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THE IMPACT OF IT GOVERNANCE AND MANAGEMENT ON THE PERFORMANCE OF BRAZILIAN PUBLIC-SECTOR ORGANIZATIONS

Claudia Marcia Vasconcelos e Mello Dias[1] **Jorge Ferreira da Silva**[2] **Augusto Cesar Arenaro e Mello Dias**[3]

[1] *M.Sc. – Business Administration. Pontifícia Universidade Católica do RJ – PUC-Rio. Rio de Janeiro, RJ – Brasil.* claudia_mellodias@yahoo.com.br
[2] *Ph.D – Industrial Engineering. Pontifícia Universidade Católica do RJ – PUC-Rio. Rio de Janeiro, RJ – Brasil.* shopshop@iag.puc-rio.br
[3] *Ph.D. – Business Administration. Pontifícia Universidade Católica do RJ – PUC-Rio. Rio de Janeiro, RJ – Brasil.* augustoarenaro@yahoo.com.br

Abstract
Objective of the study: Evaluate, according to the Resource-based View (RBV) perspective, the impact IT governance and management have on the finalistic performance of Brazilian public-sector organizations in terms of the provision of high-quality processes and products.
Methodology: Application of multivariate analysis techniques and a two-step cluster analysis (hierarchical method and K-means) in the iGov2017 Survey database which includes 482 organizations and is made available by the Federal Court of Accounts (TCU).
Relevance: The research contributes to reducing the lack of academic publications that analyze the integration of the concepts of strategy, value creation, and governance and IT management within the scope of the Brazilian public sector.
Main results: The data showed that 47.7% of the organizations presented incipient levels of IT governance and management. In contrast, 19% of the organizations analyzed presented satisfactory results in terms of performance and IT governance maturity. Evidence indicates that there is a positive correlation between governance quality, IT governance and management, and the finalistic performance of organizations.
Theoretical contributions: Results suggest, in accordance with the RBV perspective, that a multifaceted, harmonic, and complex orchestration that ensures consistent alignment of strategic decision making, IT strategies, risk management, and IT governance and management has a direct effect on the performance of Brazilian organizations.
Management contributions: Learning more about the profile of the organizations in every cluster selected for analysis could be useful for public managers in adopting measures that enhance the quality of public service provision for the benefit of all Brazilian citizens with reasonable risks and costs.

Keywords: IT value. IT governance. Public sector. Business-IT Strategic alignment. Resource-Based View.

IMPACTO DA GOVERNANÇA E GESTÃO DE TI NOS RESULTADOS DAS ORGANIZAÇÕES BRASILEIRAS

Resumo
Objetivo do estudo: Avaliar o impacto da governança e gestão de TI, à luz da Resource-based View (RBV), nos resultados finalísticos das organizações públicas brasileiras, definidos como a prestação de serviços públicos com qualidade.
Metodologia: Aplicação das técnicas multivariadas de análise de fatores e análise de cluster em duas fases (método hierárquico e K-means) na base de dados do Levantamento iGov2017, elaborado pelo Tribunal de Contas da União (TCU) junto a 482 organizações.
Relevância: Esta pesquisa colabora para a redução da carência de publicações acadêmicas que analisem a integração dos conceitos de estratégia, criação de valor e governança e gestão de TI no âmbito do setor público brasileiro.
Principais resultados: A pesquisa revelou que 47,7% das organizações exibem níveis incipientes de governança e gestão de TI. Em contrapartida, 19% delas revelaram níveis satisfatórios de resultados e maturidade de governança de TI. As evidências encontradas apontam uma correlação positiva entre a qualidade da governança e gestão de TI e os resultados finalísticos das organizações.
Contribuições teóricas: Os resultados sugerem, à luz da RBV, que uma orquestração multifacetada, harmônica e complexa, que assegure um alinhamento consistente entre decisões estratégicas, alinhamento estratégico de TI, gestão de riscos, gestão e governança de TI afeta decisivamente o desempenho das organizações brasileiras.
Contribuição para gestão: O conhecimento dos perfis comuns às organizações integrantes de cada grupo da análise poderá ser útil aos gestores públicos na adoção de medidas capazes de aprimorar a qualidade da prestação de serviços públicos ao cidadão brasileiro com riscos e custos aceitáveis.

Palavras-chave: Valor da TI. Governança de TI. Setor público. Alinhamento estratégico de TI. Resource-Based View.

IMPACTO DE LA GOBERNANZA Y GESTIÓN DE TI EN LOS RESULTADOS DE LAS ORGANIZACIONES BRASILEÑAS

Resumen
Objetivo del estudio: evaluar el impacto de la gobernanza y la gestión de TI, a la luz de la Resource-based View (RBV), sobre los resultados finales de las organizaciones públicas brasileñas, definidas como la prestación de servicios públicos de calidad.
Metodología: Aplicación de técnicas multivariadas de análisis factorial y análisis de conglomerados en dos pasos (método jerárquico y K-medias) en la base de datos de la Encuesta iGov2017, elaborada por el Tribunal Federal de Cuentas (TCU) con 482 organizaciones.
Relevancia: Esta investigación colabora para reducir la falta de publicaciones académicas que analicen la integración de los conceptos de estrategia, creación de valor, gobernanza y gestión de TI en el ámbito del sector público brasileño.
Principales resultados: Los datos mostraron que el 47,7% de las organizaciones presentaba niveles incipientes de gobernanza y gestión de TI. En contraste, el 19% de las organizaciones analizadas presentaron resultados satisfactorios en términos de desempeño y madurez de gobernanza de TI. La evidencia indica que existe una correlación positiva entre la calidad de la gobernanza, la gestión de TI y el desempeño finalista de las organizaciones.
Aportes teóricos: Los resultados sugieren, de acuerdo con la perspectiva de RBV, que una orquestación multifacética, armónica y compleja que asegura una alineación consistente entre la toma de decisiones estratégicas, las estrategias de TI, la gestión de riesgos y el gobierno y la gestión de TI tiene un efecto directo en el desempeño de las organizaciones brasileñas.
Contribuciones gerenciales: Conocer los perfiles de las organizaciones en cada clúster seleccionado para el análisis podría ser útil para que los administradores públicos adopten medidas que mejoren la calidad de la prestación de servicios públicos en beneficio de todos los ciudadanos brasileños con riesgos y costos razonables.

Palabras clave: Valor de TI. Gobernanza de TI. Sector público. Alineación estratégica de TI. Resource-Based View.

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1 Introduction

The present study aims to contribute to the assessment, according to the Resource-based View (RBV) (Wernerfelt, 1984), of the role of Information Technology (IT) governance and management on the finalistic performance of all 482 Brazilian organizations listed in the Integrated Governance Survey of Public Organizations,*Levantamento Integrado de Governança Organizacional Pública* in Portuguese, the iGov2017 database updated by the Brazilian Federal Court of Accounts (*Tribunal de Contas da União* in Portuguese, TCU henceforth), with the purpose of implementing modern management practices within the Brazilian Federal Public Administration (*Administração Pública Federal in Portuguese*, APF henceforth).

Traditionally, governments are heavy IT users since IT has become indispensable to ensure effectiveness in the implementation and execution of public policies and in public service provision. In September 2017, the Brazilian Ministry of Transparency, Oversight and Comptroller-General (CGU, henceforth) launched the IT Expenditure Panel (CGU, 2017), an instrument designed to increase transparency when it comes to the allocation of public resources devoted to purchasing IT products and services at the Federal level.

The panel has registered over BRL 35 billion that were committed by Federal agencies and entities since 2014. By August 30, 2018, the panel had registered over BRL 5 billion. Indeed, the figures are impressive; in this context, it is only natural that the public wants to learn more about the efficiency and efficacy of these investments and how they benefit society, since IT expenses are financed by taxpayers. According to Pang, Lee and DeLone (2014), even though IT business value has been largely investigated, this does not seem to be the case of public value. The researchers state that IT managers in public organizations must support, on behalf of the public, the generation of greater public value through IT resources, like the managers in the private sector seek to support the generation of private business value.

