

Information Technology Governance: exploratory study of graduate production in Brazil

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Abstract

Due to the central role that ITs have played in transforming society and the knowledge economy, it is essential to understand IT Governance (ITG), a subject that is evolving worldwide. When considering Brazil only, this research domain stands out in academia along with the United States and China. In this context, the objective of this study is to identify and describe the panorama of scientific capital, based on the final product of Brazilian graduate programs, theses and dissertations, concerning ITG. From a qualitative and quantitative approach, an exploratory and descriptive research was carried out through documentary and bibliometric research, with data extracted from the Lattes Platform and the Sucupira Platform of the Coordination for the Improvement of Higher Education Personnel (CAPES). The main results evidenced that more than half of the studies in ITG come from graduate programs in Administration, among other areas such as Engineering and Computing. It is concluded that ITG is an interdisciplinary subject, not adhering to only a certain field of knowledge within Brazil. It is noted that ITG has a scientific capital set up and that it is still developing in this country.

Keywords: Information Technology Governance; Graduate Studies; Brazil; Scientific Production; Theses and Dissertations.

1. Introduction

In an increasingly competitive environment in which greater accountability and transparency for stakeholders is encouraged as regards Information Technology (IT) activities within organizations, as well as considering that company performance also depends on IT performance, it is essential to understand Information Technology Governance (ITG) (JOSHI et al., 2017; TONELLI et al., 2017).

Concepts such as IT strategic alignment, IT value delivery, risk management, IT resource management and performance measurement are some of the concepts related to ITG, which is also part of Corporate Governance (AASI et al., 2017). Due to the central role that IT has played in transforming society and the knowledge economy, the study of these and other concepts is a matter of urgency (VATANASAKDAKUL et al., 2017).

Information Technology Governance (ITG) is a research domain that emerged in 1991 (LOH; VENKATRAMAN, 1992), and which began to be discussed in Brazil only by 2004, with the launch of the book by Weill & Ross (2004), translated into Portuguese, the common language in that country.

However, according to Khan & Wood (2015), ITG is an emerging and growing research theme in the world. Brazil, the main Latin American economy, stands out together with the United States and China regarding researches on ITG (CUNHA, FROGERI, 2016).

In this context, the objective of this research is to identify and describe the panorama of scientific capital, from the final product of Brazilian graduate programs, theses and dissertations, concerning ITG.

2. Literature Revision

2.1 *Scientific capital and Graduate in Brazil*

The Coordination for the Improvement of Higher Education Personnel (CAPES¹) is responsible for graduate studies at *stricto sensu* level in Brazil (MEDEIROS et al., 2015). The objective is to train new teachers, researchers and professionals with a focus on science. Along with the scientific cooperation of researchers in the international scenario, it is thus in line with national needs, and also advances to reach goals compatible with more advanced nations, thus offering Brazil human resources of high level (LIEVORE et al., 2017).

Undergraduate students are candidates for master's and doctoral courses at *stricto sensu* graduate level. For admission, you must meet the requirements of each Higher Education Institution (HEI), as well as the respective selection notice. After completion, the title of Master or Doctor is obtained (CIRANI et al., 2015). For Raynaut & Zanoni (2011), the master's degree is the initial training as a researcher, putting into practice various methodological instruments; while in the doctorate, researchers are consolidated as scientists and surpass the simple transmission of knowledge.

¹ Plataforma Sucupira da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior

The courses are also categorized as academic or professional. In academic terms, the focus of training is for the researcher to work in the academy, either as a researcher or as a teacher, while the professional category is to prepare researchers to work in the market, both in the public and private sectors, and to be highly qualified (CIRANI et al., 2015).

In 2017 alone, there are 3,423 academic master's degrees, 2,200 academic doctoral courses, and 727 professional master's degrees, corresponding to a total of 4,227 programs in Brazil (CAPES, 2018).

Another important aspect in the graduate context is the access to information about its researchers and programs (FERRAZ et al., 2017).

Access to information from researchers in the country is carried out from the Lattes Platform. According to Ferraz et al. (2014), this corresponds to a national register of all its curricula, essential for those who are linked either in teaching or research institutions in Brazil. This system allows to access information related to the published articles, as well as the relation of all the works oriented by these researchers, either at master's or doctoral level (FERRAZ et al., 2017).

In addition, the Sucupira Platform is the main tool used to access information about *stricto sensu* graduate in Brazil (FERRAZ et al., 2017), with the official relationship of all programs, as well as access to results and their qualitative evolution.

The question of evaluation has been the subject of constant consideration in the management of Brazilian scientific policy, even more in graduate studies. A rigorous and transparent evaluation is carried out through CAPES, as it is recognized as one of the most modern and efficient in the world and with results published in its portal (CIRANI et al., 2012).

Each of the Programs, by the year 2012, was evaluated every three years. However, such evaluations occurred from 2013 on a quarterly basis. The period of analysis of the data in this article refers to this first quadrennial evaluation, referring to the period 2013 to 2016 (LIEVORE et al., 2017).

Grades for each Program that are between 'One' and 'Seven' (CAPES, 2018) are diagnosed and received. However, Programs that receive grades lower than 'Three' are disqualified by CAPES. Offering only the masters course, 'Five' is the maximum grade, used for Programs of excellent quality; 'Three' is for performance with a quality for operation; and 'Four' when it is considered of good performance. Nevertheless, higher grades, 'Six' and 'Seven', are attributed only to Programs that also offer the doctorate. In addition, the Program only perceives this grade when considered to have performance equivalent to high international standards (CAPES, 2018), which even allows to receive exclusive promotion.

Ribeiro & Costa (2013) state that theses and dissertations, which consist of final documents in a graduate program, can be considered as a primary source for the development and progress of scientific knowledge in a given area. They can even provide insight into new topics for scientific journals or conferences. Nevertheless, they point out which are the topics of major interest of a certain research group or advisor. In fact, it often contains unpublished information, because it propagates more detailed scientific information, which is not always possible in scientific journals (BOTELHO; OLIVEIRA, 2015).

