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Impact of information system institutionalization on corruption in the Brazilian public health system

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Abstract

Purpose – This study investigates the corruption practices from a behavioral perspective, and aims to verify the impact of health Management Information System (MIS) institutionalization on corruption vulnerabilities and the intention to commit corruption. The studied vulnerabilities are related to management: lack of internal control, accountability, transparency and disburdened administration. This study was conducted in the Brazilian public health system.

Design/methodology/approach – A research model and instrument were created based on the literature. The model was later tested using the partial least squares technique. A survey of 355 valid responses followed a pilot test with 87 ones. The respondents were civil servants of the Brazilian public health system.

Findings – Seven of the eight hypotheses were confirmed, supporting the main hypothesis that MIS institutionalization impacts individuals' behavior by reducing their intention to commit corruption. Institutionalized health MIS improves public management, enabling the prevention of favoritism when awarding service provision contracts, undue payments to corrupt employees and waste of medical and hospital supplies.

Originality/value – This research adds to the knowledge on corruption from an individual's behavior perspective influenced by MIS institutionalization in a Latin American perspective. Corruption is a social and cultural-based phenomenon, which reinforces the importance of understanding the effect of Information Systems institutionalization on corruption vulnerabilities in this context. A research model and instrument were created and validated, confirming corruption vulnerabilities that influence behavior. The intention to commit corruption is reduced when mediated by institutionalized MIS. Consequently, the focus must be shifted from moral beliefs to creating and strengthening organizational capacity to systematically identify and reduce vulnerabilities and deter misbehavior and wrongdoings.

Keywords Corruption, MIS, Institutionalization, Public organizations, Vulnerabilities

Paper type Research paper

1. Introduction

Corruption is a major problem that occurs in all countries, regardless of their political, economic or legal system (Brol, 2016). One of the main consequences of corruption is that it

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can slow a country's growth either due to financial misappropriation or a lack of investment (Aladwani, 2016). It mainly affects lower social classes (Rose-Ackerman, 1999), which is why it is considered unfair from a social perspective (Brol, 2016). Thus, all possible efforts and tools must be used in stopping corruption or in deterring its operators. In recent years, the use of different information and communication technologies (ICTs) has proven to be an efficient way in fighting corruption.

Corruption is unlikely to be substantially reduced without changing the way governments operate (Tanzi, 1998). Lack of internal control, for instance, is strongly associated with corruption, especially when the rules of internal controls are unclear. More than only a focus on fraud prevention, it is necessary to establish good management and governance practices for fraud prevention and greater transparency in organizations, such as Management Information Systems (MIS) (Srivastava *et al.*, 2016).

This study investigates the relationship between health management digitalization, represented here by the adoption of a health MIS and corruption practices from an individual behavioral perspective. More specifically, the objective of this article is to verify the impact of a health MIS institutionalization on corruption vulnerabilities and the intention to commit corruption. The general hypothesis is that MIS institutionalization plays a role in reducing vulnerabilities to corruption, which, in turn, affects the behavioral intention to commit such acts.

The study focused on the Brazilian public health system, which presents an inherent field complexity enhanced by the size of its universal free health assistance. The health system management is partly decentralized, with financial resources being transferred from the federal government to state and city governments for the execution of the public health policy. Brazilian institutions against corruption give an essential contribution, but they are more focused on detection and punishment after the events occur and less on deterring corruption. Furthermore, excessive influence of moral beliefs and focus on legal measures rather than administrative ones highlight the importance of this research.

The Brazil has been suffering from corruption, with important losses of public money. Several important grand and petty corruption cases were uncovered in the public health system, and since 2003, 118 investigative operations have been conducted, presenting an estimated loss of US$1.1bn (CGU, 2020).

2. Theoretical background

In the literature, there are different approaches to the study of corruption, examining several dimensions, including, the legal, economic, political, cultural and managerial ones. Each of these dimensions provides insights into the corruption vulnerabilities and the possible ways to reduce their occurrence or intensity. Corruption has been studied in public and private organizations, and more broadly, in society. Within such studies, the analysis may occur from a macro to a micro level, considering individuals, organizations or countries (Rose-Ackerman, 1999).

Heeks (1998) states the global nature of the problem and adds that corruption is the induction to error by bribery or other illegal or improper means. Lambsdorff (2002) highlights that it is a malevolent arrangement intended to break established rules to obtain private benefits, between one or more individuals with a third party; Lambsdorff (2002) also highlights the presence of an agent, who controls rewards, penalties and legal systems.

