Information Systems Success In Public Administration: Proposal For An Exploratory Model

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ABSTRACT

Investments in Information Systems (IS) have been significantly increasing and hence the relevance of the studies on the IS success is persistent. Delone and Mclean (2003) developed an IS successful model which is a benchmark for researches in the area, however, in the perspective of the public sector, studies are still rare. In this research it was sought to propose an exploratory model of successful IS in public administration, from the identification of each construct items of the Delone and McLean (2003) original model, through multiple case studies in three Municipalities and a Town Hall of the Southern Cone of Rondônia state, in Brazil. Based on the empirical research, it was found that the IS success factors in municipal public administration are close to those factors indicated in the reviewed literature, however, showing some particularities of the public sector. A model of successful factors and items of IS, from the confrontation between literature and empirical data, is presented in the end of this work.

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Sucesso de Sistemas de Informações na Administração Pública: Proposta de Um Modelo Exploratório

RESUMO

Os investimentos em Sistemas de Informação (SI) estão aumentando cada vez mais, e consequentemente, persiste a relevância dos estudos sobre sucesso de SI. Delone e Mclean (2003) elaboraram um modelo de sucesso de SI, e esse modelo é referência para as pesquisas da área, porém, na perspectiva do setor público, ainda são raros os estudos. Nesta pesquisa buscou-se propor um modelo exploratório de sucesso de SI na Administração Pública, a partir da identificação de itens em cada construto do modelo original de Delone e McLean (2003), por meio de estudos de casos múltiplos em três prefeituras e uma câmara municipal do Cone Sul do estado de Rondônia. Com base na pesquisa empírica, constatou-se que os fatores de sucesso de SI na Administração Pública Municipal se aproximam daqueles apontados na literatura revisada, porém, com algumas particularidades do setor público. Um modelo de fatores e itens de sucesso de SI, do confronto entre literatura e os dados empíricos, é apresentado ao final.

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1 INTRODUCTION

As from the Informational Revolution, society has come to live with a large availability of information. It gives an even greater value to information and knowledge dissemination, since this process has become rather dynamic due to the innovation that the Information Technology (IT) provided (Amorim & Tomaél, 2011). Investments in IT and related services have been increasing (Roses, Hoppen & Henry, 2009), despite the economic crises.

The New Public Accounting, which aims at the conversion of Brazilian accounting language to the international accounting rules, helps the public sector to incorporate the management principles of efficiency, effectiveness and results assessment. Thus, public companies and agencies have sought to adopt the private sector management practices in order to achieve greater managerial competence (Ching, Silveira & Freire, 2011; Cunha & Miranda, 2013; Engida & Bardill, 2013). Therefore, the implementation of information systems turns to be necessary, since it brings impacts not only on an individual level but also on the organizational level, and results in experiences of success or failure which leads to the analysis multiple dimensions (Amorim & Tomaél, 2011; Fernandes , Jewelry & Andrade, 2012).

Information Technology and electronic communication are increasingly incorporated into government activities. An example is the implementation of SPED (Public System of Digital Bookkeeping), the purpose of which is to bring together the tax authorities and the taxpayers, controlling the tax collection (Geron, Finatelli, Faria & Romeiro, 2011). The researches currents on ERP systems are concentrated mainly in the adoption of the ERP and critical success factors (Matende & Ogao, 2013).

Bearing in mind the incentive of Delone and Mclean (2003) for the development of successful dimensions and measures of IS, in compliance with the specific contexts and with the players involved, the accounting and costs information systems applied to the public organizations are investigation opportunities in Brazil, considering the small number of researches in the area and the moment of transition and deployment of the

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cost systems by the public management. Therefore, the aim of this study is to propose an exploratory model of IS success in public administration as from the identification of items in each construct of the original model of Delone and McLean (2003). To achieve it, case studies were carried out in three Municipalities and a Town Hall of the Southern Cone of the state of Rondônia, Brazil.

This study provides two contributions to the IS area in Public Administration:

1) exploratory model proposition for assessment of the IS post-adoption: the models of IS success in the literature are predominantly applied to business organizations. The specific model for the Municipal Public Administration will be able to contribute with the assessment of the systems performance in use, including advantages and disadvantages;

2) assessment of elements that precede the hiring/acquisition of information systems. The validation of the exploratory model (result of this survey) in the studies that will follow may contribute with the antecedents' assessment to be analyzed in the hiring/acquisition of systems by the public administration, for example: the supporting conditions from the top management to the systems, the service quality and the system quality. This analysis tends to contribute to the success of the IS outsourcing.

In the article, there are four more sections, besides this introduction: section 2 presents the theoretical framework that encompasses the IS success, the models and constructs as well as the IS success in public administration; section 3 presents the method adopted; section 4 describes the results found in the field, as well as the confrontation of the literature and the reality of the studied administrative units; and section 5, exposes the conclusions of this study.

2 *IS* SUCCESS: MODELS AND CONSTRUCTS

The main IS model of success in the literature is displayed by Delone and Mclean (2003). Such a model defines six constructs:

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information quality, system quality, service quality, use, user satisfaction and net benefits of the use (Delone & Mclean, 2003).