2.2 Information Technology Governance

The premises of ITG are: guaranteeing value through IT, assuring benefits, and optimizing risk levels and

resources (ISACA, 2012). Its main purpose is to align IT with business requirements, considering business support solutions, as well as guaranteeing services and minimizing business exposure to IT risks (FERNANDES; ABREU, 2014).

For Selig (2016), there are several benefits that can be obtained from well-governed IT: a) improving the overall profitability of the organization; b) optimizing human capital assets and resources; c) supporting in a greater organizational maturity; d) generating greater compliance and facilitating IT audits; e) ensuring more efficient and ethical IT management; f) improving planning, integration, communications and performance between business units and IT groups, as well as within IT itself; g) ensuring more effective outsourcing, selection, contract administration, among others.

Although considering the multiplicity of aspects analyzed in researches conducted on ITG by Luciano et al. (2015a) bring together at least two central concepts. The first is related to the specification of key IT decisions (PETERSON, 2004), as well as on regulatory and compliance issues, and a second, to aspects of desirable behavior in IT use and management (WEILL; ROSS, 2004).

The following are considered origins of ITG, according to De Haes et al. (2013): the issue of IT alignment with business, the need for alternative structures to organize the IT function, and the issue of return on IT investment.

Several bibliometric studies about ITG were carried out, such as Ramos et al. (2016); Khan and Wood (2015); and Freitas et al. (2018), among others.

Ramos et al. (2016) demonstrated which are the Critical Success Factors for implementing a good ITG, out of a total of 64, and grouped them into 24 categories.

Khan & Wood (2015), in their bibliometric study involving articles from more than 40 international journals in the area of Information Technology Management, found that ITG is a growing topic, at the expense of some themes that have been studied less in recent years, such as 'planning', 'strategic', CIO or 'reengineering'. Other keywords referring to the theme remain in pre-eminence, such as 'performance', 'value' and 'framework', as well as 'alignment' and 'strategic IT management', which are emerging themes, indicating the direction of current academic research.

Freitas et al. (2018) identifies that ITG or Strategic and Competitive Use of Information Technology, a classification used in this study, although with some stability and a clear decrease in production in the last period, represents the second largest volume of production in Information Systems within the ANPAD events, the main national event of the Brazilian Administration area.

3. Method and Instruments

From a qualitative and quantitative approach, an exploratory and descriptive research was conducted through documentary research, supported by bibliometrics and descriptive statistical analysis (CRESWELL; CLARK, 2015).

Data collection followed the following steps:

1) Manual search on the Lattes Platform (CNPQ, 2018) through the simple search engine, by subject, considering only the database of researchers with a doctorate degree, from the terms: 'ITG' or 'Information Technology Governance' or 'IT' or 'Information Technology management'. The respective records of the

Lattes curriculum address of each of these doctors were stored in a text file.

- 2) From the tabulated addresses in the text file, a script was generated in order to obtain the complete Lattes curriculum in HTML file format, from the platform Scriptlattes.
- 3) Generation of worksheets in XLS format, compatible with the MS-Excel standard, containing data referring to the 'bibliographic production' section, which are: 'complete articles published in journals', 'complete papers published in congress proceedings'; as well as, referring to the 'guidelines - Supervisions and guidelines completed' section: 'PhD thesis' and 'Master's Dissertation' (academic or professional).
- 4) Once all the records in the Scriptlattes have been returned, only the following nomenclatures have been selected: 'Governance' + ('IT' or 'Information Technology'). The CNPq Lattes Platform was consulted to clarify any doubts, when necessary. Similar collection was performed in CAPES Open Data (2018) from the same keywords as above, in 'Catalog of Theses and Dissertations' and 'Reports of Data Sent from Collection' within the Sucupira Platform, in order to complement the data. Once consolidated, duplicate records were eliminated.
- 5) As a conference and necessary unification of the terminologies in relation to the Institutions of origin, the current state of operation of the *stricto sensu* programs and respective areas of evaluation, as well as the CAPES concept (evaluation 2017, for the quadrennium 2013-2016) of the Program, were consulted with the Sucupira Platform (CAPES, 2018). Discontinued courses were shown as inactive.
- 6) For consultation regarding the administrative category of the Institutions, the E-MEC Platform (MEC, 2018) was used.
- 7) Scientific articles were stratified according to Qualis journals 2013-2016, regardless of the year of publication of the article in the analyzed journal.

The sample prospected in this study considers the period from 2002 to 2017 as a temporal cut. However, the first records returned were related to the year 2004. For theses and dissertations, only those completed in a *stricto sensu* program in a Brazilian institution were considered. Likewise, studies clearly outside the proposed thematic scope were discarded.

In order to meet the research objective, the following analyzes were carried out: 1) Production by levels (professional masters, academic masters and academic doctorates), year by year; 2) Advisors with higher production; 3) Institutions of Higher Education (HEI), Regions of the country and administrative categories with higher production; 4) *Stricto sensu* graduate programs with higher production and per institution; 5) Production by CAPES Evaluation Area; 6) Frequency of words and objects found in the titles, containing the total occurrences from the keywords and group of words evidenced in the titles.

4. Presentation and Discussion of Results

4.1 Production by levels

The total number of theses and dissertations in each of the three levels, respectively: Doctoral (DO), Academic Master's (AM) and Professional Master's (PM), according to the nomenclature adopted by CAPES.

