatives are complying with governance principles such as transparency, fairness and accountability while also meeting IT goals. These indicators present the potential to become valuable tools for CIOs in monitoring and evaluating the effectiveness of ITG. Despite differences in classification, these indicators were familiar to most CIOs and were present in the major frameworks. However, the set of indicators was synthesised to preserve the independence of any framework, contributing to improving ITG monitoring because the study proposes indicators based on the main criteria of ITG effectiveness.

According to Weill and Ross (2004), the value added by IT to a business is a result of adopting effective IT Governance mechanisms. The proposed and validated indicators work in this direction and are also aligned with Nfuka and Rusu's (2011) proposal, namely, they are a set of indicators unbound to market models. According to Westerman, Mitra and Sambamurthy (2010), measuring IT Governance mechanism effectiveness helps to increase stakeholder confidence as a result of increased compliance with the governance principles. Similarly, understanding and satisfying stakeholder requirements was the effectiveness indicator that the focus group considered to be the most important.

5 Final Considerations

This research began by identifying a set of nine criteria for measuring IT Governance effectiveness by conducting 14 semi-structured interviews. The structured interviews led to identifying 213 indicators, which were consolidated into 48 indicators using the technique of content analysis. However, the main result of this study was the identification of 27 indicators for measuring ITG effectiveness, which were determined by a focus group. It is considered that this study's objective was achieved, to the extent that a set of indicators was obtained with which ITG effectiveness can be monitored and measured, aligning an organisation's IT business objectives with the principles of corporate governance. The mechanisms have potential applicability in a wide range of organisations, facilitating their use in other studies on this subject as well as their adoption by organisations.

The limits of this study include, beyond those inherent in each of the data-collection techniques used, the geography issue in that the study was conducted in a single country, with professionals from two of the five regions of Brazil; therefore, it reflects only the opinions of these professionals on the subject.

The continuity of this study involves the completion of case studies that confirm the relevance of collecting the indicators proposed and validated in this study in Brazilian and non-Brazilian organisations. The applicability of the indicators remains potential, although the different techniques of collecting and analysing data have gradually refined the set of indicators, which may contribute to CIOs' decision making in choosing metrics to evaluate and measure IT Governance effectiveness. Currently, considering the relevance of the continuity of this study, case studies are being performed in different countries. These studies, in addition to providing descriptions of the description of the indicators, will also explore organisational factors, such as a particular industry or companies with similar sizes; these elements were not addressed in this study, but they could contribute to a better explanation of the observed phenomena. In addition, a study with a quantitative purpose will be developed in order to propose and validate a measurement model for IT Governance effectiveness based on the set of related criteria and indicators defined in this study.

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