Based on the foundations of the Resource-based View (Wernerfelt, 1984), Barney (1991) stated that the performance of a firm is determined by their strategically relevant physical, human, and organizational capital, and by their unique capability of exploiting such resources. As to IT resources, the author mentions that machines and equipment hardly qualify as sources of sustained competitive advantages, since, in general, they can be purchased in the market and, therefore, are not inimitable. However, to Barney (1991), an information processing system that is deeply embedded in a firm's decision-making process might be a potential source of sustained competitive advantage. In this perspective, IT may be considered a valuable strategic resource and an indispensable tool that helps organizations meet internal and external demands, promoting the optimal use of their resources to facilitate the achievement of institutional objectives with quality, safety, and efficiency. Business-IT strategic alignment supports processes and is fundamental to achieving organizational goals.

The present research also represents a contribution for it fills a gap due to the lack of research dedicated to study the integration of the concepts of strategy, value generation, governance, and IT management in the Brazilian public sector. Considering the aforementioned gap in the extant literature, the theoretical foundation chosen for the present paper was based on three pillars: (1) IT Value oriented by the RBV; (2) Business-IT strategic alignment; (3) IT Governance and Management focused on the creation of public value.

Thus, the main purpose of the present study is to answer the following question:

"How does IT Governance and Management impact the finalistic performance[1] *of the Brazilian organizations*[2] *listed on the Brazilian Federal Court of Accounts' (TCU's) 'Integrated Governance Survey of Public Organizations (iGov2017)' database, considering the Resource-based View perspective?"*

The platform used in the research enabled a secondary data collection (iGov2017 Survey) (TCU, 2018a). The processing of the quantitative data collected consisted in a multivariate analysis, a cluster analysis, and significant difference tests MANOVA and one-way ANOVA classification using the SPSS software. Results indicate that 47.7% of the organizations analyzed presented incipient levels of IT governance and management, which impacts the quality of public service provision. In contrast, 19% of the organizations analyzed presented satisfactory results in terms of performance and IT governance maturity. Evidence indicates that there is a positive correlation between governance quality, IT management, and the finalistic performance of organizations.

Learning about the characteristics and profile of the organizations in every cluster selected for analysis could be useful for public managers as they work on the identification and assessment of critical processes. Informed managers focused on the adoption of measures that enhance public service provision for the benefit of all Brazilian citizens are able to take rational risks and pay reasonable costs.

Regarding its presentation, the article has been divided into four sections in addition to this introduction, namely: 2. Theoretical Foundation; 3. Data and Methods; 4. Analysis and Interpretation of Results; 5. Conclusions; 6. References.

2 Theoretical foundation

2.1 IT Value considering the Resource-Based View (RBV)

In accordance with the Resource-based View (RBV), Barney (1991) states that organizational resources can represent a source of sustained competitive advantage if they are valuable, rare, imperfectly imitable, and non-substitutable. The author has also pointed out four attributes that may

[1] Finalistic Performance corresponds to public service provision with quality and efficiency, especially the provision of digital and technology-related services.
[2] The Brazilian Federal Public Administration (APF) consists of organizations or agencies that receive Federal funding.

be costly for competitors to imitate: (a) unique historical circumstances; (b) causal ambiguity; (c) social complexity; and (d) patenting.

A study by Mata, Fuerst and Barney (1995) found that there is little doubt that IT can add value to a firm. The authors suggest that only managerial IT skills are likely to become a source of sustained competitive advantage, once these skills are, in general, heterogeneously distributed across firms, reflect the unique histories of each firm, become part of the "taken for granted" routines of the organization, and may be based on socially complex relations within the IT area. The article points out that a resource-based view of firms proposes that, when searching for IT-related sources of sustained competitive advantages, firms should focus much less on IT per se, and more on IT organization and management within the firms (Mata et al., 1995).

The line of reasoning exposed by the authors associates IT value with a broader and more complex system than the established hardware and software technological environment. This perspective is consonant with the conclusions of Brynjolfsson (1993), who addresses the IT productivity paradox. The paradox refers to the fact that high IT investment levels are overtly connected to high return expectations which, in many cases, are not met due to a difficulty to accurately measure IT investment returns through conventional measurement techniques that assess productivity, as these techniques usually fail to capture IT's real impact.

Ray, Muhanna and Barney (2005) studied IT effects on the quality of the services rendered to clients at the process level. Their empirical findings are consistent with the RBV theory and suggest that the skills built and shared from IT tacit attributes are path-dependent, socially complex, and explain performance variations of processes, while IT explicit resources (e.g., IT technical skills, general information technologies, and IT spending) are not significant. Ray et al. (2005) defend that merely introducing new technologies to a process will not necessarily improve it, and it could actually make processes less efficient. This observation is in accordance with the consensus that the context to which IT is applied is just as important as IT itself.

IT has been considered as an imperfectly imitable valuable asset (Liang, You & Liu, 2010) as well as a complementary resource that adds value to other resources and supports organizational capabilities (S. Bharadwaj, A. Bharadwaj & Bendoly, 2007). The authors argue that the value of an organizational resource can increase in the presence of other complementary resources and it is difficult to compete against or emulate the results that stem from this combination.

Examining the studies cited in this section, it is possible to infer that IT is a complex ecosystem, composed by interdependent parts (e.g., equipment, systems, people, processes, capabilities, competences, partnerships, etc.) and, therefore, it can be a source of sustained competitive advantages, considering the RBV perspective, if the firms successfully coordinate and combine complementary resources.

2.2 Business-IT strategic alignment

There is a consensus that IT and information systems have evolved from their traditional Backoffice administrative support orientation towards a more strategic position, having more space within organizations (Venkatraman, Henderson, & Oldach, 1993). Simultaneously, a controversy has emerged regarding the benefits IT provides if marginal gains in productivity are compared to the significant IT investments. Henderson and Venkatraman (1993) believe that the firms' inability to obtain significant returns to their IT investments is, in part, due to the lack of coordination and alignment between business and IT strategies.

According to Venkatraman et al. (1993), the potential impact IT has on organizations is so varied and complex that managers should seek to institutionalize continuous evaluation procedures and processes through which it is possible to identify the alignment mechanisms that will work best to generate sustained competitive advantages.

Kearns and Lederer (2003) studied information-intensive firms and realized that these organizations depend, to a greater degree, on the sharing of business and IT knowledge than other firms in different areas. The Chief Information Officers (CIOs) at information-intensive firms must increase their efforts to establish and improve Business-IT alignment mechanisms, participate in business planning, and develop solid relationships with other C-level executives.

Yayla and Hu (2012) highlight the statistically significant positive effects of Business-IT strategic alignment on organizational performance in highly uncertain environments, especially in developing countries. Their findings suggest that executives and IT managers in developing countries should devote their energy towards Business-IT strategic alignment, thus reducing the impact of budget and resources constraints to a minimum.

In Wu, Straub and Liang (2015) the authors introduce the idea that structures, processes, and communication are mechanisms that constitute IT governance and create the required conditions for the establishing of an institutional context that favors knowledge sharing between IT managers and C-level executives.

As organizations digitalize their businesses and need to innovate to capitalize future opportunities, the processes related to their core businesses are becoming more IT-dependent (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). In this context, the bivariate-fit perspective proposed by Venkatraman et al. (1993) becomes a key-mechanism that facilitates the generation of IT value (Coltman, Tallon, Sharma & Queiroz, 2015).

Hansen, Kraemmergaard and Mathiassen (2011) defend that IT leadership practices have been elaborated over time, result from the organization's history, and often may negatively affect collaboration and the relationship between IT and Business leaders. According to these authors, digital transformations require "conversations that matter". In other words, it is necessary to discuss topics such as innovation in order to adapt to new demands and opportunities. In practice, it is possible to

observe that IT managers and Business executives are often unaware of their own assumptions and find it difficult, or even controversial, to address them. The authors propose the application of a Participatory Process Model (PPM) to bring IT managers and Business executives closer together, disseminate knowledge in their environment, improve communication fluidity and, consequently, promote positive impact on the firm's performance.

Argenti (2017) states that cultivating consistent and constant bidirectional dialogue is probably the most critical factor in the construction of a strong culture that is aligned with the organization.

2.3 IT governance and management: public value creation

According to Caudle Gorr and Newcomer (1991), the public sector presents several peculiarities that differ it from the private sector such as its multiple, conflicting, and often unattainable objectives. In addition, according to the authors, the public sector is constantly influenced by Politics and bureaucracy. Its products are characterized as "public goods".