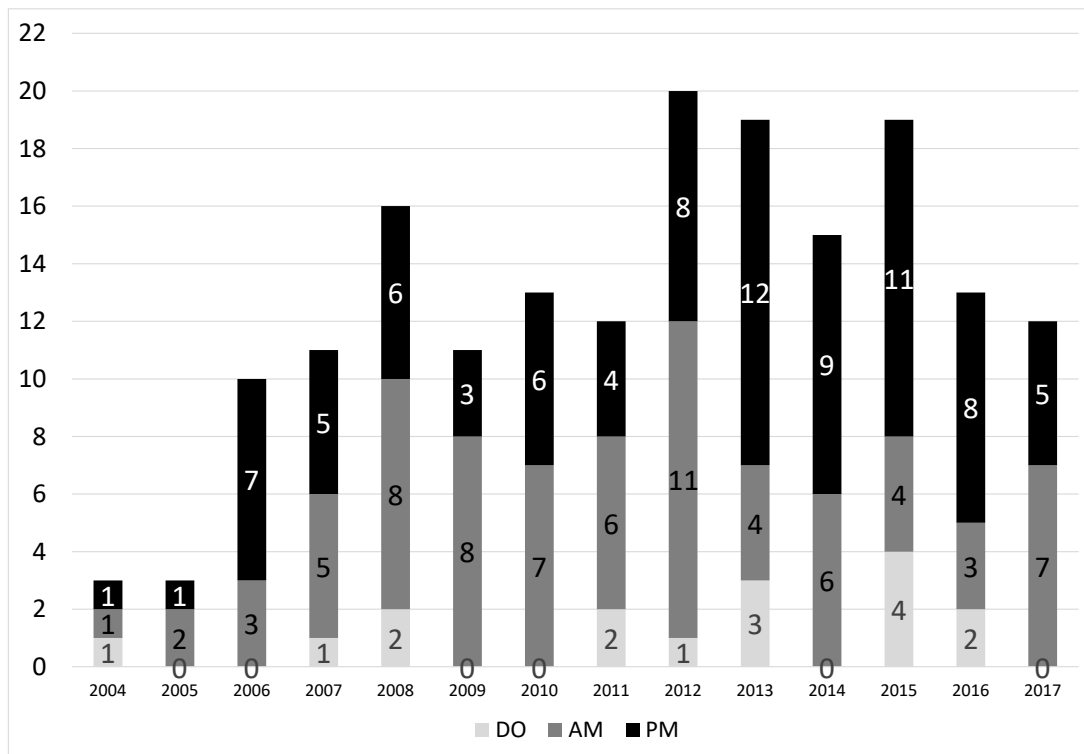


Illustration 1- Total of doctoral and master's degrees, by level, year by year

A total of 177 papers were found, including 16 theses, 75 academic dissertations and 86 professional master's dissertations, considering the period from 2004 to 2017. Thus, as pointed out by Ribeiro & Costa (2013), theses and dissertations can be designated as a primary source for development and the progress of knowledge, providing greater clarification for the scientific area in question, ITG.

The first doctoral and master's studies defended with the terms 'Governance + IT' in its title begin in 2004, being an academic master's dissertation, a master's dissertation and a doctoral thesis. This corroborates the indication of Luciano et al. (2015b) when mentioning the year 2004 as the initial milestone in the research in the country; as well as Graeml et al. (2010), who considered from the year 2002 onwards the beginning of the expansion of research on this topic in a network of co-citation, that is, the connection of two or more articles, in relation to the number of works where these articles are cited, at the same time within the ADI area.

During the 14-year prospective period, there was growth until 2012, the year with the highest production in the period, with 20 studies, with a fall in the following 2 years, for a new leap in 2015, with 19 productions, and a further drop to 2017, reaching 12 studies in the last year evaluated. This result confirms the study of Freitas et al. (2014), when they analyzed the year 2012 as more proficient in the ITG theme. Nonetheless, doctoral theses were concluded in greater quantity in the year 2015, with four papers defended; while in the academic masters (ME), the peak was recorded in 2012, with 11 papers. Already in the professional master's degree (MP), introduced in the country from 1999, the year of 2013 obtained greater prominence with 12 studies defended.

In addition, it was verified that Altino José Mentzingen de Moraes, Guilherme Costa Wiedenhof and Karoll Haussler Carneiro Ramos were the only three authors of the 174 graduated students who carried out a

research, successively at master's and doctoral level, in ITG. It was also verified that Fernando de Abreu Faria, from the University Center Alves Faria (UNIALFA), besides being a guide in the subject in question, was also an egress student related to ITG.

4.2 Most Productive Guidelines

Table 1 shows 6 of the 114 supervisors with the highest production (with at least 4 jobs), the institution where the orientation was held, as well as the production by level of *stricto sensu* course.

Table 1 - Guided work supervisors with higher production, by level

Position	Name of the supervisor	Institution	DO	AM	PM	Total
1	Joao Souza Neto	Catholic University of Brasilia	0	0	9	9
2	Edimara Mezzomo Luciano	Pontifical Catholic University of Rio Grande do Sul	2	6	0	8
3	Adolfo Alberto Vanti	University of the Sinos River Valley	0	8	0	8
4	Napoleão Verardi Galeale	State Center for Technological Education Paula Souza	0	0	5	5
5	Rejane Maria da Costa Figueiredo	Catholic University of Brasilia	0	0	4	4
	Hermano Perrelli de Moura	Federal University of Pernambuco	1	2	1	4

João Souza Neto of the Catholic University of Brasilia (UCB) stands out as a permanent teacher with more research orientations in the ITG subject, with a total of 9 papers oriented, all of them with a professional master's degree, which also makes up the largest number in this category (PM). His dissertations were developed in an 'Interdisciplinary' area of evaluation.

In addition, it is verified that Edimara Mezzomo Luciano from the Pontifical Catholic University of Rio Grande do Sul (PUC/RS), together with Adolfo Alberto Vanti of the University of Vale dos Sinos River (UNISINOS), both with 8 orientations, are tied in second place. The studies by one and the other were carried out within the 'Public Administration and Business, Accounting and Tourism' evaluation area. Still, Adolfo Alberto Vanti also stands out with the largest number of defences in the academic master's degree, with all eight papers (AM).

Another highlight is Antonio Carlos Gastaud Maçada, from Federal University of Rio Grande do Sul (UFRGS), tied for the seventh position of the overall score with 7 other advisors. He is a teacher with the highest number of doctoral degrees, with three degrees in this category (DO). His production is concentrated in the CAPES area 'Public Administration and Business, Accounting and Tourism'.