The construct 'use of the system' has been withdrawn from research models that test the IS success (Gorla, Somers & Wong, 2010). One of the reasons is the extent of the use meanings in the model of Delone and McLean (2003). Other reason refers to the little benefit of the use concept in mandatory systems, as in the case of public administration (Gable, Sedera & Chan, 2008; Petter, Delone & Mclean, 2008), as well as the lack of confidence in electronic information (Amorim & Tomaél, 2011). In addition, researches results with distance learning system demonstrate no relationship between the constructs of quality (information, system, service) and the IS use (Sanchez, Cruz & Agapito, 2012).

Similarly, the construct 'user satisfaction' is removed from the models of IS success, considering that its items can be included in constructs such as information quality and the system quality as highlighted by Gorla et al. (2010). In addition to the constructs related to the system (information, system and service quality) and to the net benefits (organizational impacts), the literature has indicated antecedents of the IS success. The main antecedent is the top management support (Hartono, Li, Na & Simpson, 2010; Zaied, 2012), used in this study.

2.1 *IS* SUCCESS IN THE PUBLIC ADMINISTRATION

Government organizations are increasingly looking for professionalism, efficiency and effectiveness. The new public and governance management is aiming at the information quality, through the implementation of measurement instruments that allow a systematic monitoring of economic and financial performance (Martinez & Alves Filho, 2012). The main features of the New Public Management include: delivery of high quality services; improvement in the organizational and individual performance; managerial autonomy, reducing the centralized control; recognition of the importance of providing the technological resources for the managers and public servers so that they are able to achieve the performance targets; and receptivity to the competition, when incorporating

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principles of the private sector and non-governmental organizations (Engida & Bardill, 2013).

The information systems (IS) are social systems that deal with the interaction of people and technology. An information system, including an *Enterprise Resource Planning* (ERP) system, has the user interface and is designed to provide useful information to support the strategy, operations, management analysis and the decision-making process in several positions of an organization (Matende & Ogao, 2013).

Approaches that focus on the organization and its strategy claim that the IT application supports the change in processes and the transformation of the organization, as long as it is oriented to the institutional objectives and goals. And these approaches are also applied to the public sector: the integration between systems and IT infrastructure and the management process is considered essential to the results effectiveness and should reflect the strategic vision. Thus it is relevant the presence of a political leader committed to the project system and capable of keeping the support and persuasion in the fragmented ambience of public administration (Fernandes et al., 2012).

Figure 1 presents the research conceptual model. In it the models proposed by Delone and Mclean (2003) and Gable et al. (2008) were used and adapted in order to characterize the public sector. For example, the constructs 'benefits' at the public institution level and 'benefits' at the processes level represent the construct 'net benefits of use', of Delone and Mclean (2003).
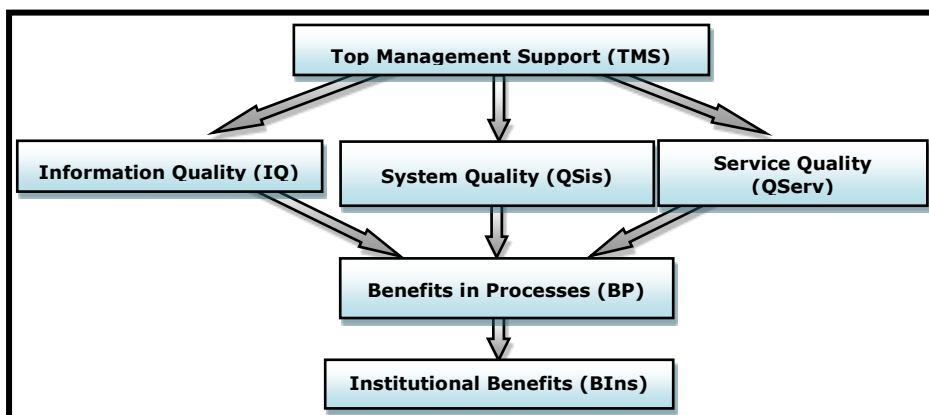

Figure 1: Conceptual model of research

Source: Prepared by the authors

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2.2 IS SUCCESSFUL MODELS AND CONSTRUCTS

Regardless of the economic environment, organizations need to assess whether the implementation of information systems was successful or not. Petter, Delone and Mclean (2012) emphasize that the mission of the Information Systems (ISs) is to offer an efficient *design* that enables the management to make decisions. In addition, the effective use should impact not only its users but also the society. Organizations evaluate its information system for various reasons, and the positive impacts are pursued. Recent researches often seek a measure of net benefit or impact of the IS. So far, however, it is expected that the information system get a continuous flow of benefits in the future, since it is a long-term investment (Gable et al., 2008).

In 1992, Delone and McLean formulated a theoretical model in order to integrate the research work on the IS success that had been made up to that time as well as to provide directions for further researches. It had been presented a model of IS success that tried to capture the multidimensional and interdependent nature of the concept, and tackled, initially, six constructs: information quality, system quality, service quality, use, user satisfaction, individual impacts and organizational impacts.

After ten years, Delone and McLean (2003) observed a huge progress regarding the IS's impacts on the company and on the society, as well as the progress in the investigation about the IS success, and adapted the D & M (2003) model to serve as a basis for empirical researches on IS. It was added the construct "service quality", and the constructs: 'individual impacts' and 'organizational impacts' have teamed up in the construct 'net benefits', preserving the thrifty nature of the model.

The measurement of IS's success has become increasingly complex, but its essence is still simple. The complexity arises because of the increased use and the increased number of information systems users. However, the measurement of the information systems success, in its essence, is still simple because there are consistent key elements such as information quality, system quality, use and results. Relevance, timeliness

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and accuracy of information are still the key to the IS success (Petter et al., 2012).