Perry and Rainey (1988) listed the main differences that distinguish state owned organizations from private owned organizations:

a) environmental variables: less exposition to the market, less productivity incentive; legal and formal restrictions; stronger influence of Politics.
b) organizational transactions: more compulsory actions; contemplation of "public interest" actions; higher level of scrutiny regarding the performance of civil servants so they will have better work ethics.
c) structure and internal processes: complex criteria; less decision-making autonomy; less authority over subordinates; less fulfilment at work.

Caudle et al. (1991) pointed out two of the main 15 problems in the public sector: budget requests for information systems and technology transfers. Information systems budget requests consider the long term so as to overcome political pressures. Technology transfers are an issue that derived from the public nature of public goods. Splitting the cost of system development and production, financing these costs through consortia and technology transfers between organs are a clear contrast with the current private sector scenario, characterized by the search for competitive advantages.

As stated by Bannister (2001), the slow rhythm of organizational changes promoted by IT in public administration is due to the conservative and bureaucratic nature of the public sector. However, social pressure to obtain better cost-benefit relationships in IT in the public sector is getting stronger. Pang's (2017) study featured American Federal agencies and showed that while some of them invest in advanced digital technologies, others still struggle with the maintenance of legacy systems, called

"silos" by Bannister (2001), which suffocate flexibility and innovation. Pang (2017) concludes that to increase IT investment levels it is necessary to guarantee the Congress' political legitimacy. The researcher believes that the results of his study also apply to the Brazilian case.

Current trends indicate that dependence on IT will become more intense over time in the public sector, even though IT has already changed service provision and management of goods in the sector (Dawson, Denford & Desouza, 2016). Technological advancements lead to transformations in open governance and transparency initiatives in the public sector such as e-government (electronic government) and the increased interest on m-government (use of applications and mobile technology aimed to mediate the relationship between individuals and the government).

In Brazil, it is possible to list the following digital initiatives by the Federal Government:

- Institution of a Digital Governance Policy, formalized by Decreet n. 8.638 (2016).
- Institution of the Digital Citizenship Platform formalized by Decreet n. 8.936 (2016). The objective of this initiative was to expand and simplify the access to digital public services with the inauguration of the 'Portal of the Federal Government Services' (servicos.gov.br).
- Approval of the Digital Governance Strategy (EGD), intended to be in force between 2016 and 2019. The approval was formalized by Bill MPOG n. 68 (2016).
- Elaboration of Bill 13.460 (2017), which established that public service provision must be effective and assessed in terms of the experience of final users and the quality of the services rendered. In its seventh article, the Bill determines the organization, elaboration, and distribution of the Citizen Services Letter[3], which provides information related to the services rendered and expresses commitment to maintain high quality levels.

According to Pang, Lee and DeLone (2014), IT managers in public organizations must guarantee Business-IT alignment in terms of investment and resources, in order to generate greater public value. For this reason, IT governance plays a fundamental role in the public sector regarding the achievement of institutional objectives.

In this sense, it is important to mention that there is a clear distinction between governance and management (Figure 1): (ISACA, 2012; TCU, 2014; Weill & Ross, 2004)

[3] The Citizen Services Letter is a document that was elaborated by a public institution. The document aims to inform citizens about the services they have access to, explains how to access and obtain these services, and indicates if there is commitment in the provision of public services in terms of maintenance of high quality. The letter also informs which were the plans made regarding the logistics of service provision. (http://www.gespublica.gov.br/carta-de-servicos)

Figure 1 – Relationship between governance and management

Source: Basic References on Governance, 2nd version (TCU, 2014).

(a) Governance evaluates the necessities of the interested parties so as to determine organizational objectives; guides actions through prioritization; oversees management considering the conduction of public policies and the provision of services of interest to society.

(b) Management is responsible for planning, developing, executing, and monitoring activities in accordance with the guidelines defined by the governance organ to achieve organizational objectives.

In order to implement IT governance in an effective manner, a set of mechanisms is needed to stimulate congruence with organizational missions, strategies, values, and organizational culture (Wu et al., 2015) which, in turn, will promote desirable IT behavior and better results (Weill & Ross, 2004).

Tonelli, De Souza Bermejo, Aparecida Dos Santos, Zuppo and Zambalde (2017) provide the fundamentals of the conception of IT governance in the Brazilian public sector based on the establishment of synergies between IT teams and other teams. The study by J. Klier, M. Klier and Muschter (2017) has shown that adequate IT governance is essential in a context of intensive use of communication with multiple stakeholders, which is the case of IT infrastructure projects in the public sector. The study points out that governments all over the world are exploring IT resources to improve efficacy and efficiency in the public sector to stimulate public value creation, allowing citizens to take part in democratic processes and exercise their rights.

3 Data and methods

The data collected were secondary, since the study was conducted based on the data originally provided by the TCU in the elaboration of the iGov2017 platform. The data were made available on

the Internet on April 24, 2018 (TCU, 2018a). The data were processed through the conduction of a quantitative analysis.

The universe of the present study originally included 581 Brazilian public organizations. The responsible team in the TCU removed 57 organizations that had had at least one aspect considered as inapplicable, reducing the number of organizations to 524. This number dropped to 482, which is the number of organizations that have actually had their data published on the TCU's website (TCU, 2018a). The data were made available on a Detailed Technical Report, a document that displayed the data with no identification of the 482 organizations (TCU, 2018b). The number 482 was the one considered in this study, and the organizations were sorted by areas of practice (Table 1) and by type (Table 2).

Table 1 – Quantity of organizations sorted by practice area

Segment	Quantity
EXE-Dest (Federal Government Entities linked to SEST – Secretariat for the Coordination and Governance of State-owned enterprises)	112
EXE-Mil (Federal Government Entities, Military)	12
EXE-Sipec (Federal Government Entities linked to the Personnel Civil System of Federal Public Administration	243
FEJ (Entities that conduct essential activities with the Judiciary)	8
Funds in the Union's General Budget	9
GDF (Government of the Federal District)	3
JUD (Organizations that work with the Judicial Branch)	91
LEG (Organizations that work with the Legislative Branch)	2
The third sector (Organizations that do not belong in any of the segments listed above)	44
Total	**524**

Source: Detailed Technical Report (TCU, 2018b).

Table 2 – Quantity of organizations sorted by type

Type	Quantity
Autarchies	37
Banks	12
Legislative Chamber	1
Professional Councils	28
State/District initiatives	3
Federal initiatives	97
Functions essential to the Judiciary	7
Foundations	15
Funds	9
Educational Institutions	113
Military agencies	12
Ministries	21
Executive Organs (Direct Administration)	23
Para-State initiatives	16
Courts	92
Health Units	38
Total	**524**

Source: Detailed Technical Report (TCU, 2018b).

Regarding spatial delimitation, the study has analyzed the data corresponding to the "2100 – Strategy", "4200 – IT Management" and "5100 – Finalistic Performance" dimensions in the iGov2017 platform.