Other highlights with 4 studies are: Napoleão Verardi Galeale of the State Center of Technological

Education Paula Souza (CEETEPS), with 5 orientations; Rejane Maria da Costa Figueiredo from UCB and Hermano Perrelli de Moura from the Federal University of Pernambuco (UFPE), have 4 completed papers, each one. On the other hand, the HEI with the greatest number of mentors in the ITG theme is the UFPE, with 8 teachers in total; followed by the UCB, with 7 professors and USP, with 6 advisors on the subject. Nevertheless, more than three-quarters of the respondents, or 85 of the 114 (74.6%) supervisors considered, have only one piece of work oriented in the researched topic. Thus, only 29 supervisors (25.4%) have more than one work focused on the theme of this research.

When compared to the ranking of 13 researchers with the highest number of publications in ITG elaborated by Rasera et al. (2010), 5 have at least one thesis or dissertation orientation in ITG.

It was also found that 3 of the 8 authors with the highest production in the ranking proposed by Marques & Mota (2013) were also located with at least one orientation in the ITG theme.

Still in comparison with this work, it is verified that 2 alumni in the present research also appear in the Marques & Mota (2013) ranking.

Comparing the present research to Cunha & Frogeri (2016), who developed a study on ITG work at the international level, only Edimara Mezzomo Luciano is on both lists of the most proficient authors. It also stands out that a student graduated on ITG, Guilherme Lerch Lunardi.

In addition, it was verified that 17.1% of the articles analyzed in the bibliometric study stage on IT Strategic Alignment with the business, carried out by Almeida & Santos (2014), have at least one supervisor or student egress, related to the results presented in present research. This reflects the participation of these researchers also in congresses and scientific journals specific to the ITG area.

4.3 Higher Education Institutions (HEI), Country Regions and Higher Management Administrative Categories

Table 2 shows the 10 HEIs with the highest volume of publications, all with 5 or more papers defended, out of a total of 57 HEIs identified in this study. The administrative category of the institution (public or private), the state of the federation of the institution, as well as production by level of *stricto sensu* course are also exposed.

Table 2 - Total studies supported by HEI, administrative category, federative unit, by level

Position	Current HEI	Administrative category	UF	DO	AM	PM	Total
1	Catholic University of Brasilia	Private non-profit	DF			20	20
2	Federal University of Pernambuco	Federal public	PE	1	7	6	14
3	Pontifical Catholic University of Rio Grande do Sul	Private non-profit	RS	2	10	1	13
4	University of the Sinos River Valley	Private non-profit	RS		8		8
	State Center for Technological Education Paula Souza	State public	SP			8	8
6	Federal Fluminense University	Federal public	RJ			7	7
7	Federal University of Rio Grande do Sul	Federal public	RS	5	1		6
	University of Brasilia	Federal public	DF	1	3	2	6
	University of Sao Paulo	State public	SP	3	3		6
10	Paulista University	Private non-profit	SP	1	4		5

Having analyzed the total number of articles by HEI, the first position corresponds to UCB, with 20 studies defended, all of professional master's degree. In fact, it is the program with the highest number in this category (MP).

In second and third places, UFPE and PUC/RS are verified, with 14 and 13 studies each. In addition, PUC/RS stands out with the highest number of academic master's degrees (10).

Next, UNISINOS and CEETEPS are tied in fourth place, both with 8 studies defended.

A similar highlight is UFRGS, tied for seventh position, with a total of 6 papers, with the highest number of theses, of which 5 are in this category.

When comparing with the results of the research conducted by Freitas et al. (UFSC, FGV SP, UFPE, PUCRS, Federal University of Santa Catarina (UFSC), which presented the relationship of the 10 HEIs with the greatest number of studies developed about ITG, the following institutions converge: UFRGS, USP, FGV/SP, UFPE, PUCRS, Federal University of Rio de Janeiro (UFRJ), Federal University of Santa Catarina (UFSC), and UNISINOS. Compared to the study by Freitas et al. (2018), the 3 HEIs with the highest production also stand out: UFRGS, FGV/SP and USP.

On the other hand, when compared to the study by Rasera et al. (2010), of the eleven HEIs with the greatest number of ITG works, it is verified that seven are also in the ranking of the 19 most prominent HEIs pointed out in this research.

On the other hand, when confronted with a study by Araujo & Dornelas (2016), 4 HEIs are presented in a

similar way among the 14 most profitable HEIs pointed out in this research.

The productivity segregated by state of the federation can be visualized next in Table 3.

Table 3 - Total works defended by state of the federation by level

Position	Federation state	DO	AM	PM	Total
1	SP	5	14	18	37
2	RS	7	19	1	27
3	DF	1	3	22	26
4	RJ	0	9	14	23
5	PE	1	7	8	16
6	MG	0	4	10	14
7	PR	0	8	1	9
8	SC	1	2	3	6
9	CE	0	2	3	5
10	ES	0	1	3	4
	BA	0	2	2	4
12	RN	1	1	0	2
13	4 states with just one job (RO, SE, AC, GO)	0	3	1	4
	11 states with no studies (AL, AM, AM, MA, MS, MT, PA, PB, PI, RR, TO)	0	0	0	0
	General total	16	75	86	177

When the production by federation state is verified, the state of São Paulo (SP) is in first place, with 37 studies (20.9% of the total), followed by the states of Rio Grande do Sul (RS) (27 studies or 15, 3%), Federal District (DF) (26 studies or 14.7%) and Rio de Janeiro (RJ) (23 studies or 13.0%).

Considering only the studies of the academic category, Rio Grande do Sul (RS) is the most profitable, with the largest number of dissertations and academic theses, concentrating 28.6% of this production (26 of 91), while the Federal District (DF) stands out in the professional category, with 25.6% of professional dissertations (22 out of 86).