For this study, corruption is conceived as acts in which the power of public officials is used for personal gains by violating rules (Jain, 2001). Due to cultural aspects, these rules can be both regulations and what is considered appropriate in each population group. The acts refer to several types of financial and administrative infractions, such as bribes,

misappropriation, nepotism, abuse of authority and extortion (Rose-Ackerman, 1999), as well as embezzlement, theft and favoritism, which exploit conflicts of interest and the absence of adequate policies to prevent such acts. A violation of rules may occur due to vulnerabilities, which are weaknesses exploited by threats.

There are a number of corruption vulnerabilities, such as lack of planning, weak management, poor law enforcement, overly centralized public administration, ineffective Information Systems (IS) (Barros and Rodrigues, 2017) and lack of effectiveness in organization control. Undesirable events, such as bribery or kickbacks, among other types of corruption, may come up from these vulnerabilities. However, these are often treated merely as a matter of honesty, focused on morals, ethics and individual behavior, while failing to adequately take into account institutional management measures (Olivieri *et al.*, 2018).

Increasingly, ICTs have been used to support management due to the emergence of new paradigms resulting from ICT development, globalization and the growing influence of non-governmental organizations (Rossel and Finger, 2007). When organizations strive to complete and institutionalize technology and systems projects, they formulate good management practices. Ionescu (2016) demonstrates that the smaller the amount of manual labor, the lower the level of corruption.

A maturing process is necessary for IS to become institutionalized, which contributes to the organization's management through interactions in the cultural and political context and the processes resulting from employee action. The IS adoption can be understood through institutional factors, provided normative, regulatory and cognitive factors influence IS adoption (Scott, 2008). For instance, MIS institutionalization is influenced by the context in which these systems operate.

3. Research method

3.1 Theoretical empirical model

The study's general assumption is that institutionalized MIS acts positively in reducing vulnerabilities that lead to corruption, consequently decreasing the intention to commit such acts. Eight hypotheses were developed, as follows:

H1. The greater the institutionalization of health MIS, the greater the internal control.

Institutional standards are not equally applied in organizations, there is no universal procedure, and it is essential to value and ensure mechanisms for institutional change that improve procedures, especially regarding the application of institutional rules in a direct relationship with citizens. Among these mechanisms are ICTs, especially MIS, as their progress is an important aspect of public service management modernization, improving internal controls (Barros and Rodrigues, 2017):

H2. The greater the institutionalization of health MIS, the greater the disburdened administration.

Fountain (2004) highlights that the institutional perspective is suitable for analyzing the relationships among ICTs, organizations and institutional and social arrangements. Within the governmental context, ICTs have been used to increase efficiency and disburden the administration. Among the many ICTs, MIS has the potential to improve information management, the service to citizens and the organization of processes, as well as shorten the queues for the provision of services and disburden administration (Barbosa *et al.*, 2016):

H3. The greater the institutionalization of health MIS, the greater the accountability.

Accountability is the responsibility of public agencies to ensure good management of public money. Well-defined and documented processes lead to good management and a clear understanding of the roles and responsibilities of civil servants. The role of MIS is to facilitate user operations and control daily tasks to improve the quality of the services (Amuna *et al.*, 2017). Thus, with MIS institutionalization, the processes no longer belong to the civil servants but are managed by the systems. Therefore, the accountability principle is better addressed because institutionalization systems make it more difficult for human error to occur:

H4. The greater the institutionalization of health MIS, the greater the transparency.

Transparency is closely related to accountability because it provides better governance (Jardim, 2008). It is much more than making the population aware of management conduct in a public organization (Galvão, 2016).

Effective management is achieved through defined processes and roles and the use of ICTs. When IS are socially disseminated, i.e. institutionalized, they have the capacity to produce new controls and organizational process paradigms, as well as ensure citizens' access to information (Jardim, 2008):

H5. The greater the internal control, the lesser the intention to commit acts of corruption.

IS have been used for internal control as a way to enhance organizational control capacities, which can reduce the vulnerability to corruption and government inefficiency. Corruption decreases if the opportunities for such acts are minimized (Olivieri *et al.*, 2018). Internal control reduces corruption, which acts on the individuals' behavior provided by the influence of external factors like organizational culture, and social influence, among other contextual factors. Fewer opportunities reduce the intention to commit corruption through behavioral change:

H6. The greater the disburden of the administration, the lesser the intention to commit acts of corruption.