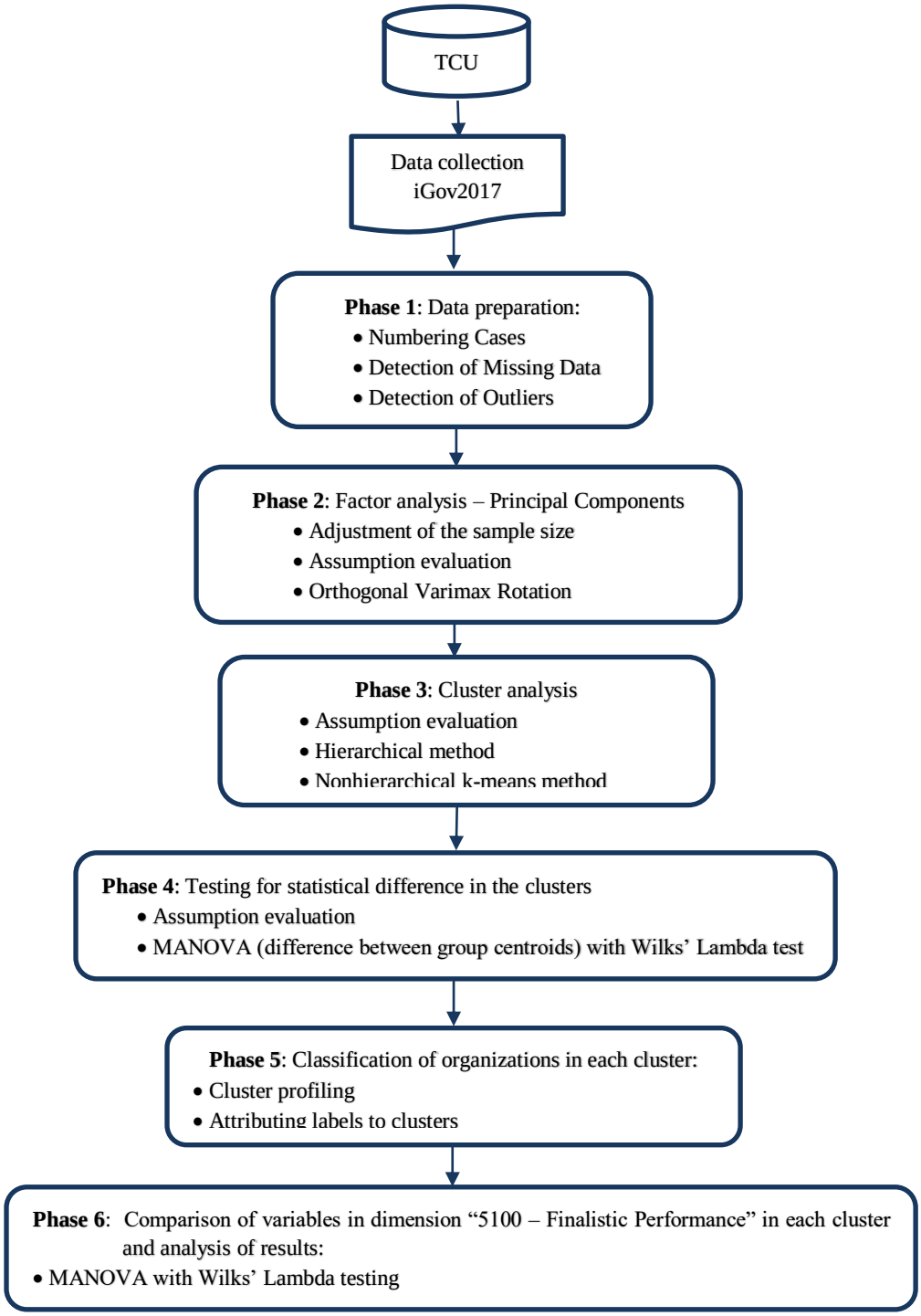
Regarding time delimitation, the iGov2017 database considered the year of 2017 and the data that was made available by the TCU included the same year, from July 10, 2017 to September 15, 2017. The unit of analysis of the present study is the organization.

The analysis was carried out in six steps. The data collection phase was conducted by the TCU since, as mentioned, the processed data are secondary. The chosen methodological approach is similar to that in the study by Carneiro, Da Silva and Da Rocha (2011). The process is demonstrated in a methodology flow chart (Figure 2).

- **Phase 1: Preparation:** Investigation of the characteristics of the sample such as number of cases, detection of outliers and missing data, application of normality tests for the variables in all three dimensions analyzed (Table 3). In large samples (>200 cases), violations of the normality assumption do not have significant impact (Hair, Anderson, Tatham & William, 2010).
- **Phase 2: Reduction of strategic space:** Application of the "Principal Component Factor Analysis with Varimax Rotation" in the original set of variables in each dimension, substituted by new variables created using summated scales. The reduction was applied to dimensions "2100 – Strategy" (questions 2111 to 2138), "4200 – Information Technology Management" (questions 4211 to 4281) and "5100 – Finalistic Performances" (questions 5111 to 5124), considering the focus of the present research, that aims to identify the impact of IT governance and management on the finalistic performance of Brazilian organizations in the public sector.
- **Phase 3: Group formation:** Classification and grouping of all 482 organizations in the sample in strategic spaces. The identification of groups in relation to determined strategic variables (factors related to dimensions "2100 – Strategy" and "4200 – IT Management"). At first, hierarchical clustering was performed to define the appropriate cluster number, and then nonhierarchical clustering (through the k-means method) was performed to allocate cases in clusters.
- **Phase 4: Comparison of governance and IT management levels in the groups:** Testing the existence of statistical differences between group centroids applying the MANOVA method (Wilks' Lambda test).
- **Phase 5: Group classification:** Classification of the organizations according to the groups formed, considering IT governance and management levels. Then, clusters were profiled and labeled according to the degree of importance of their main attributes.

- **Phase 6: Comparison of finalistic performances of each group:** Testing the existence of statistical differences between the means of the variables of the "5100 – Finalistic Performance" dimension, obtained by the organizations in each group, and, if significant differences were detected, the variables that have influenced the results the most were identified through MANOVA and one-way ANOVA, using a post hoc test (Tamhane's T2 comparison test (α = 5%)).

Figure 2 – Methodology flow



Source: The authors, 2021.

Table 3 – Original set of variables

Dimension	Subdimension	Original Variables	Variable Description
2100 – Strategy	2110 – Management of organizational risks	@2111	"The organization's risk management model is well established."
		@2112	"The risks considered critical by the organization are managed."
	2120 – Establishing of organizational strategies	@2121	"The organization's strategic management model is established."
		@2122	"The organization's strategy is well defined."
		@2123	"The main processes have been identified and mapped."
		@2124	"The demands of the interested parties are identified, mapped and prioritized."
	2130 – Promotion of Strategic Management	@2131	"C-level administration has established a finalistic procedure management model."
		@2132	"C-level administration monitors the performance of finalistic process management."
		@2133	"C-level administration has established a people management model."
		@2134	"C-level administration monitors the performance of people management."
		@2135	"C-level administration has established an IT management model."
		@2136	"C-level administration monitors the performance of IT management."
		@2137	"C-level administration has established a recruitment management model."
		@2138	"C-level administration monitors the performance of the recruitment model."
4200 – IT Management	4210 – Conduction of IT Planning	@4211	"The organization executes IT planning processes."
		@4212	"The organization has an IT plan in force."
	4220 – Managing IT services	@4221	"The organization executes a service catalog management process."
		@4222	"The organization executes change management."
		@4223	"The organization executes an IT service asset and configuration management."
		@4224	"The organization executes an incident management process."
	4230 –IT service level management	@4231	"The IT management area formally agrees with the service levels of other internal business areas (Service Level Agreement – SLA)."
		@4232	"The SLA includes the degree of customer satisfaction as an indicator of service levels."
		@4233	"The IT management area informs other business areas about results found by monitoring the service levels defined together with these areas."
	4240 – IT risk management	@4241	"The organization manages IT risks of the business processes."
		@4242	"The organization executes an IT service continuity management process."
	4250 – Definition of responsible	@4251	"The organization has an information security policy"

	information security management policies	@4252	"The organization has an information security committee."
		@4253	"The organization has an information security manager."
		@4254	"The organization has a policy aimed at controlling the access to information and IT resources and services."
	4260 – Establishing of processes and activities for information security management	@4261	"The organization executes an asset management process associated with information and information processing."
		@4262	"The organization executes processes to classify and process information."
		@4263	"The organization executes an incident management process related to information security."
		@4264	"The organization promotes information security events to raise awareness, educate and train employees."
	4270 – Execution of software processes	@4271	"The organization executes a software process."
	4280 – Management of IT projects	@4281	"The organization executes an IT project management process."
5100 – Finalistic Performance	5110 – Provision of quality public services	@5111	"The organization elaborates, distributes, and updates a Citizen Services Letter (or similar documents that have not been provided by the Federal Government)."
	5120 – Provision of quality digital public services	@5121	"The organization ensures that the services available via the Internet meet the interoperability, usability and accessibility standards applicable to its operation."
		@5122	"The organization conducts customer satisfaction surveys regarding public services provided digitally, enabling the assessment of these services."
		@5123	"The organization has defined goals for the expansion of public digital service provision."
		@5124	"The organization ensures that new services are designed to be provided digitally."

Source: The authors, 2021.