11 other states of the federation, which did not present any work defended in the analyzed subject, should also be noted considering the majority belongs to the Midwest, North and Northeast Regions.

When the geographical regions of the country are verified, the Southeast has almost half of the works

completed, with 78 works defended (44.1%). Next, defenses of graduate programs established in the South Region (42 or 23.7%), Northeast (28 or 15.8%), Central West (27 or 15.3%) were found and, finally, North with only 2 studies (1.1%).

Figure 2 shows the total number of studies, by administrative category of the institution (public and private), as well as the production by level of *stricto sensu* courses.

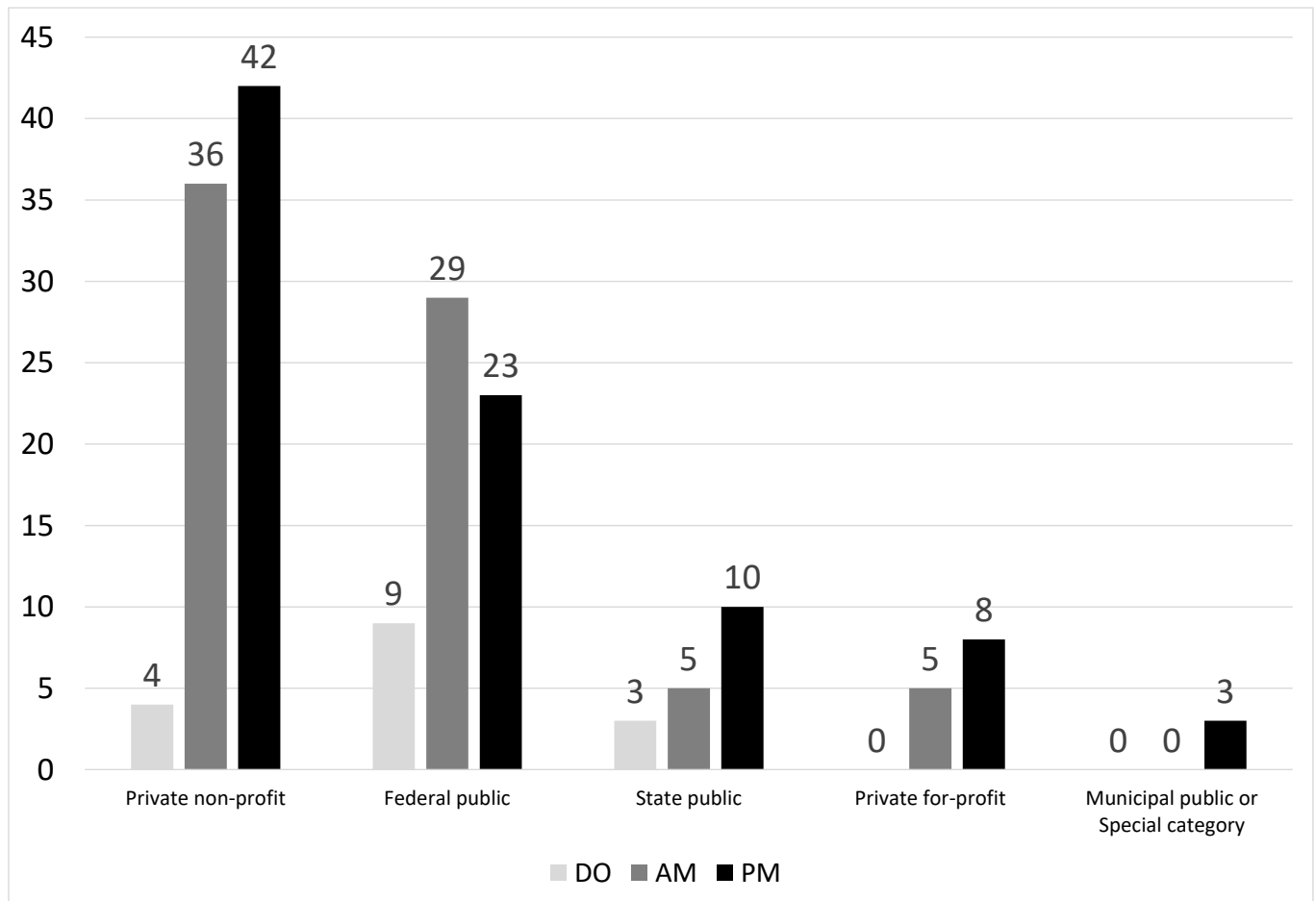


Illustration 2 - Total doctoral and master's studies, by administrative category

When analyzing *stricto sensu* production in ITG by administrative category, 82 studies were completed in private non-profit institutions (46.3% of the total), followed by federal public (61 studies or 34.5%), state public (18 studies or 10.2%), private for profit (13 studies or 7.3%) and finally, public municipal or special category (3 studies or 1.7%). These are more prevalent in federal public institutions (9 papers or 56.3%), while dissertations are concentrated in non-profit private HEIs, of which 36 (or 48.0%) of the academic master's degree and 42 (or 48,8%) of the professional master's degree.

4.4 Programs with Higher Production by Institution

Table 4 shows the first 16 of 81 *Stricto sensu* programs and the respective HEI with a greater amount of papers defended, based on the data collected in the research. Also presented is the respective note of the four-year evaluation published in 2016 attributed by CAPES to the course.

Table 4 - Total work supported by programs, including HEI and CAPES evaluation note

Position	Current HEI	Name of the Programme	CAPES Grade	DO	AM	PM	Total
1	Catholic University of Brasilia	Knowledge Management and Information Technology	PM (4)			20	20
2	Pontifical Catholic University of Rio Grande do Sul	Business and Management	DO (5), AM (5)	1	10		11
3	State Center for Technological Education Paula Souza	Management and Technology in Productive Systems	PM (3)			8	8
4	Federal Fluminense University	Management Systems	PM (3)			7	7
5	University of the Sinos River Valley	Administration	AM (6)		5		5
	University of São Paulo	Production engineering	AM (5)	1	4		5
	Federal University of Pernambuco	Computer Science	PM (4)			5	5

The program 'Management of Knowledge and Information Technology', from the UCB's 'Interdisciplinary' evaluation area, stands out with the highest productivity, with 20 studies (11.3% of the total). This Professional Master's Degree was evaluated by CAPES in 2016 with a grade of 'Four' and also stands out with the highest number of studies in the professional category.