In addition to internal control, individual behavior can be affected by burdened administrative systems, even when it is based on ethical principles and beliefs. Environments involving an excessive number or overlapped procedures can encourage acts of corruption among companies and public agents to reduce the unjustifiable time required for all the steps or to break a loop of inefficient procedures. Excessive regulations and procedures, as well as unclear information, are common factors encouraging corruption (Reis, 2015). The excess of administrative procedures and the lack of use of systems that help manage the queues allow the public servants to use artifices and collect bribes to favor the corruptors:

H7. The greater the accountability, the lesser the intention to commit acts of corruption.

Accountability has a direct influence on transparency and contributes to reducing vulnerabilities to corruption, especially when roles and responsibilities are clear. It involves the actions of civil servants in leading positions to establish clear responsibilities, obligations and penalties in the governance system. High levels of burdened administration can affect negative accountability and consequently increase the vulnerability to corruption.

Increased transparency and accountability in public management can inhibit corruption, especially due to the pressure exerted by citizens (da Rosa *et al.*, 2016). However, it is necessary to facilitate access to public information:

H8. The greater the transparency, the lesser the intention to commit acts of corruption.

Transparency increases the likelihood of uncovering corruption (Halter *et al.*, 2009), and it is an instrument to reduce the intention to commit corruption by increasing government information disclosure to society. In developing countries, transparency in public administration is paramount for advancing democracy consolidation and reduction of corruption. Transparency involves the willingness of civil servants in leading positions to disclose information, offering greater interactivity and usefulness to other stakeholders, in the quest for open dialogue.

This study adopted the institutional theory as its theoretical lens as it represents a set of typified actions that become usual by specific actors, which is the case use of IS (Tolbert and Zucker, 1996). The theory of planned behavior (Ajzen, 1991) was also used, through the model of corrupt action (Rabl and Kuhlmann, 2008). The next section describes the methodological procedures adopted in testing the model.

3.2 Research design

This descriptive and exploratory cross-sectional study presents a mixed-method focus regarding the data collection and analysis techniques used. Figure 1 shows the main methodological steps.

3.2.1 Phase 1: Descriptive phase. A literature review was conducted to identify the vulnerabilities to corruption linked to the Brazilian public sector. The search involved ten stages divided into three phases (planning, conducting and reporting the review) (Brereton *et al.*, 2007). Table 1 shows the steps taken.

The vulnerabilities in the theoretical model were selected because they are the most important and represented more than 56% of the total findings in the literature. Moreover, the vulnerabilities (ineffective control, excessive bureaucracy, lack of adequate accountability and auditing and ineffective or absent transparency) refer to management and are interconnected or associated with IS.