4 Analysis and interpretation of results

4.1 Reduction of strategic space

The three sets of variables of each dimension ("2100 – Strategy", "4200 – IT Management" and "5100 – Finalistic Performance") were separately subject to the Factor Analysis – Principal Components method with Varimax Rotation, to obtain orthogonal factors. The Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity presented adequate indexes, as did the relationship between the cases (482) and the total number of variables (40). The criteria adopted were eigenvalue greater than or equal to 1, and factor loading greater than 0.7 (explained variance of 49%).

Regarding the "2100 – Strategy" dimension, four factors have been extracted that together explain approximately 65.6% of the variation (Figures 3 and 4): F1 – Finalistic Process Management; F2 – People and Recruitment Management; F3 – IT Management; and F4 – Risk Management.

Figure 3 – Strategy dimension – factor matrix after varimax rotation

Rotated Component Matrix

	Component				Variable Description
	1	2	3	4	
@2131	.818				"C-level administration has established a finalistic procedure management model."
@2132	.729				"C-level administration monitors the performance of finalistic process management."
@2123					
@2124					
@2137		.739			"C-level administration has established a recruitment management model."
@2138		.719			"C-level administration monitors the performance of the recruitment management model."
@2134		.709			"C-level administration monitors the performance of people management."
@2133					
@2135			.801		"C-level administration has established an IT management model."
@2136			.736		"C-level administration monitors the performance of IT management."
@2122					
@2121					
@2111				.844	"The organization's risk management model is well established"
@2112				.800	"The risks considered critical by the organization are managed"

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Source: The authors, 2021.

Figure 4 – Strategy dimension – resultant factors

Factor	Name of the Factor	Substitution Variable (*Summated Scales*)	Original Variables	Original Variable Description
1	F1 – Finalistic Process Management	Strategy_F1_FinalisticProcManagement = (@2131+@2132)/2	@2131	"C-level administration has established a finalistic procedure management model."
			@2132	"C-level administration monitors the performance of finalistic process management."
2	F2 – People and Recruitment Management	Strategy_F2_PeopleRecruitManagement = (@2137+@2138+@2134)/3	@2137	"C-level administration has established a recruitment management model."
			@2138	"C-level administration monitors the performance of recruitment management."
			@2134	"C-level administration monitors the performance of people management."
3	F3 – IT Management	Strategy_F3_ITManagement = (@2135+@2136)/2	@2135	"C-level administration has established an IT management model."
			@2136	"C-level administration monitors the performance of IT management."
4	F4 – Risk Management	Strategy_F4_RiskManagement = (@2111+@2112)/2	@2111	"The organization's risk management model is well established"
			@2112	"The risks considered critical by the organization are managed"

Source: The authors, 2021.

As to the "4200 – IT Management" dimension, five factors were initially extracted that, together, explain approximately 60.3% of the variation: F1 – not represented; F2 – Information Security Management; F3 – IT Service Level Management; F4 – Information Security Management Responsibility Policies; and F5 – IT Planning. However, Factor 1 has not presented any variable with loading higher than 0.7 and, therefore, it has not been represented (Figures 5 and 6).

Figure 5 – IT Management Dimension – Factor Matrix after Varimax Rotation

Rotated Component Matrix[a]

	Component					Variable Description
	1	2	3	4	5	
@4224						
@4281						
@4222						
@4223						
@4271						
@4221						
@4263						
@4264						
@4261		.717				"The organization executes an asset management process associated with information and information processing."
@4262						
@4242						
@4254						
@4241						
@4231			.833			"The IT management area formally agrees with the service levels of other internal business areas (Service Level Agreement – SLA)."
@4232			.820			"The SLA includes the degree of customer satisfaction as an indicator of service levels."
@4233			.744			"The IT management area informs other business areas about results found by monitoring the service levels defined together with these areas."
@4252				.787		"The organization has an information security committee."
@4251				.705		"The organization has an information security policy"
@4253						
@4211					.836	"The organization executes IT planning processes"
@4212					.830	"The organization has an IT plan in force."

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Source: The authors, 2021.

Figure 6 – IT management dimension – resultant factors

Factor	Name of the Factor	Substitution Variable *(Summated Scales)*	Original Variables	Original Variable Description
1	F1	Not represented		
2	F2 – Information Security Management	ITManagement_F2_InformSecManagement = @4261	@4261	"The organization executes an asset management process associated with information and information processing."
3	F3 – IT Service Level Management	ITManagement_F3_ITServLevelManagement = (@4231+@4232+@4233)/3	@4231	"The IT management area formally agrees with the service levels of other internal business areas (Service Level Agreement – SLA)."
			@4232	"The SLA includes the degree of customer satisfaction as an indicator of service levels."
			@4233	"The IT management area informs other business areas about results found by monitoring the service levels defined together with these areas."
4	F4 – Information Security Management Responsibility Policies	ITManagement_F4_ InformSecManagementResponsPolicies = (@4252+@4251)/2	@4252	"The organization has an information security committee."
			@4251	"The organization has an information security policy"
5	F5 – IT Planning	ITManagement_F5_ITPlan = (@4211+@4212)/2	@4211	"The organization executes IT planning processes"
			@4212	"The organization has an IT plan in force."

Source: The authors, 2021.

About the "5100 – Finalistic Performance" dimension, two factors have been extracted that together explain approximately 60% of the variation (Figures 7 and 8): F1 – Provision of quality digital public services; and F2 – Public Service Provision.

Figure 7 – Finalistic performance dimension – factor matrix after varimax rotation

	Component		Variable Description
	1	2	
@5123	.825		"The organization has defined goals for the expansion of public digital service provision."
@5124	.821		"The organization ensures that new services are designed to be provided digitally."
@5121			
@5111		.864	"The organization elaborates, distributes, and updates a Citizen Services Letter (or similar documents that have not been provided by the Federal Government)."
@5122			

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Source: The authors, 2021.

Figure 8 – Finalistic performance dimension –resultant factors

Factor	Name of the Fator	Substitution Variable (*Summated Scales*)	Original Variables	Original Variable Description
1	F1 – Provision of quality digital public services	FinalisticResults_F1SumScal_PubServProvisionDigitalMeans = (@5123 + @5124)/2	@5123	"The organization has defined goals for the expansion of public digital service provision."
			@5124	"The organization ensures that new services are designed to be provided digitally."
2	F2 – Public Service Provision	FinalisticResults_F2SumScal_PubServProvision = @5111	@5111	"The organization elaborates, distributes, and updates a Citizen Services Letter (or similar documents that have not been provided by the Federal Government)."

Source: The authors, 2021.

4.2 Group formation

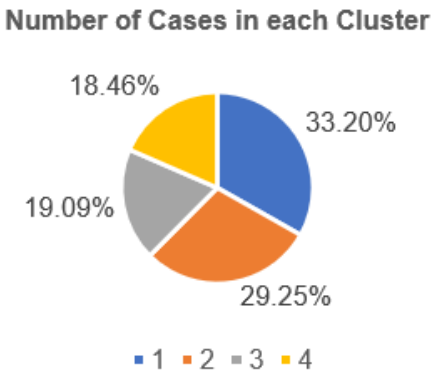
The study adopted hierarchical clustering as a method for the analysis to define the appropriate number of clusters. In view of that, agglomerative clustering was performed with the algorithm Average Linkage. Then, the cases were attributed to clusters by using the nonhierarchical k-means method. The most significant percentage increase in the agglomeration index was observed in the transition from five to four clusters (13.63%), suggesting that the appropriate number of clusters was four. The MANOVA method confirmed that the four groups analyzed were statistically different among themselves (Wilks' Lambda = 0.068; p = 0.000).

Figures 9 and 10 present the results of the case distribution (organizations).

Figure 9 – Distribution of organizations in the clusters

Number of Cases in each Cluster

Cluster			
	1	160	33.20%
	2	141	29.25%
	3	92	19.09%
	4	89	18.46%
Valid		482	100%
Missing		0	



Source: The authors, 2021.

Figure 10 – Centroid matrix

	Cluster			
	1	2	3	4
Strategy_F1_FinalisticProcManagement	.36023	.12183	.81521	.75114
Strategy_F2_PeopleRecruitManagement	.31060	.18198	.64095	.44192
Strategy_F3_ITManagement	.57182	.15691	.76811	.31655
Strategy_F4_RiskManagement	.15716	.10417	.52977	.22007
ITManagement_F2_InformSecManagement	.24980	.13511	.61978	.20678
ITManagement_F3_ITServLevelManagement	.19073	.12317	.60308	.09195
ITManagement_F4_ InformSecManagementResponsPolicies	.78208	.25671	.74885	.22786
ITManagement_F5_ITPlan	.85124	.30328	.81877	.51218

Source: The authors, 2021.