The program 'Administration and Business', offered by PUC/RS, is in second place. It is evaluated within the area of Public Administration and Business, Accounting and Tourism, with a total of 11 papers defended. Its grade is 'Five' for doctoral and master's degree courses. In addition, this program had the highest production of academic master's degree, with a total of 10 productions.

The following are the program 'Management and Technology in Productive Systems' of the CEETEPS and the program 'Management Systems' of the Federal University of Fluminense (UFF), with 8 and 7 studies each. Both programs are in the professional category and received a grade of 'Three' by CAPES in 2016 within the 'Engineering III' CAPES area.

Another highlight is the UFRGS Administration program, ranked in eighth place in the general ranking. This program provided the highest number of doctoral theses with the term ITG in its title (4).

However, there are still studies from 11 doctoral courses, 44 academic master's degree courses and 35 professional master's degree courses. Disregarding the level, 90 different courses offered by 57 different HEIs were found.

Figure 3 depicts the total number of papers defended based on the CAPES evaluation notes for the quadrennium 2013-2016, as well as the production by level.

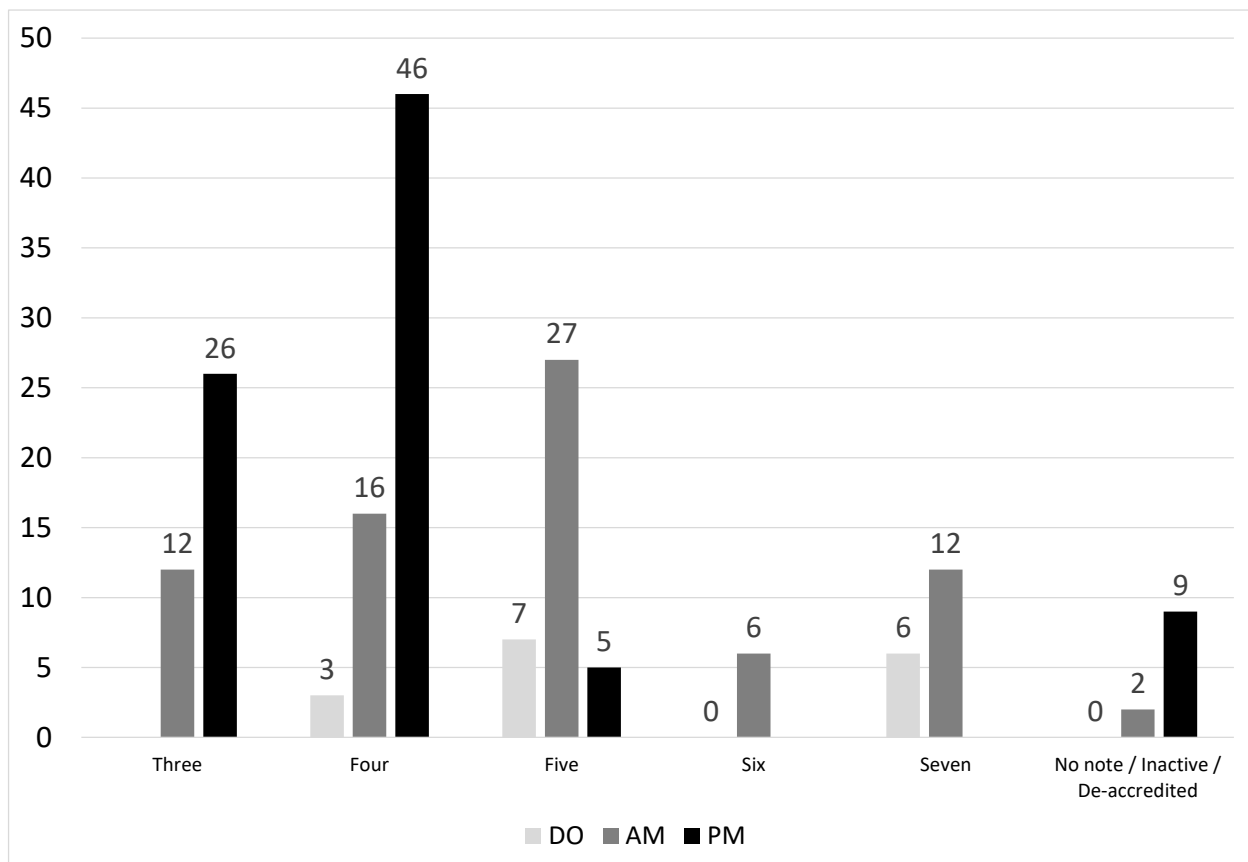


Illustration 3 - Total of papers supported by CAPES 2013-2016 evaluation grades and by level

The greatest amount of studies defended, when considering the CAPES assessment notes of the four-year evaluation 2013-2016 of the respective courses, scored ‘Four’, totalling to 65 papers (36.7%), followed by ‘Five’, with 38 papers (21.5%), ‘Seven’ with 18 papers (10.2%), and ‘Six’ with six papers (3.4%).

When analyzing only doctoral theses, the greatest number of papers defended comes from courses with ‘Five’ (7 papers or 43.8% of theses). For academic master's studies (27 or 36.0% of academic dissertations), ‘Five’ was the one that predominated the most, which presupposes excellence nationally, while for the professional master's degree (46 or 53.5% of the professional dissertations), the grade ‘Four’ was the one that overcame the courses analyzed.

In addition, more than two-thirds of the academic theses and dissertations found, that is, 58 of 91 papers (63.7%), come from high quality programs, with a minimum of ‘Five’ in the evaluation promoted by CAPES in the four-year period 2013-2016.