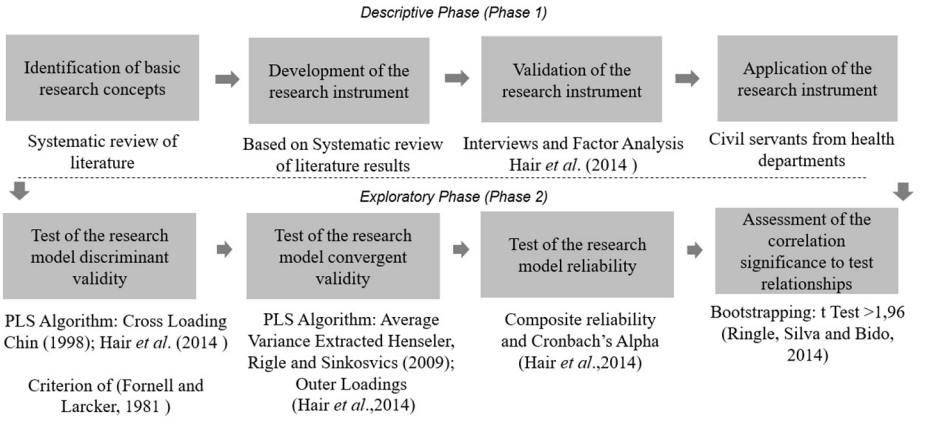

Figure 1.
Research design

Step	Procedure
Research question definition	Which are the vulnerabilities of corruption in the Brazilian public sector?
Research protocol	Search for scientific articles published in peer-reviewed journals indexed on SciELO, EBSCO, Sage, Wiley, Springer, Emerald, ProQuest, Spell, Scopus and Web of Science. Terms used: corruption and Brazil. Languages: English or Portuguese
Validation of the research protocol	The protocol review was performed by three other researchers
Identification of relevant research	Initial return of 525 articles
Selection of primary studies	Duplicate articles were removed, as well as the ones that were not addressing the specific research subject (131), as well as the non-academic one (40), leaving 227 articles
Extraction of the necessary data	The articles were imported into Mendeley®, where all the missing fields were filled
Data synthesis	All articles were read and analyzed through NVivo®, aiming to perform a categorical content analysis
Write the report	33 possible vulnerabilities were found
Report validation	Four other researchers reviewed all stages of the proposed model

Table 1.
Literature review procedures

3.2.2 Phase 2: Exploratory phase

3.2.2.1 Building research instrument. The data collection instrument was developed based on the proposed model (see Section 4). After creating the instrument, a face and content validation involving eight specialists from different areas was carried out by (Krosnick, 2018). They considered the following items: clarity and precision of terms; the number of questions; questions content; instructions for filling; order of questions; and instrument format. Pretest participants were professors and hospital administrators, having backgrounds in management, IS and health management courses.

After the questionnaire adjustments, a pilot test was carried out among public administration employees, using a printed form containing 87 valid responses. The minimum number of participants was 85, as defined with the help of the free software G* Power 3.1.9 (Faul *et al.*, 2009). To adjust the model, it was necessary to eliminate ten questions, as they presented low factor loadings; 51 closed-ended questions scaled as 5 points remained in the questionnaire.

Validation was performed using statistical package for the social science® software to improve the data collection instrument. The Kaiser–Meyer–Olkin (KMO), Cronbach's alpha and principal components analysis (PCA) tests were conducted. The KMO was acceptable at a value of 0.829 and reliable, with a Cronbach's Alpha of 0.937 (Hair *et al.*, 2014). The PCA (with varimax-rotation) was performed without defining the number of factors to be extracted (Hair *et al.*, 2014). The value showed that 14 factors correspond to 89.68% of the total explained variance.

3.2.2.2 Data analysis technique. Using a printed questionnaire, the survey was conducted with the health department staff in the State of Paraná, Brazil. The sample consisted of civil servants working on health departments in management/supervisions positions and using computerized management systems.

Aiming to calculate the ideal sample size, there must be between five and ten respondents for each of the observed variables (51) (Hair *et al.*, 2014). Based on these criteria, the number of valid responses must be between 255 and 510.

A set of 382 answered questionnaires were returned. After data purification following the precepts of Hair *et al.* (2014), 355 valid cases remained. The working area of the respondents are: administrative (169), health care (120) and control, evaluation and audit (66). The academic training are: not graduated (80), university graduate (124), specialist (122) and Master's or PhD (29).

SmartPLS® software was used in structural equation modeling with partial least squares estimation (PLS-SEM). The relationships between the constructs and their indicators of composite confidence, average variance extracted (AVE) and discriminant validity were analyzed (Hair *et al.*, 2006).

Within the SmartPLS®, convergent validity was performed to check the AVE (Henseler *et al.*, 2009) and the discriminant validity (Hair *et al.*, 2014), using cross loading (Ringle *et al.*, 2014). Additionally, the Fornell and Larcker criterion (Fornell and Larcker, 1981) was used to compare the loads to the squared values of the AVE for each factor.

Next, Pearson's determination coefficients (R^2) were noted (Ringle *et al.*, 2014). Convergent validity analysis through the AVEs was also conducted, using Fornell and Larcker criterion. The values of internal consistency (Cronbach's alpha) and composite reliability (CC) were also checked (Hair *et al.*, 2014).

The Student's *t*-test was used to check the data values obtained using the resampling technique for each correlation between the latent and observed variables through the bootstrapping module (Ringle *et al.*, 2014).

The last analysis tested the Stone-Geisser indicator or the predictive validity (Q2), which assessed the model's prediction quality or the accuracy of the adjusted model (Hair *et al.*, 2014). Another analyzed item was the Cohen indicator, which represents the size of the effect (f2) or to what extent each construct is important to the model adjustment (Ringle *et al.*, 2014).