It is possible to notice that Group 3 is the one with the highest centroid values for each factor. In contrast, Group 2 is the one with the lowest centroids for each factor (Figure 10). It is also possible to state, by observing Figure 11, that Groups 2 and 3 were the ones furthest apart from their centroids (distance = 1.490), which indicates that these two Groups have the most different strategic combinations among themselves. On the other hand, Groups 2 and 4 presented the closest strategic combinations of all Groups (distance = 0.744).

Figure 11 – Distance between Centroids

Cluster	1	2	3	4
1		.918	.896	.820
2	.918		1.490	.744
3	.896	1.490		1.068
4	.820	.744	1.068	

Source: The authors, 2021.

After that, labels were distributed to the clusters based on the observation of the final centroids (Figure 9) and on the evaluation of the relative distances between them (Figure 11). The scale created to label the groups resembles the scale used with the winners of Olympic Games (except for the

insertion of a fourth position). The categories are listed in a descending order: Gold, Silver, Bronze, and Lead. Therefore:

- 1st place – Group 3: Gold category.
- 2nd place – Group 1: Silver category.
- 3rd place – Group 4: Bronze category.
- 4th place – Group 2: Lead category.

4.3 Performance comparison

In this study, the factors extracted from the "5100 – Finalistic Performance" dimension were used as performance measures, since this dimension intends to reflect the results achieved by organizations (public service provision with quality and efficiency, especially if provided via digital media). The MANOVA methods confirmed the existence of statistical difference between the means of the performance variables observed for at least two Groups (Wilks' Lambda = 0.875; p = 0.000).

The one-way ANOVA method also shows that at least two clusters are statistically different from one another. Then, a post hoc test (Tamhane's T2) was performed. This conservative test permits the comparison of unequal variances and makes multiple comparisons between pairs in order to test the existence of significant statistical differences between the results of other Group pairs (α = 5%), as it is shown in bold on Figure 12.

Figure 12 – Post Hoc Test (Tamhane's T2)

Multiple Comparisons (*Post Hoc Test* Tamhane)

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	Interval Lower Bound	Interval Upper Bound
FinalisticResults_F1SumScal_PubServProvisionDigitalMeans	1	2	**.2253768***	.03439745	.000	.1342322	.3165213
		3	-.0324728	.04627323	.981	-.1555028	.0905571
		4	.0476475	.04649387	.889	-.0760149	.1713099
	2	1	**-.2253768***	.03439745	.000	-.3165213	-.1342322
		3	**-.2578496***	.04197408	.000	-.3698180	-.1458812
		4	**-.1777293***	.04221719	.000	-.2904051	-.0650535
	3	1	0.0324728	.04627323	.981	-.0905571	.1555028
		2	**.2578496***	.04197408	.000	.1458812	.3698180
		4	.0801203	.05234804	.559	-.0591502	.2193908
	4	1	-.0476475	.04649387	.889	-.1713099	.0760149
		2	**.1777293***	.04221719	.000	.0650535	.2904051
		3	-.0801203	.05234804	.559	-.2193908	.0591502
FinalisticResults_F2SumScal_PubServProvision	1	2	**.1990913***	.05128128	.001	.0632378	.3349449
		3	-.0172554	.05284492	1.000	-.1576417	.1231308
		4	.0756671	.05683336	.706	-.0755077	.2268420
	2	1	**-.1990913***	.05128128	.001	-.3349449	-.0632378
		3	**-.2163467***	.05579360	.001	-.3645044	-.0681891
		4	-.1234242	.05958499	.215	-.2817982	.0349498
	3	1	.0172554	.05284492	1.000	-.1231308	.1576417
		2	**.2163467***	.05579360	.001	.0681891	.3645044
		4	.0929226	.06093593	.564	-.0692275	.2550727
	4	1	-.0756671	.05683336	.706	-.2268420	.0755077
		2	.1234242	.05958499	.215	-.0349498	.2817982
		3	-.0929226	.06093593	.564	-.2550727	.0692275

Based on observed means.
The error term is Mean Square(Error) = ,185.

Source: The authors, 2021.

Regarding the "FinalisticResults_F1SumScal_PubServProvisionDigitalMeans" factor, the differences detected were only significant between Group 2 and the remaining Groups (α = 5%). As to the "FinalisticResults_F2SumScal_PubServProvision" factor, Group 2 presented significant differences only when compared to Groups 1 and 3, and no significant difference was observed between Group 4 and the remaining Groups (α = 5%).

The differences detected between Groups regarding the "FinalisticResults_F1SumScal_PubServProvisionDigitalMeans" factor are more relevant than the ones observed for the "FinalisticResults_F2SumScal_PubServProvision" factor, except for Groups 3 and 4 (Figure 12).

4.4 Discussion of results

The analysis suggested four different Groups based on eight factors (Figure 10). The content of Figure 13 allows the identification of the weaknesses and strengths of each Group.

Figure 13 – Order of importance of the factors –scale: 1 (highest) / 8 (lowest)

	Cluster			
	1	2	3	4
Strategy_F1_FinalisticProcManagement	4	7	2	1
Strategy_F2_PeopleRecruitManagement	5	3	5	3
Strategy_F3_ITManagement	3	4	3	4
Strategy_F4_RiskManagement	8	8	8	6
ITManagement_F2_InformSecManagement	6	5	6	7
ITManagement_F3_ITServLevelManagement	7	6	7	8
ITManagement_F4_ InformSecManagementResponsPolicies	2	2	4	5
ITManagement_F5_ITPlan	1	1	1	2

Source: The authors, 2021.

A characteristic that is common to all four Groups is giving emphasis to IT planning. On the other hand, risk management, service level management, and information security management presented the worst results, in that order. Concerning Group 4, the factor with the lowest final centroid value was "ITManagement_F3_ITServLevelManagement".

It is also possible to notice more emphasis on the "Strategy_F1_FinalisticProcManagement" given by Groups 3 and 4, comparing to the remaining Groups.

The observation of the quartile matrix allows an overview of all four Groups (Figure 14). The quartile matrix also reveals a peculiarity in Groups 2 and 4, which ranked last in the overall rank: factors "Strategy_F3_ITManagement", "ITManagement_F4_ InformSecManagementResponsPolicies", and "ITManagement_F5_ITPlan" were in the second quartile, Q2.

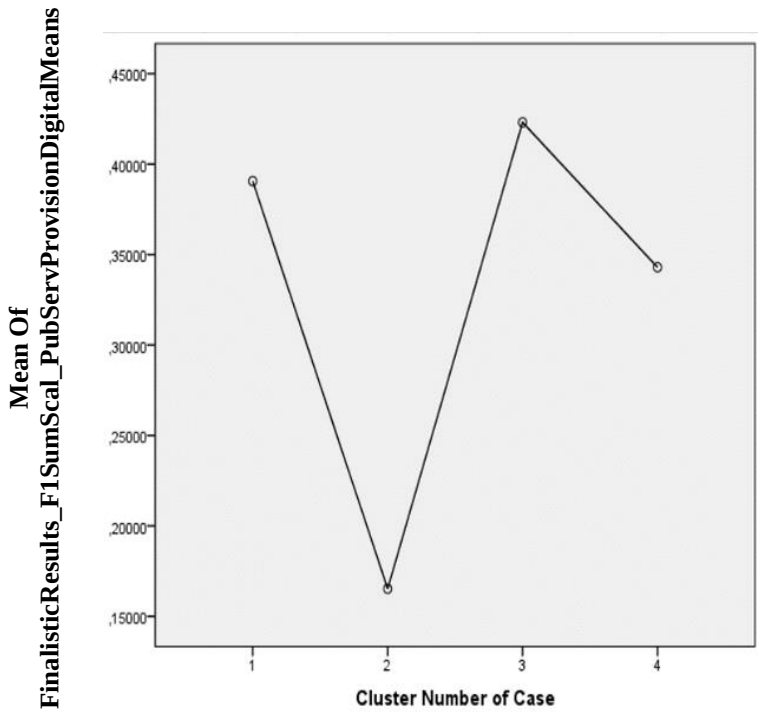
The analysis of the performance graphs (Figures 15 and 16) allows the realization that the relative performance of the Groups was virtually unchanged in relation to these two performance variables, since the trajectory of both graphs is remarkably similar.