Gamble et al. (2008) points out that around 60% of the studies employing the Delone and Mclean constructs use a single construct. As a consequence, these authors advocate that part of these studies is inadequate and does not employ a subset of the constructs as a global measure of success. In this sense, the authors used in their study the IS impact, which is a measure of impacts at a moment in the time. They also included in their study the IS-organizational measure which reflects the IT artifact and their impacts at different moments in the time, before and after the satisfaction and usage. Chart 1, presents the aspects identified in the literature that characterize each construct (section 2.2.5).

2.2.1 Top Management Support

The top management support (TMS) is an important variable for the project's success (Hartono et al., 2010; Young & Poon, 2012). Young and Poon (2012) presented a study that listed the differences between project successes and project successes of management. In this study, the TMS proved to be the most important factor to the project success. According to the authors, it is highlighted the conventional approaches that emphasize the project methodologies, the user involvement, the high level planning and the fine personal project. A governance project using the TMS can solve the persistent problems of the IT project failure. In the public sector, leadership and top management support, favor the information sharing among agencies, improving their quality, despite the difficulties caused by the pressure exerted by the time shortage and the heavy workload (Oliveira, Girardi & Gouveia Neto, 2011).

In their study, Young and Poon (2012) evaluated five critical factors of success: top management support (TMS), project methodology, user involvement, high-level planning and staff suitability. The evaluation of the TMS adequacy was based on factors such as the commitment strength, the leader sustainability, the most from the commitment concerning projects and the speed of response to the questions. The results of the study, in 15

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cases, showed that the support of the board is significantly more necessary than all other critical factors of success.

2.2.2 System quality

According to Peter et al. (2008), some of the features of the construct 'system quality' are: the ease of use, system flexibility, system reliability and the ease of learning as well as the information system resources, sophistication, flexibility and response time .

In their research, Zheng, Zhao and Stylianou (2012) observed that system quality issues, in terms of how the system can be efficiently planned and managed, enhanced the user experience with the virtual community. With regard to the system quality dimensions, the authors state that browsing is ranked as the most important dimension, because it relieves the information overload. Another important dimension of the system quality is the security since the system must implement control mechanisms to protect personal information.

2.2.3 Information Quality

Petter et al. (2008), Arazy and Kopak (2011) and Oliveira, Lipke and Silva (2013) described the characteristics of the information quality - relevance, understandability, accuracy, conciseness, completeness, understandability, timeliness and usability - as being those desirable in management reports and on the *web* pages.

The technical pronouncement of the CPC (*Brazilian Accounting Pronouncements Committee*) 00 (CPC 2012) states that the fundamental qualitative characteristics of information in the accounting statements are the relevance and the faithful representation. The relevance is regarded to the influence of the accounting information in the decision-making process. The faithful representation is based on three characteristics: the complete, neutral and error free information. As for the characteristics of information improvements are: comparability, verifiability, timeliness and understandability.

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Lee, Strong, Kahn and Wang (2002) developed the AIMQ methodology, which provides a rigorous and pragmatic basis for information and *benchmark*s quality assessments. The AIMQ *(Assistance in Maintenance and Quality)* methodology has four dimensions of information quality, namely: intrinsic IQ; contextual IQ; representational IQ and accessibility IQ. Intrinsic IQ implies that the information has quality. Contextual IQ highlights the demand that the IQ should be considered within the scope of the task in question, which must be relevant, timely, complete and adequate in terms of quantity, in order to add value. Representational IQ and accessibility IQ emphasize the importance of the computer systems that store and provide access to information, that is, the system must present information in a way that they are interpretable, easy to understand, easy to handle, and be represented concisely and coherently; a further characteristic is that the system should be accessible, and, even though, secure.

2.2.4 Service Quality

The information and the system quality directly affect the individual benefits, and this determines the supply continuity and the information use by the user (Zheng et al., 2012).

According to Delone and Mclean (2008), the service quality can be defined as the quality of support that the system users receive from the IS department and IT support.

The service quality characteristics are: response capability, accuracy, reliability, technical competence and empathy of the personnel *staff*. In the public sector, the services provided via the *Internet*, as in the case of the tax collection sector, have been causing the reduction in the number of taxpayers and accountants who move to the service stations for solving simple problems (Nascimento, Luft, Araujo & Dacorso, 2011). Ding Hu and Sheng (2011) advocate that the service quality is a measure that assesses how well the level of service provided meets the customer expectations.

2.2.5 Organizational Benefits

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According to Delone and Mclean (2008), the net benefits are considered to the extent that the Information Systems are contributing to the success of individuals, groups, organizations, industries and nations. The characteristics of the net benefits are: better decision making, improvement in productivity, sales increase, cost reduction, higher profits, market efficiency, consumer welfare, job creation and economic development.

The literature has been approaching the need of investigation regarding the IT impact in the various processes and organizational capabilities. There are several measures to assess the IT impact in organizations, which can be divided into two groups: performance at the company level and performance at the level inferior to the company level (Tallon, 2010). The first group refers to the variation measures of the company profitability such as return on investment, return on shareholder assets, profit margin, earnings per share, productivity, cost reduction, revenue increase. The second group adds measures related to processes performance, innovation, sectors performance, among others (Oliveira & Oliveira, 2013). Hence, in this study, the organizational benefits are divided into benefits at the level of processes and at the level of public institution.