After performing all the tests, 12 variables were eliminated. The remaining ones all attended the scores recommended by the literature, as shown on Table 2.

The detailed data analysis through the used statistic tests is available upon request to the authors.

4. Results and discussion

After data collection, the PLS-SEM was performed, following the protocol by Ringle *et al.* (2014). The results showed the model's reliability as the discriminant and convergent validity were confirmed. The final model is shown in Figure 2.

The Figure 2 demonstrates the existence of significant and positive relations between MIS institutionalization and vulnerabilities to corruption and a partial negative relation between vulnerabilities to corruption and the intention to commit corruption. *H1–H7* were supported, while hypothesis *H8* was not.

In Brazil, public health is provided and regulated by a public unified health system called *Sistema Único de Saúde* (SUS). Over 70% of the Brazilian population needs public assistance from it (Portal da Transparência, 2020). However, SUS is the sole executor of some programs, such as the immunization program and the national program of inner organs donation and transplant.

The federal government spends about 3.8% of the country's gross domestic product on health, reaching $26bn in 2019 (Portal da Transparência, 2020). This expenditure must be designated by at least 12% state and 15% municipality budget, as per the Brazilian Federal Constitution. The health system is partly decentralized, with financial resources transferred from the federal government to state and city governments for the execution of the federal public health policy.

Managing this complex system requires good and effective management practices to orchestrate its resources, population needs and regulations. Unfortunately, SUS is

Table 2.
Quantitative tests

Function	Criterion and indicator	Model values	Reference
Convergent validity	AVE_> 0.50	Accountability_(0.705) Internal control_(0.513) Corruption_(0.733) Disburdened administration_(0.592) Institutionalization_(0.693) Transparency (0.647)	Henseler *et al.* (2009)
Discriminant validity	Higher loads in the original latent variables than in others	Adequate in the constructs themselves	Chin (1998)
	Square roots of AVE values_>_Pearson correlations between constructs	Accountability_(0.840) Internal control_(0.716) Corruption_(0.856) Disburdened administration_(0.769) Institutionalization_(0.833) Transparency_(0.804)	Fornell and Larcker (1981)
Model reliability	Cronbach's alpha > 0.70 and composite reliability_> 0.70	Accountability_(0.930),(0.944) Internal control_(0.862),(0.891) Corruption_(0.964),(0.971) Disburdened administration_(0.827),(0.879) Institutionalization_(0.779),(0.872) Transparency_(0.731),(0.846)	Hair *et al.* (2014)
Evaluation of significance, correlations and regressions	t-Student's test > 1.96	Accountability ≥ Corruption_(3.415) Internal control ≥ Corruption (3.949) Disburdened administration ≥ Corruption (3.778) Institutionalization ≥ Accountability (29.933) Institutionalization ≥ Internal control (11.674) Institutionalization ≥ Disburdened administration_(13.715) Institutionalization ≥ Transparency_(14.314) Transparency ≥ Corruption_(0.511)	Hair *et al.* (2014)
Evaluation of the portion of the variance of endogenous variables	R^2 > 0.02 small effect R^2 > 0.13 medium effect R^2 > 0.26 large effect	Accountability_(0.599) Internal control_(0.362) Corruption_(0.517)	Cohen (1988)

(*continued*)

Table 2.

Function	Criterion and indicator	Model values	Reference
explained by the structural model		Disburdened administration_(0.431) Transparency_(0.458)	
Evaluation of the usefulness of each construct in adjusting the model	Effect size $f^2 > 0.02$ small effect $f^2 > 0.15$ medium effect $f^2 > 0.35$ large effect	Constructs were considered valid, except Transparency, which presented 0.001	Hair *et al.* (2014)
Evaluation of the adjusted model accuracy	Predictive validity Q^2 or Stone-Geisser_> 0 indicator	Accountability_(0.389) Internal control_(0.170) Corruption_(0.341) Disburdened administration_(0.239) Institutionalization_(0.371) Transparency_(0.276)	Hair *et al.* (2014)

frequently involved in corrupt practices. More than a quarter of the total investigations carried out by the Brazilian Office of the Comptroller General involved the public health sector (CGU, 2020), which can be a result of its remarkable budget and its enormous complexity, combined with the presence of vulnerabilities to corruption.