Figure 14 – Quartile matrix

	Cluster			
	1 Prata	2 Chumbo	3 Ouro	4 Bronze
Strategy_F1_FinalisticProcManagement	Q2	Q2	Q4	Q3
Strategy_F2_PeopleRecruitManagement	Q3	Q2	Q4	Q3
Strategy_F3_ITManagement	Q3	Q2	Q4	Q2
Strategy_F4_RiskManagement	Q3	Q2	Q4	Q3
ITManagement_F2_InformSecManagement	Q3	Q2	Q4	Q3
ITManagement_F3_ITServLevelManagement	Q3	Q3	Q4	Q3
ITManagement_F4_ InformSecManagementResponsPolicies	Q3	Q2	Q3	Q2
ITManagement_F5_ITPlan	Q3	Q2	Q3	Q2

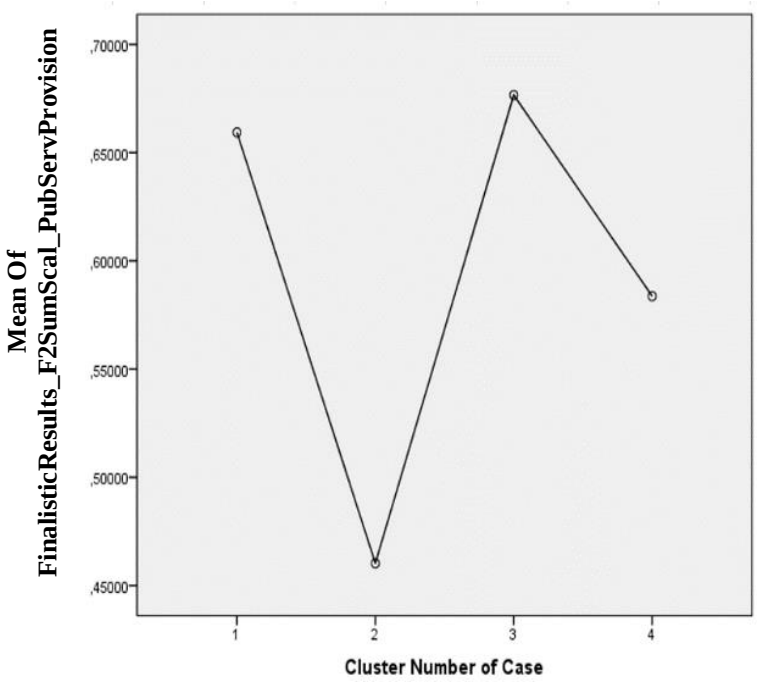
Source: The authors, 2021.

Figure 15 – Performance graph: public service provision by digital Means x Cluster number



Source: The authors, 2021.

Figure 16 – Performance graph: Public service provision x Cluster number



Source: The authors, 2021.

Hence, Group 3 presented the best performance, and Group 2 the worst. Between extremes, even though the statistical differences found have not been incredibly significant (α = 5%), the graphs indicate that Group 1 has ranked second, followed by Group 4 on the third position.

4.4.1. Group 3 – Gold Category – 1st place

Group 3, the second less numerous (92 organizations – 19.09%), presents satisfactory results in all factors of the "2100 – Strategy" and "4200 – IT management" dimensions, which makes the Group take the first place on the overall Group rank. In four of the eight factors, Group 3 presented values over 0.75 (α = 5%) and, in six factors, the values are in the upper quartile, Q4. (Figure 14)

Group 3 strengths are related to the "ITManagement_F5_ITPlan", "Strategy_F1_FinalisticProcManagement", "Strategy_F3_ITManagement", and "ITManagement_F4_InformSecManagementResponsPolicies" variables in that order, and the values observed for the first two variables were around 0.81 (Figure 10).

The weaknesses of this Group are related to the "Strategy_F4_RiskManagement", "ITManagement_F3_ITServLevelManagement", and "ITManagement_F2_InformSecManagement" variables, in that order. Nonetheless, the values of these variables are also in the upper quartile, Q4, and vary from 0.53 to 0.62 (Figure 10).

The model proposed by Wu et al. (2015) based on the RBV was applied, and through it a positive, significant, and impactful relationship was observed between IT governance mechanisms and strategic alignment, and also between strategic alignment and organizational performance. In view of

this, in order to effectively implement IT governance, a set of IT mechanisms is required (Barney, 1991; Venkatraman et al., 1993; Ray et al., 2005; De Haes & Van Grembergen, 2009; Liang et al., 2010; Yayla & Hu, 2012; Gerow, Thatcher & Grover, 2015; Wu et al., 2015) to stimulate consentaneity with organizational missions, strategies, values, norms, and culture which, in turn, promote desirable IT behaviors and enhance performance (Weill & Ross, 2004). Hence, the IT governance mechanisms of an organization frequently represent an indication of this organization's sophistication and of its IT and business manageability (Wu et al., 2015).

Results show that Group 3 organizations are in a more advanced level of maturity, for they are able to combine, with synergy, strategic and management aspects to achieve their objectives satisfactorily, in accordance with the literature presented. Group 3 indicators, classified in the upper quartile in most of the aspects considered in the analysis, suggest that this Group presents Business-IT alignment and adequate implementation of IT governance mechanisms.

The outstanding performance of this Group is the reflection of an organizational environment that is favorable to value creation, which points to a great deal of sophistication in IT and business management. These characteristics are evidence of this Group's leading position, notwithstanding its necessity to enhance risk management and IT service level management processes (Figures 15 and 16).

4.4.2. Group 1 – Silver Category – 2nd place

Group 1 is the most numerous group (160 organizations – 33.2%) and includes the organizations that give more importance to the variables related to IT planning ("ITManagement_F5_ITPlan") and to information security policies ("ITManagement_F4_ InformSecManagementResponsPolicies"). The Group's weaknesses are related to the "Strategy_F4_RiskManagement", "ITManagement_F3_ITServLevelManagement", and "ITManagement_F2_InformSecManagement" variables (Figure 9).

Results reveal that the organizations grouped in Group 1 presented higher levels when it comes to IT planning and management and to the definition of information security policies. However, the Group is still on initial stages of maturity in the remaining management-related aspects. Critical indicators in the areas of risk management, IT service level management, information security management, people and recruitment management, and finalistic processes represent the most relevant gaps this Group must address (Figure 10).

The organizations in Group 1 seem to struggle to balance and effectively align Business and IT strategies.

Venkatraman et al. (1993) believe that many firms, as they devote a great deal of their energy and resources to evaluate alternatives according to the four Strategic Alignment Model (SAM) perspectives, do not pay enough attention to the challenge that is making sure these four concepts are

in accordance with the administrative practice. The authors define strategic control as an ongoing strategic management task that seeks to maintain consistency within the organization in terms of governance, technological capabilities, human resources capabilities, and value management. The researchers recommend that managers do not consider IT as a panacea and, consequently, do not focus only in these two perspectives in which the IT strategy is the starting point (competitive potential and service level). In the same vein, organizations should not always perceive the business strategy as the starting point, only contemplating the two other perspectives on strategic alignment. IT's potential impact in organizations is so varied and complex that the executive must consider these perspectives as alternative conceptual lenses and institutionalize an appropriate set of alignment mechanisms.

4.4.3. Group 4 –Bronze Category – 3rd place

Group 4 is the smallest in terms of number of organizations (89 organizations – 18.46%). It is the only Group whose most relevant factor was not "ITManagement_F5_ITPlan", which took the second place. In turn, "Strategy_F1_FinalisticProcManagement" took the first place in this Group.

The Group's weaknesses, like the other Groups, are related to the "Strategy_F4_RiskManagement", "ITManagement_F2_InformSecManagement", and "ITManagement_F3_ITServLevelManagement" variables, besides "Strategy_F3_ITManagement" and "ITManagement_F4_ InformSecManagementResponsPolicies". The highest centroid value observed for factor "ITManagement_F3_ ITServLevelManagement" is the worst result obtained in all remaining Groups (0.09) (Figure 10).