2.2.5.1 Benefits at the processes level

Regarding the performance level, researches indicate the processes level like the one that captures, first, the IT impact, although this impact has affinity with the performance at the company level (Oliveira & Oliveira, 2013). The companies concentrate on operational excellence in three aspects: the demand for low costs, reliability, accuracy and availability; the customer intimacy, focusing on service quality; or the product leadership, which means the products innovation and cutting edge services (Tallon, 2010).

The accounting information systems can add value to the company when they deliver accurate and available information. As a result, such systems increase the company efficiency and effectiveness, reduce the products and services costs, enhance the quality of decision-making and

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contribute to the knowledge dissemination (Souza & Passolongo, 2005). An example is the use of the *internet banking*, which in recent years, has promoted the ease and speed in the banking transactions (Oliveira et al., 2013). These effects could be extended to the public organizations, based on researches results.

2.2.5.2 Benefits at the public institution level

With regard to the benefits at the organizational level, studies have stated that the performance at the company level encompasses two items for the construct measurement: profits increase and market participation (Oliveira & Oliveira, 2013). Researches in IT, in the business perspective, are being disseminated across all sectors. The aspects of IT costs and investments impact the managerial performance. The use of IT, whether only as support, whether intensely in the production process, reflects in the company's results (Silva & Moraes, 2012).

According to Oliveira and Maçada (2013), studies about impacts on the company performance adopt measures such as return on investment, return on shareholder assets, profit margin, earnings per share, market share, reduction in personnel costs and reduction in sales, general and administrative expenses. The ERP (*Enterprise Resource Planning*) can offer intangible benefits for companies including better information, more efficient internal business processes and better coordination between the different units of an organization (Hsu, 2013).

The ISs can be assessed through the cost-benefits ratio. One should compare if alternatives that the ISs offer satisfy the managers information needs (Souza & Passolongo, 2005).

In the public sector, the information systems management is more complex due to the fact that the strategies have the purpose of rendering accounts to the general public, upon justification of decisions and actions, as well as transparency, which requires a reliable and timely flow of information to all stakeholders (Nascimento & Luft, 2012). The cost information system should ensure the comparability attribute, detailing of information and meeting the information needs of the various organizational units and their users. The cost information provides essential content for

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making more efficient decisions, facilitating the sustainability and the economic development (Machado & Holland, 2010).

The aspects that characterize each construct of the research conceptual model (Figure 1) are listed in Chart 1.

Construct	Aspects	Adapted from
Top management support	Top management support strength, relevance of the support.	Hartono et al. (2010)
	Support of the municipal executing agency for the IT project.	Young and Poon (2012)
	Sharing between departments and municipal agencies.	Oliveira et al. (2011)
	High investments in IT.	Fernandes et al. (2012)
System quality	The *IS* ease of use.	Petter et al. (2008)
	Increase in revenues, agility in the organizational procedures.	Zheng et al. (2012)
	Useful information for decision making.	Matende and Ogao (2013)
	Reduction in operating costs.	Seethamraju and Sundar (2013)
Information quality	IS updated with reliable information.	Oliveira et al. (2013)
	IS Accounting with complete information representing the actual condition of the organization.	CPC (2012)
	IS with accurate information.	Petter et al. (2012)
	Protection of access to the IS through passwords.	Lee et al. (2002)
Service quality	Reliable service	Petter et al. (2008)
	Satisfaction of taxpayers.	Ding et al. (2011)
	Service through fast internet.	Nascimento et al. (2011)
	Efficient management of service delivery.	Biancolino, Maccari, Kniess and Costa (2011)
Benefits at the processes level	Reliability and efficiency of the processes.	Oliveira et al. (2011); Tallon (2010)
	Reduction in operating costs.	Tallon (2010)
	Operating activities depend on the IS.	Nascimento and Luft (2012)
	Innovation of organizational processes.	Perez et al. (2012)
	Improvement of products and services.	Tallon and Kraemer (2007)
	Satisfaction of taxpayers and improvement of decision making.	Tallon and Kraemer (2007)
Benefits at the public institution level	Surplus of government institutions.	Ching et al. (2011); Oliveira e Maçada (2013)
	Control of public spending.	Ching et al. (2011)
	High impact of IT on organizational performance.	Silva and Moraes (2012)
	Make more efficient decisions.	Machado and Holanda (2010)
		Souza and Passolongo (2005)

Chart 1: Aspects found in the literature and references by construct

Source: Prepared by the authors

Section 3 presents the method, which aims to propose an exploratory model of success in IS in the Public Administration as from the identification of items in each revised construct, based on the original model of Delone and McLean (2003).

3   METHOD

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The methodological procedure adopted is the case study, investigating a contemporary phenomenon in depth as well as its context (Yin, 2010). The case study is characterized by deep and comprehensive study of one or more objects, allowing a wide and detailed knowledge (Gil, 2010). This research is exploratory, as it aims to develop, clarify and modify concepts and ideas, formulating more accurate problems or hypotheses that can be researched in further studies. According to Gil (2010), this kind of research is carried out when the subject is poorly studied.

It was used the semi structured interview to identify the relationship between the model constructs and the reality of the municipal government institutions as well as the direct observation and analysis of the accounting statements found on the *websites* of the studied government agencies. The analysis unit is made up of three Municipalities and a Town Hall of the Southern Cone of the state of Rondônia. It was interviewed six civil servants of the accounting, comptroller and auditing sectors, and municipal government managers.