With all its inner complexity, public health management must have effective mechanisms to avoid the misuse of resources, such as misappropriation, bribes or kickbacks and improper favoring, among others. One mechanism might be a health MIS, which diminishes the public officials' intention to commit corruption due to the increased internal control, accountability, transparency and disburdened administration.

With greater control of processes, mainly using institutionalized MIS (*H1*), there are chances of perpetrators being caught committing corruption. The most relevant issue is the type of control, represented here by insufficient procedures and quality in executing them. A number of municipalities do not have enough and qualified human resources and good day-to-day practices, which can lead to inefficiencies in corruption preventing procedures. Furthermore, control can be flawed due to the size of the government, as the demand for corruption is likely to be lower in smaller governments (Ray and Das, 2015). Additionally, in smaller municipalities, control is often hampered by scarce financial resources. Often, they lack resources to create, improve and apply systematic internal control mechanisms (Galvão, 2016) that preventively and concomitantly establish an environment that is hostile to corruption (Ramos, 2010). However, most of the acts of corruption occur in small municipalities with relatively large resources (CGU, 2020).

H5 reinforces that greater control, mainly through institutionalized IS, increases the chance of being caught, which reduces the intention to commit corruption. It was observed that people involved in corruption scandals acted individually or in small groups, concluding that large-scale corruption is not easy to manage and be carried out efficiently (Ribeiro *et al.*, 2018). Another issue is that it leaves fewer gaps due to monitoring activities and control of government officials' behavior (Shim and Eom, 2008), better management of processes and the performance of an active complaint channel. MIS also contributes when authentication is mandatory by all employees, and they have access only to the information pertinent to them.

As proven by *H2*, the more institutionalized a health MIS, the more the reduction in vulnerabilities to corruption. It is also possible to state that the greater the institutionalization of health MIS, the greater the disburden of the administration. One way to reduce vulnerabilities to corruption is to replace paper-based services with digitalized ones, through the MIS functionalities. MIS institutionalization disburdens the administration, preserving the good bureaucracy management instruments. Data analysis also shows that the greater the reduction of disburdened administration, the lower the intention to commit corruption (*H6*). Decentralization,

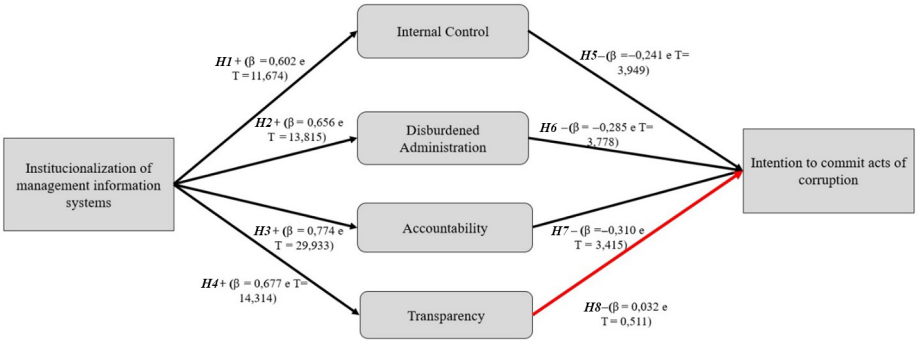

Figure 2.
Final model

automation and process simplification are vital elements for this relationship as it is necessary to make transactions more agile and resolute. Corruption, when studied from the perspective of a disburdened administration, involves public and private agents as well as burdened time-consuming procedures.

H3 proves the impact of the MIS institutionalization in the reduction of vulnerabilities to corruption through accountability processes. Being accountable is an efficient instrument to improve public services and develop the state's capacity to respond to citizens' demands. MIS plays a role in facilitating user operations and controlling everyday tasks (Amuna *et al.*, 2017) to improve the quality of the services offered. The good relationship between MIS and accountability shows that the latter occurs due to the access to information by the population as well as depending on the precision of the roles and responsibilities of the civil servants. Accountability in public management can inhibit corruption, mainly due to the pressure exerted by society provided there is easy access to public information (da Rosa *et al.*, 2016). In this study, the intention to commit corruption has been found to be strongly related to accountability (*H7*), due to the administrative rules and procedures performed by civil servants to follow, ignore or circumvent those rules. However, as accountability influences public transparency, it consequently contributes to the fight against corruption, in addition to making it clear who is responsible for a given task, to whom the public official needs to respond and when they need to be held accountable.