It is possible to see that the organizations grouped in Group 4 are disproportionally devoted to finalistic process management, when compared to other aspects such as IT management, risk management, information security management, and IT service level management. Such emphasis might be based on the misconception that it is enough to focus on the finalistic performance to enhance overall performance indicators. Venkatraman et al., (1993) believe that the organizations' difficulty to obtain desirable returns to IT investment is largely due to a lack of coordination and Business-IT strategic alignment.

4.4.4. Group 2 – Lead Category – 4th place

Group 2, the second most numerous (141 organizations – 29.25%), presented consistently low results for all factors, which made it rank last in the overall Group rank. In six of the eight factors of dimensions "2100 – Strategy" and "4200 – IT management", Group 2 had final centroid values under 0.19 (α = 5%). The factor of this Group that presented greatest importance was ITManagement_F5_ITPlan, even though this factor's centroid value was approximately 0.3 (Figure 10).

Results suggest that Group 2 organizations are on incipient stages of governance and management maturity. They presented barely tolerable indicators, which suggests general inadequacy in the terms of the present study, especially when it comes to risk management and finalistic process management. The Group's performance was the poorest of all Groups (Figures 15 and 16).

Indeed, the numbers obtained point to the fact that the organizations in Group 2 were unable to meet the basic or adequate levels of IT governance (Pang, Tafti, & Krishnan, 2014; Wu et al., 2015; Dawson et al., 2016) and strategic alignment (Barney, 1991; Venkatraman et al., 1993; Ray et al., 2005; Liang et al., 2010; Yayla & Hu, 2012), as recommended by national and international good practice manuals (TCU, 2014; ISACA, 2012). Under these circumstances, poor performance is the reflection of an unfavorable organizational environment for value creation.

Coltman et al. (2015) state that misalignment is often wrongly associated with insufficient IT investment, when bad investments or even the underuse of available IT resources have caused misalignment. The authors encourage the identification of instances of misalignment due to underused IT resources.

Therefore, as discussed in the extant literature (Barney, 1991; Venkatraman et al., 1993; Ray et al., 2005; Wu et al., 2015), it is possible to observe that IT is a complex ecosystem and its valuable resources must be coordinated in a harmonic way to enhance performance, leverage organizational capabilities, and consistently create value.

5 Conclusions

The question elaborated to orient the conduction of the present research was the following:

"How does IT Governance and Management impact the finalistic performance of the Brazilian organizations listed on the Brazilian Federal Court of Accounts' (TCU's) 'Integrated Governance Survey of Public Organizations (iGov2017)' database, considering the Resource-based View perspective?"

The concept "finalistic performance" corresponds, in the present article, to public service provision with quality and efficiency, especially the provision of digital and technology-related services.

The results presented corroborate analyses in the extant literature on the decisive role of IT governance and management in the generation of public value, for they support organizations on their institutional mission of providing public services with quality, safety, and efficiency to all Brazilians. The findings of the present study also corroborate the perspective exposed in Dawson et al. (2016), that IT governance plays a fundamental role within the public sector to ensure that IT is an efficient driver of improvement and contributes to organizations and agencies as it helps them meet their organizational objectives.

As to the scenario identified in the research, the organizations in Group 2 (Lead category) which presented the worst indicators related to IT governance and management also had the poorest performances. In contrast, the organizations in Group 3 (Gold category), which presented consistently satisfactory indicators (over 0.75) for most variables (which suggests the existence of Business-IT alignment) have presented superior performance results. The intermediate position that Groups 1 and 4 presented is also compatible with the reviewed literature, considering the limitations of this study.

It is important to highlight the nature of these limitations. The performance measure used for this study included indicators regarding compliance with the legislation in public service provision, a different approach than the one used in the private sector which focuses on objective measures (e.g., net profit, return on assets). In addition, the content of the questions incorporated to the performance factors (Figure 8) may have contributed to the undesirable standardization of the responses noted. It is possible that these peculiarities in the data collection may have generated imprecision in the measuring of performance indicators, which was extended to the analyses of organizations.

Although there is not an explicit reference to communication and IT investment in the iGov2017 questionnaire, these aspects play a relevant role in IT governance and management.

Even though communication fluidity is evaluated through a perceptual, complex, and inexact measure, its relevance for IT governance and management should not be unvalued. Some studies point out that encouraging IT and Business executives to collaborate more has positive implications in terms of IT governance and firm results. (Hansen et al., 2011; Wu et al., 2015). For instance, Argenti (2017) shows that modern leaders recognize the relevance of effective internal communication and consider it a strategic management instrument.

It is worth mentioning that IT investment also represents a critical factor for IT governance and management, and it has not been included in the scope of this research due to the lack of information availability. Additionally, organizations have demands that involve the implementation of new systems and services, and they make use of modern digital technologies as well as of legacy systems. Modern technological advancements, in turn, require continuous government investment that are compatible with the risks and challenges of implementing new technology. It is also important to mention that, if the government fails to provide the resources required to implement new technologies, the public expectations will not be met and institutional goals may be neglected mainly due to digital, technological, and system obsolescence. In this sense, Pang, Tafti and Krishnan (2014) found that higher IT investments are positively associated with administrative efficiency in American states.

Unfortunately, the scenario observed for the 482 organizations analyzed in this study is very discouraging, for nearly half of the organizations considered in the analysis (Groups 2 and 4) have presented incipient levels of IT governance and management, which impacts the quality of public service provision. Indicators such as risk management, IT service level management, and information security management have presented outstandingly poor performances.

This scenario becomes even more dramatic as there has been observed an increase in global demand for transparency and for the sharing of reliable information with safety and agility. According to the World Bank (2018), access to high-quality data allows citizens to take action in the development of their countries and monitor the performance of their leaders. Failures in risk management, IT service levels, and information security hinder the achievement of institutional goals for they disturb the capability of organizations to live up to the expectations of modern society.

Notwithstanding, IT is a strategic asset that assists the implementation and execution of great strategic initiatives in the public sector, especially information-intensive firms, which is the case of various public organizations. IT is a powerful instrument that supports the processes of institutional businesses and is indispensable to extract value from the data available, transforming these data into useful information.

The findings of this study ratify the diffuse nature of IT impact on organizations and suggest that IT solutions are not restricted to technology per se, as pointed out by Barney (1991). Therefore, it is important to establish team coordination in IT and Business teams so as to explore complex combinations of capabilities and resources that will enable the creation of public value, in accordance with strategic guidelines, taking the risks considered acceptable by the organization (TCU, 2014; Dawson et al., 2016; Pang, 2017). For this reason, good practices manuals (ISACA, 2012) recommend that IT governance is conducted through a systemic and holistic approach, including all areas and aspects of the organization.

Ultimately, the evidence found in the present research points to the existence of a positive relationship between the quality of IT governance and management and the finalistic performance of the Brazilian organizations listed in the TCU's iGov2017 database. Nonetheless, it was observed that there is not an ideal or unique governance and management model designed for IT that could ensure better performance, once this ideal model would make strategies lose their purpose.

The results of the present study also suggest, according to the Resource-based View, that a multifaceted, harmonic, and complex orchestration that ensures consistent and continuous alignment between strategic decision making, IT strategies, risk management, and IT governance and management has a direct effect on the performance of Brazilian organizations.

5.1 Future research topics

A suggestion for future research that further explores the line of reasoning here presented is a survey with executives from Brazilian Federal Public Administration organizations, in which perceptual measures (i.e., communication fluidity, the level of comprehension employees have of the strategic planning, effective communication between C-level executives and employees, CIO participation in strategic planning, level of knowledge sharing between IT and Business executives, etc.) of at least two C-level executives from each organization are collected, one of them being a

Business executive, and the other an IT executive, a similar approach to the one found in Tallon and Kraemer (2007). The results can enrich the analyses presented and provide further insight which could not have been had in the conduction of traditional questionnaires.

Another suggestion is the conduction of a series of case studies on APF organizations to assess their capability of creating public value. These studies would provide evidence regarding the five organizational capabilities that mediate the relationship between IT resources and public value mentioned by Pang, Lee and DeLone (2014), namely: public service delivery capability, public engagement capability, co-production capability, resource-building, capability, and public-sector innovation capability.

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