3.1 DATA COLLECTING

For the data collecting, it was opted for the semi structured interviews with a variety of questions including open questions, as well as the direct observation and document analysis. The interview is defined by Gil (2010) as "a form of asymmetric dialogue, where one of the parties seeks to collect data and the other presents itself as an information source".

The second data collecting technique used was the direct observation. According to Yin (2010), direct observations can be made during the field visit and in occasions when other sources of evidence are being applied, as when the interviews are being carried out.

Other technique used was the documentary analysis of the financial statements found, namely: Summary Report of Budget Execution (RREO), Fiscal Management Report (RGF) and the Transparency Portal on the *websites* of the surveyed units of analysis. According to Yin (2010) the documentary analysis is used to confirm and increase the evidence coming from other sources.

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The author also states that the review of relevant documents plays a key role in any data collecting plan.

3.2 DATA ANALYSIS

It was carried out the analysisof the interviews content, the direct observation and the statements found on the *websites* of the government agencies surveyed in order to draw up an exploratory model of accounting and costs of ISs success in the municipal public administration.

To list these factors, it was used the content analysis, which is conceptualized by Bardin (2011, p. 44) as:

> A set of communications analysis technique aimed at obtaining, through systematic procedures and objectives of the messages content description, indicators (quantitative or not) that allow the knowledge inference concerning the conditions of production / reception (inferred variables) of these messages.

Gil (2010) conceptualizes data analysis as an investigation technique which aims at the interpretation of the collected contents through an objective, systematic and quantitative description. According to the author, the analysis is intended to organize the data in such a way that they will enable the provision of answers to the proposed problem.

The categories used for content analysis comprise the items in Chart 1. The data obtained in the interviews, in the direct observation and in the accounting statements were compared to the items of Chart 1, which correspond to the IS success aspects presented in the literature. This analysis aims to verify if the IS success factors found in the literature are in accordance with the reality of municipal public entities, and if there are other aspects that are no longer mentioned in the literature.

4 RESULTS AND DISCUSSIONS

It were conducted interviews with civil servants of the Controlling and Accounting of three Municipalities and a Town Hall of the Southern Cone of the state of Rondônia, totaling six interviews, being three civil servants of Municipality A, one civil servant of Municipality B, one civil servant of Municipality C and one civil servant of Town Hall A. The

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interviews lasted around 15 to 25 minutes each. It was used the Table 1 as the basis for the semi-structured interview [based on case study protocol] in order to confirm whether the factors found in the literature correspond to the reality of municipal entities, and also for adding some aspect not mentioned in the literature . It was analyzed The Fiscal Management Report (RGF) and the Summary Report of Budget Execution (RREO) of the studied Municipalities and the Town Hall. Regarding the direct observation, information was collected during visits in the surveyed administrative units.

4.1 RESULTS

In this section, the results will be presented through the interviews and visits made to Municipalities and to the Town Hall. Table 1, describes the characteristics of each interviewee and respective public agency. In two Municipalities and in the Town Hall, it was interviewed only one civil servant due to the unavailability of other civil servant in participating in the interviews.

Table 1: Characterization of the studied administrative units

Public agency	Annual Budget - Realized (2013 - R$)	Sector –Administrative Unit	Length of service in the Public sector	Information Systems (accounting systems / Costing systems)
Municipality A	166.438.500,27	Controllership	7 years	Accounting
		Accounting - SEMFAZ (Municipal Finance)	6 years	Accounting
		Accounting - SEMUSA (Municipal Health Department)	18 years	Accounting
Municipality B	32.548.532,30	Internal Control	18 years	Accounting
Municipality C	28.390.999,33	Accounting	9 years	Accounting
Town Hall A	24.628.244,90	Board of Directors	1,5 year	Accounting

Source: Prepared by the authors

In the following sections, the results are presented by construct of the conceptual model, according to the findings of the research empirical phase. The Chart 2 presents the exploratory model of IS success resulting from the research.