H4 has also been confirmed, showing that transparency is affected by MIS institutionalization. This relationship is relevant as IS can distribute information in a coordinated manner to facilitate control, for example, by blocking some unexpected processes.

Even though transparency is crucial in this context, no significant relationship with the intention of committing acts of corruption was found (*H8*). A possible reason is the unwillingness of the politicians to be transparent as it could expose government wrongdoings. Technology can be an issue too, as the lack or limitation of these tools hampers improving public management (Galvão, 2016) and the relationship between government and citizens.

It is crucial to establish effective control mechanisms to reduce corruption. The mechanisms can provide higher transparency and a reasonable probability of detecting corrupt acts by providing adequate documentation and records in the work environment, complemented by institutional control and support tools that assist in identifying it (Rabl and Kuhlmann, 2008).

Individuals favor behaviors believed to have desirable consequences and disfavor those linked to undesirable consequences (Ajzen, 1991). Decision-making is directly related to behavioral attitudes, because judgments regarding what is favorable or unfavorable will be based on decisions taken by people themselves.

MIS can support good management. In the initial, or pre-institutional, stage (Tolbert and Zucker, 1996), MIS tends to have an imitative characteristic, with its optional nature of use, a high operational failure rate and, most importantly, generating little value in decision-making. In the semi-institutional stage, the use of an MIS is formally or informally agreed as a rule and most groups recognize its importance. However, there is still a low adherence by civil servants.

The institutionalization of MIS results is more clearly understood through norms and rules and an internalized organizational identity that is more fluidly disseminated among civil servants. It leads people to work together and constantly seek the institutionalization of the processes within the public organization.

5. Final remarks

This study created and tested a relationship model among MIS institutionalization, corruption vulnerabilities and the intention to commit acts of corruption. Vulnerabilities to

corruption were qualitatively identified and categorized, and the relationship between MIS institutionalization and the intention to commit acts of corruption was confirmed.

There are four theoretical contributions:

- the identification of the corruption vulnerabilities;
- the proven positive relationship between MIS and each vulnerability to corruption;
- the demonstration that the greater the internal control, accountability and extent of administrative disburden, the smaller the intention to commit acts of corruption; and
- the identification of the nonsignificant relationship between transparency and the intention to commit acts of corruption, demonstrating that transparency is not perceived by respondents.

The practical implications for public managers are the demonstration of the importance of institutionalized health MIS not just to automatize procedures but also to prevent corruption from happening, rather than dealing with their consequences. Systems work as a frame for the administrative routine, driving procedures to follow the same rules and consequently reducing these vulnerabilities. The internal control is increased due to the impossibility of bypassing the procedures. Beyond this, the use of MIS allows data-driven decision-making, which helps internal control and accountability. Systems also contribute to disburdening the administration. Another practical implication is the list of vulnerabilities found, which can be helpful to public authorities seeking to improve their processes for reducing corruption.

The study findings may directly impact public organizations; for example, having an institutionalized MIS improves the control of public management, enabling the prevention of favoritism when awarding service provision contracts, undue payments to corrupt employees and the waste of medical and hospital supplies. Reducing the opportunities for corruption by increasing control and accountability and reducing bureaucracy consequently reduces the intention to commit corruption in the public sector.

Testing it in a developing country with existing and functioning government control institutions is also another contribution. After many years of trying approaches from the global north, it becomes clearer that local understanding and answers for corruption are necessary, provided corruption vulnerabilities and challenges are very attached to values, culture and *modus operandi*. In Brazil, a country with almost 90% of Christians, where morality has a lot of influence in the *modus operandi*, there is a belief that corruption is mainly a moral issue, so the solution is to remove the rotten apples. An alleged hegemony of the judiciary limits the discussion on corruption to the need for more laws or their better implementation, treating corruption events a posteriori in most cases. The moral and legal debate narrows the civil servant's potential contribution on a day-to-day basis. As this study shows, it is essential to further discuss management measures and internal controls. The results of this study can benefit countries with similar contexts.

The study's limitations are related to the predictive capacity of the proposed model, which requires further confirmatory tests. Future studies can be carried out but mainly in smaller municipalities and in other contexts, such as education, as it receives the second-highest funds from the federal government. Transparency vulnerability could be isolated from the proposed model to clarify why the relationship is not significant with the intention to commit corruption.

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