However, another 11 studies (6.2%) are in programs without CAPES evaluation. Accordingly, several papers are in line with programs that have undergone changes in grades, as well as several courses that have been de-accredited after different evaluation periods, and the grade referring to the last four-year evaluation period (2013-2016) has been normalized for the presentation of the results exposed in this section.

4.5 Production by Area of Knowledge and Evaluation of CAPES

Figure 4 shows the total of papers defended grouped according to the evaluation areas stipulated by CAPES, as well as the production by level of *stricto sensu*.

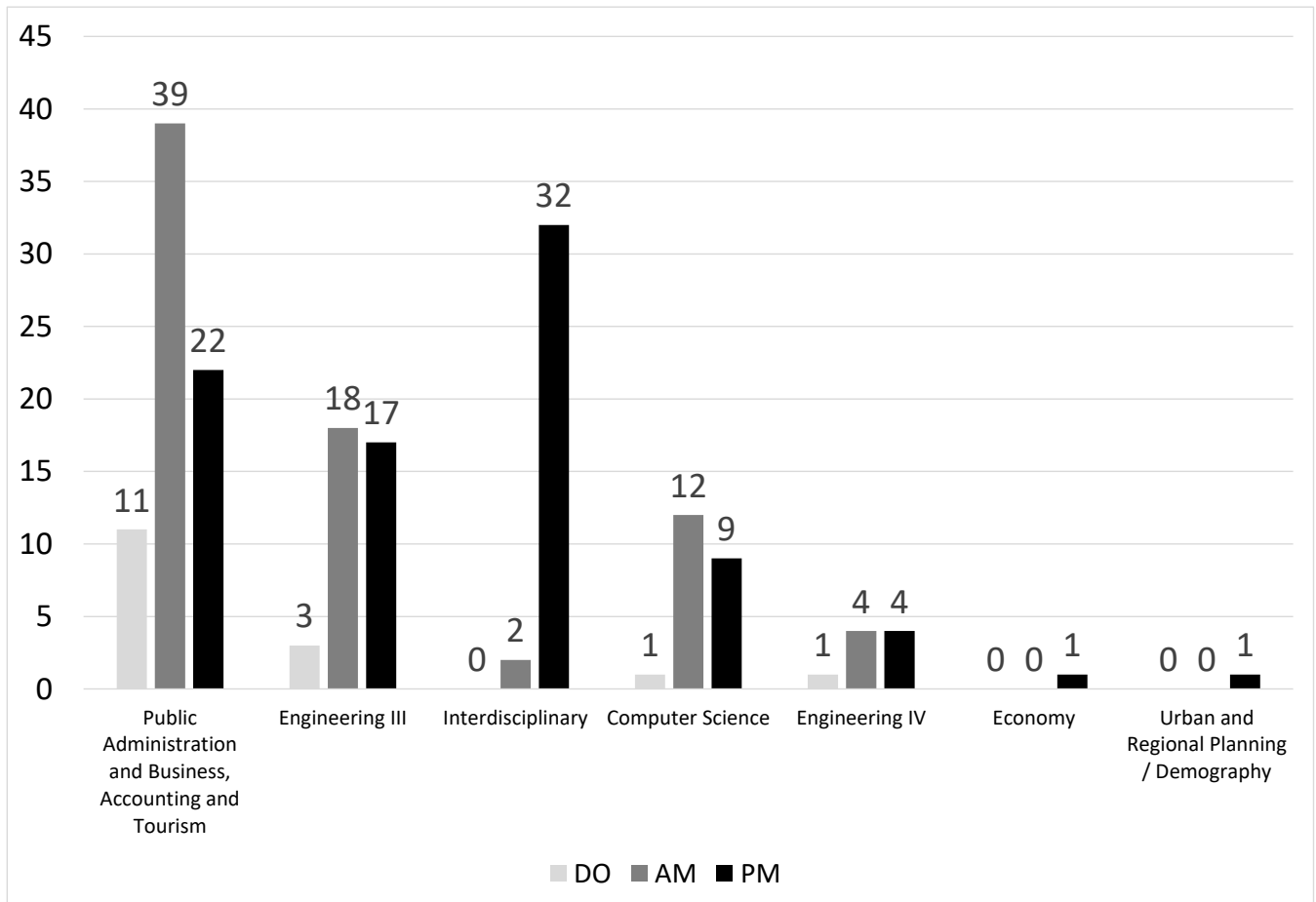


Illustration 4 - Total of doctoral and master's studies, by CAPES evaluation areas

Of the 49 areas of knowledge officialized by CAPES in the country, studies were found in 7 different areas (14.3%). ITG is not unique to a single area of knowledge, with emphasis on ‘Applied Social Sciences’, with a total of 74 papers. This area encompasses the area of evaluation entitled ‘Public Administration and Business, Accounting and Tourism’, with 72 productions, as well as the areas of evaluation ‘Economy’ and ‘Urban and Regional Planning / Demography’, both with only one study respectively.

Thus, ‘Public Administration and Business, Accounting and Tourism’ is in first position, concentrating almost half of the studies (40.7% of the total). This area also presented the greatest amount of studies defended at doctoral level (11) and academic master's degree (39). These results represent 68.8% of the studies defended in the doctoral category and 52.0% in the academic master's degree, always with studies on ITG in this area of evaluation.

Then, the area of knowledge ‘Engineering’ brings together 47 papers (26.6%). It encompasses the ‘Engineering III’ evaluation area with 38 titles, ranking in the second position, as well as the evaluation area ‘Engineering IV’, with 9 studies and constant in the fifth position in the ranking by evaluation area.

The ‘Multidisciplinary’ area of knowledge, with the ‘Interdisciplinary’ area of assessment, appears in the third position in the general ranking, with 34 studies defended (19.2%) and similarly receives the largest number of professional master's degrees (32 or 37.2% of the professional category). In fact, this result also represents almost all of this type, since only 2 papers in this area of evaluation were not defended in the professional master's degree category.