Constructs	Items identified in the literature	Items found in the field	Source
Top management t support	The support of the municipal manager for the use of accounting and cost systems is high.	The manager is concerned about the IS use in order to comply with the rules.	Hartono et al. (2010)
	The Top Management Support (TMS) is important for project success.	The manager invests in IT in order to comply with the rules.	Young & Poon (2012)
	The leadership and support of the top management favor the sharing of information between public agencies, improving the information quality.	There is information sharing between municipal bodies that do not depend on the top management support.	Oliveira et al. (2011)
	The leading politician is committed to the system project.	The IT deployment costs are high, but it is not the priority of the studied public agencies.	Fernandes et al. (2012)
System quality	The system is easy to use, flexible, reliable, and is easy to learn.	The accounting system is easy to use, it is flexible, reliable, and is easy to learn. Other item is the user experience which can contribute to reduce the difficulties.	Petter et al. (2008)
	The initial use results in net benefits, which influence the subsequent use of the system.	The IS provides agility in the organizational procedures and enables the manager to have greater control on the spendings.	Zheng et al. (2012)
	The information system provides useful information for the decision making process.	Information are important for the decision making process, but they should be checked.	Matende and Ogao (2013)
	The systems help in the organizational resources planning by reducing the costs.	The IS use reduces costs of printer maintenance, printing and personnel department expenses. Digital files are gradually being used.	Seethamraju and Sundar (2013)
Information Quality	The information is updated, reliable, understandable and interpretable by the user.	The information gathered in the accounting IS are reliable and checked daily.	Oliveira et al. (2013)
	The accounting information is relevant, faithful, besides being comparable, verifiable, timely and understandable.	The accounting IS has relevant, faithful, comparable, verifiable, timely and understandable information, since these information are necessary for powering the Transparency Portal.	CPC (2011)
	The relevance, timeliness and accuracy of information are the key to the IS success.	The information contained in the accounting IS are accurate and timely.	Petter et al. (2012)
	The information system is accessible, but, even though it is safe.	Every civil servant has his/her access password, for each function, and then the information are consolidated.	Lee et al. (2002)
Service Quality	The service rendered presents accuracy, reliability, technical competence and empathy of personnel *staff*	The IT service is reliable, accurate and has technical competence.	Petter et al. (2008)
	The service rendered meets the customer expectations (taxpayers).	The service rendered meets the needs of civil servants as soon as it is requested, but it needs to improve as regards the response time.	Ding et al. (2011)
	The provision of *internet* service is faster and more effective.	The provision of *internet* service is facing capacity problems, which decreases the agility to carry out activities via the *internet*.	Nascimento et al. (2011)
	There is capability to establish and manage the providing services strategy.	The IT service is efficiently managed; however, the employee turnover of the private companies may hinder the resolution of some problems.	Biancolino et al. (2011)
Benefits at the processes level	The organizational processes are reliable and effective.	Comparing the performance of the last three years, the organizational processes are trustworthy and effective, provided that they are monitored daily.	Oliveira et al. (2011); Tallon (2010)
	There are cost reductions by improving the organizational performance.	In the past three years the cost of printing, printer maintenance and personnel expenses, among other costs, decreased and this improved the organizational performance.	Tallon (2010)
	The information systems not only monitor the processes, but they are also part of the process due to its capability to transform raw data into a product.	The accounting IS are indispensable to the processes achievement.	Nascimento and Luft (2012)
Benefits at the processes level	Continuous innovation in IS / IT turns the use of technology into processes and innovative applications.	The IS provided innovation in organizational processes, but without leaving the standards of public rules.	Perez et al. (2012)
	There is the product / service improvement.	The public services are continuously improved.	Tallon and Kraemer (2007)
	Improvement in the relationships with taxpayers and the decision-making process.	The IS provided ease of use for taxpayers, besides collaborating with tax evasion reduction.	Tallon and Kraemer (2007)
Benefits at	There is optimization of the governmental programs results.	There was an optimization of the studied administrative units' results over the past three years.	Ching et al, (2011); Oliveira and Maçada (2013)

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the public institution level	Higher quality of public spending.	There was a higher quality of public spending, however this quality does not depend only on the IS as well as it does not depend only on the public policies and on the decisions of the public manager.	Ching et al. (2011)
	The aspects of IT costs and investments impact the organizational performance.	The IT investments have positively impacted the institutional performance, and the Transparency Portal is a link between the public sector and the society.	Silva and Moraes (2012)
	The cost information provides essential content for making more effective decisions.	The information on costs is important for the decision-making process, but in none of the studied administrative units there is an IS of costs, which is under implementation.	Machado and Holanda (2010)
	Information systems are assessed by taking into account their cost-benefit ratio.	Over the last three years there was assessment of the cost-benefit ratio of IS, through bidding processes.	Souza and Passolongo (2005)

Chart 2: Exploratory model of IS success in the public administration: constructs and items

Source: Prepared by the authors

A graphical representation of the exploratory model of IS success obtained in the empirical research - with the number of indicators (items) for each construct - is shown in Figure 2 and discussed in the sections that follow it.
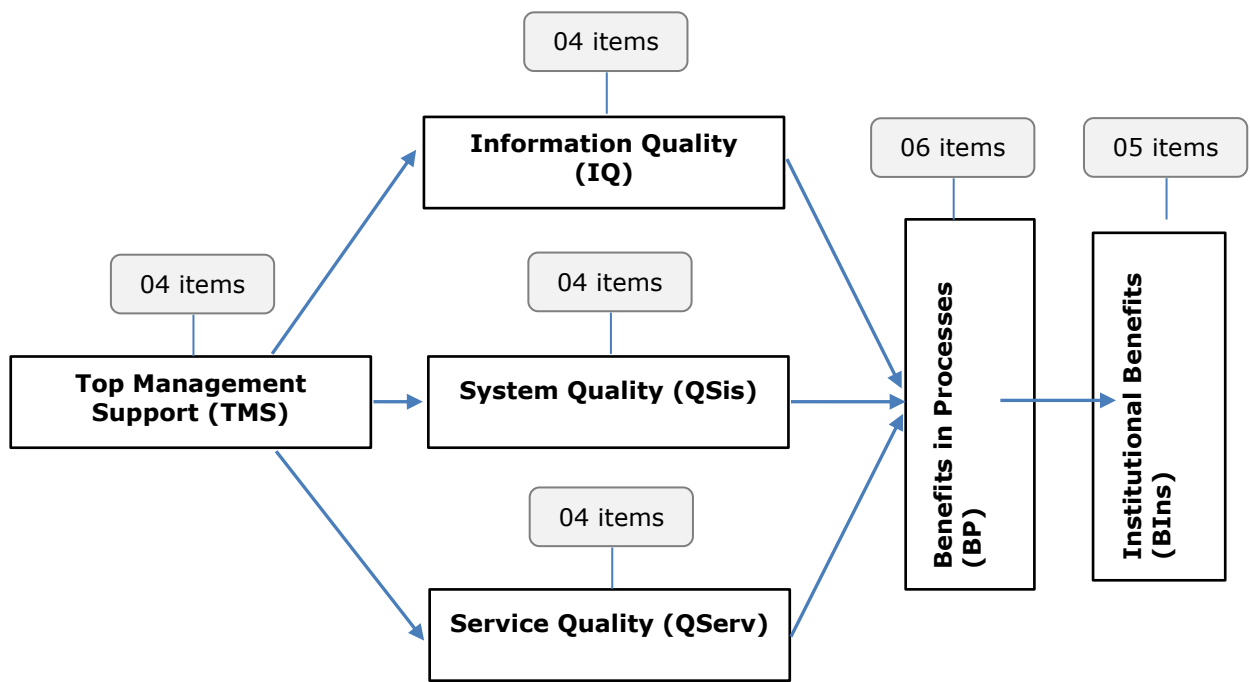

Figure 2: Graphical representation of the exploratory model of IS success: empirical research

Source: Prepared by the authors

4.1.1 Top Management Support (TMS)

All the civil servants stated that the manager is concerned about complying with the rules, so this concern extends indirectly to the

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information systems implementation. It was noticed that, in the Municipalities A, B and C, and in the Town House A, the top management support is an important factor, however, the Municipality managers' concern is the compliance with the rules. Therefore, the systems implementation occurs only for this purpose. According to the civil servant of Municipality B, "although it is necessary, the administration is poorly aware of the IS purpose".

With regard to investments in IS, in Municipality A the interviewees stated that there are always investments and that the IS implementation costs are high. The civil servant of Municipality B stated that there are investments, but they are still not enough. With regard to the civil servant of Municipality C, she claimed that there are investments in the IS area, but they are not the Administration priority. The civil servant of the Town House A stated that there is plenty of IS investments in that administrative unit. The information among the administrative units are shared in all of them, Municipalities A, B and C, as in Town Hall A, as observed in the field. According to the civil servant of Municipality C, "before the system implementation it took us two days to import a payroll to the Accounting, today it takes us just half an hour, so the information sharing between the administrative units is important".

4.1.2 System Quality (QSis)

With regard to the ease of use of the IS accounting and the cost systems, in Municipality A, the accounting system is easy to use, and the cost system is still being implemented. The civil servant of this Municipality emphasizes that the user experience makes the system use less arduous, but users need to improve their knowledge constantly. In Municipality C and in the Town House A, the cost system is still being implemented.

Regarding the agility that IS provides for the organizational activities, all civil servants have agreed that the accounting system is fast and collaborates so that the information required by the manager is presented promptly.

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At the surveyed Municipalities and Town Hall all the civil servants support the idea that the system is relevant for the decision making process because it allows to control the public spending. The civil servant of Municipality C agrees that the IS is important for the decision-making process, however, the information should be checked so that mistakes do not negatively compromise the decisions. According to the civil servant of Municipality C, the information system must be in accordance with the Brazilian Standards for Accounting Applied to the Public Sector (NBCASP), because if the system is not in accordance with the NBCASP, they, civil servants, will need to do the tasks manually, and this compromises the information reliability. Therefore, those responsible for the software should provide the changes in due time so that civil servants do not incur in losses.

On the costs reduction, due to the use of the information system, in Municipality C and in the Town House A, there was a reduction of paper printing, of printer maintenance costs and reduction of time to perform certain activities. According to the civil servant of Municipality C the operating costs were reduced because the information is sent electronically to the Court of Auditors, however, they still send printed reports to the Legislative and this represents a cost. Municipality A sends two versions of the report to the Court of Auditors, which is the printed version and the digitized version. The civil servant of Municipality A was unable to inform if the operating costs decreased or not. The other civil servant of Municipality A stated there had been a reduction in costs with respect to the personnel expenses to assist in the Accounting Department. In Municipality B, there is no information to measure the cost.

4.1.3 Information Quality (QI)

In Municipality A, the information provided is reliable and checked daily, as well as in the Municipalities B and C, and in the Town House A.

In Municipality A, the information provided is relevant, faithful, and are comparable, verifiable, timely and understandable. One of this municipality interviewees reported that the IS system is fed daily and the information is checked, and that the Municipality has the obligation to update the Transparency Portal, which, however, faces some problems

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regarding the site's capacity. At the Municipalities B and C, the information is reliable, as the Transparency Portal must be fed daily, but the municipalities are facing problems regarding the hiring of a service provider for organizing the information on the portal.

The interviewees also confirmed that the information provided reflects the municipality reality; therefore, the information is accurate and timely. However, the Transparency Portal *site* of the surveyed Municipalities and of the Town House feature some outdated information. Consequently, if the taxpayers want to know the statements of the Municipalities and the Town Halls, they must go in person to the public agency and request them.

In the Municipalities and Town Hall studied each employee, depending on his/her position, has access to a specific module of the IS, and their access is restricted to just a specific function. The civil servant of Municipality C has ensured that civil servants have restricted access depending on their responsibilities, but that subsequently, this information is consolidated.