The area of knowledge ‘Exact and Earth Sciences’, represented only by the area of evaluation ‘Computer Science’, is the fourth area of evaluation with the greatest number of studies with ITG, with 22 papers defended (12.4%).

4.6 Frequency of words found on titles

In this section, the frequency of the words evidenced in the titles of theses and dissertations analyzed in this research is highlighted, as shown in Illustration 5, through the exposure of the word cloud generated. According to Ribeiro & Costa (2013), this type of image demonstrates a visualization that indicates the frequency with which the terms are found in a certain context. For the preparation of this illustration, the online tool Wordclouds was used.



Illustration 5 - Cloud of words evidenced in titles of theses and dissertations

The most used terminologies in the theses and dissertations analyzed were: 'governance' (185 occurrences), 'IT' (110), 'information' (98) and 'technology' (88); which represents 28.7% of the total words identified in the analyzed titles. As they were mandatory keywords for participation in the sample of this subchapter were excluded from the presentation within the word cloud.

In this way, the most frequent words were: 'study' (57), 'cases' (43), 'model' (33), 'companies' (30), 'public' (21), 'practices' (20), 'analyze' (19), 'institution' (19), 'management' (19), 'Brazilian' (18), 'federal' (18), 'process' (18), 'organization' (16), 'sector' (15), 'service' (15), 'application' (12), 'corporate' (12), 'evaluation' (12), 'base' (11), 'strategic' (11), 'teaching' (11), 'alignment' (10), 'implantation' (10), 'relationship' (10), among other verified words, in that order.

When the research objects or themes were analyzed, the following terms were identified: 'Government' (26), 'Teaching Institutions' (19), 'Banking / Finance' (7), 'Companies in general' (7), 'Health' (7), 'Industry' (6), 'National enterprises' (5), 'Public Enterprises' (5), 'Local and regional enterprises' (4), 'Energy' (4), 'Executives / professionals' (3), 'telecommunications' (2), 'Local productive arrangement' (2), 'Software enterprises' (2), 'Small enterprises' (2), among others.

The ITG theme in government or public administration has been a subject widely studied by researchers, as demonstrated in more detail in a study conducted by Chagas et al. (2015). However, no conclusion work was found to have the analysis of institutionalization or even scientific capital in ITG, as proposed in this paper.

5. Final considerations

These were the main findings regarding this article: more than half of the studies about ITG come from *stricto sensu* programs with academic courses of 'Public Administration and Business, Accounting and Tourism'. Nevertheless, there were also studies in the areas of 'Engineering', specifically in the 'Engineering III' and 'Engineering IV' evaluation areas. Additionally, the 'Interdisciplinary' evaluation area congregates practically all the professional master's degrees cataloged in the field research carried out. In addition, the area of evaluation 'Computer Science' is another area contemplated in the studies of ITG. Thus, it is concluded that ITG is an interdisciplinary subject, not adhering to only a certain field of knowledge.

In addition, more than two-thirds of the academic-level courses found are from *stricto sensu* graduate courses of excellent quality, with a minimum grade of 'Five', according to CAPES, without considering the professional masters courses that have differentiated evaluation criteria. In this case, the grade 'Four' prevailed among the professional master's degree courses.

Among the main results obtained, 177 papers were identified, including 16 theses, 75 academic dissertations and 86 professional master's dissertations in the analyzed historical series, which included all data available in the Lattes Platform, Sucupira Platform and CAPES Open Data. 2004 is confirmed as the year with the first graduate studies defended with the terms 'governance + IT' present in their titles. A tendency of growth of the researches in this subject in dissertations and theses was noticed until the most proficient year verified (2012), with consequent constant decrease until the last evaluated year (2017).

Among 81 programs distributed in 57 different HEIs and 114 advisors, UCB (DF), UFPE (PE) and PUC

(RS) stood out for presenting 174 qualified students. In addition, João Souza Neto (UCB), together with Edimara Mezzomo Luciano (PUC/RS) and Adolfo Alberto Vanti (UNISINOS) are the most proficient teachers in the verified production.

Private non-profit institutions, also in the Southeast Region of Brazil and the state of São Paulo, stood out from the other units explored in their respective research questions.

In addition to the words ‘governance’, ‘IT’, ‘information’ and ‘technology’ that were most commonly found in thesis titles, other useful terms were found such as ‘study’, ‘cases’, ‘public’, ‘practices’, ‘analysis’, ‘management’, ‘institution’, among others. Alternatively, the most common topics in ITG studies are related to government and educational institutions.

As contributions of the research, it is verified that ITG has a scientific capital that is being explored in Brazil. In fact, because it is an interdisciplinary subject, it cannot be studied only from a single point of view, since the phenomena and problems faced are complex. Thus, it is important to consider the possibility of the ITG academic community wanting to dialogue with researchers from other areas, in addition to being willing to receive researchers (and research) from other areas of knowledge promptly.

Some limitations of this study are the restriction of previously defined keywords for data collection for documentary research in secondary data, and the manual extraction of information from the Lattes Platform. Thus, errors stemming from the release of information by the researchers themselves in the tool are not always subject to correction, which ratifies results previously pointed out by Autran et al. (2015). For its mitigation, the data was complemented and checked in another platform, Open Data of CAPES (2018c). On the other hand, the characteristics of the institutionalization of theses and dissertations that have become other types of publications, such as studies in scientific events or articles in scientific journals, or even books or book chapters, have not been analyzed.

As future projects, there is an increase in the number of keywords for the titles of works, as those central concepts pertinent to the definition of ITG, namely: alignment and strategy; value and benefits; scratches; management and optimization of resources; control, performance and compliance; transparency; structure, decision, direction and responsibility; processes and relationships. Other possibilities refer to the analysis of the adequacy of the nature of the study (exploratory, descriptive or confirmatory), methods and instruments used (qualitative or quantitative research, case study, action research, survey), as well as cross-studies theoretical or empirical, or the analysis of the perspectives or epistemological characteristics of the field.

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