4.1.4 Service Quality (QServ)

In all the Municipalities and Town Hall studied, a private company is in charge of providing the IT service. Regarding the service reliability, the civil servants of Municipality A, Municipality C and the Town House A confirmed that the service provided by the IT staff is reliable but the civil servant of Municipality B did not issue any opinion, since, according to him, in the municipality mentioned there is no IT Department, there is an employee who only assists in solving some problems. With regard to the employee satisfaction, one of the civil servants of Municipality A said: "Considering that the service provider is from other state, as we receive a notification from the Court of Auditors, we send a request to them, and they do the adjustments". The civil servant of Municipality B did not issue any opinion about this aspect. In Municipality C, the IT service provider seeks the satisfaction of the civil servants; however, it falls short as regards the response time to meet a request. On the other hand, in Town House A, the IT service provider meets the needs of its civil servants.

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In Municipality A, the interviewees say that the available *internet* in the state is not fast because it has only one Internet service provider (ISP), which reduces the signal capacity. Regarding the Municipality B, the interviewee stated that "the availability of signal makes it difficult for citizens to access information". In Municipality C and in Town House A, the weak internet signal represents 90% of the problems encountered and to solve them, the public manager would have to prioritize investments to increase the *internet* capacity.

As for the aspect of effective management service, in Municipality A one of the civil servants said that, due to the fact that the service demand is very heavy, "sometimes the service providers do not meet the requirements in time"; other interviewee ensures that the service has been improving and the other one states that the service is managed efficiently. In Municipality B, the civil servant has not issued any opinion on that aspect. Regarding the Municipality C, the accountant states that the service is managed efficiently, but the employee turnover of the private companies is intense, which impairs, with regard to the routine problems solution. The interviewee of Town House A ensures that the service is managed efficiently, since it meets the needs of the public body.

4.1.5 Benefits in processes (BP)

In all Municipalities and Town Hall, the respondents ensure that with the IS adoption, processes become reliable and effective, and the civil servant of Municipality B added that the processes are reliable, provided that there is a follow-up.

Regarding the reduction in operating costs, over the past three years, in Municipality A the costs decreased, an example is the health care area, which presents great demand for service and the IS assists in carrying out this sector activities. In Municipality B, there was a reduction in the cost of printing; the reports are digitally sent to the Court of Auditors; only in Town House A the public servers send printed reports. In Municipality C the costs were reduced regarding to the time taken to prepare a report, reducing personnel expenses. In Town House A there was also a cost reduction.

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In all Municipalities and in Town Hall, interviwees also agreed that the system is essential for the organizational processes attainment over the past three years. All interviewees confirm that in this period the IS use provided innovation in organizational processes, however, these innovations must correspond to what the rules determine. All interviewees also agree that the IS service has to be improved. One of the interviewees of Municipality A added: "You have to be innovating, or else you stay out of date if compared to the others".

In Municipality A, all interviewees agree that the relationship with taxpayers has improved in the last three years due to the fact that the citizen is able to issue municipal taxes electronically. Regarding the Municipality B, the Transparency Portal is a link between the taxpayer and the Municipality, and the system contributes to the reduction of tax evasion. In Municipality C, there is a problem with regard to the taxpayer assistance, because the issue of taxes, certificates and invoices is done at the Municipality as a consequence of the unavailability of an electronic system and the reduced *internet* capacity in the city. At Town House A, the IS has improved the relationship with citizens, in terms of access to the regular sessions, to the laws and to the decrees, over the *internet*.

4.1.6 Institutional Benefits (BIns)

Over the last three years, revenues increased in Municipality A, due to the IS use, and comparing to the other municipalities studied, the Municipality A has the highest realized income. As for Municipality B, there was an improvement because it has reduced personnel expenses. In Municipality C and in Town Hall A, there were positive results in this period, and civil servant of Municipality C added that, compared to the other municipalities, there was an improvement in the item of accounting information integration.

In Municipality A, over the past three years, the IS provided improvement in public spending since the manager has control of the information on the public money invested, being such information updated. In Municipality B and Town Hall A, public spending also improved due to the

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IS use for the decision making. In Municipality C, the civil servant said that this item of public spending improvement does not depend only on the IS, but also on the public policies and on the decisions made by the public manager.

In all the studied administrative units over the past three years, the IT investments have benefited the population. The civil servant of Municipality B added that the information is more accessible for citizens in the Transparency Portal, and the ISs are responsible for generating information for that *site*. In the studied administrative units, all the interviewees support the idea that the cost information provides essential content for making more effective decisions, however the costs are not yet determined in the studied administrative units.

In the studied Municipalities and Town Hall the information systems are evaluated for its cost-benefit ratio, and this evaluation process takes place through the bidding. The civil servant of Municipality C added that, no matter how expensive the system is, what matters is the benefit generated by its use.

In the following section, the discussion of the found results are presented in order to propose an exploratory model of IS success in public administration, as from the identification of items in each construct of the original model of Delone and McLean (2003).

4.2 DISCUSSION

It is observed that the results found in the studied Municipalities and Town Hall are close to the literary model, adding the public sector peculiarities. Fernandes, Jóia and Andrade (2012); Hartono et al. (2010) and Young and Poon (2012) state that the top management support for the use of accounting and costs systems must be high, and this applies to the reality of the studied administrative units, however the public manager is concerned essentially , to comply with the rules. In the studied Municipalities and Town Hall information is shared among the administrative units, reducing the time taken to perform certain activities, in line with Hartono et al. (2010) and Oliveira, Girardi and Gouveia Neto (2011).

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The accounting systems of the studied public agencies present ease in the use and ease of learning, reliability, flexibility, corroborating the system qualities that Petter et al. (2008) describe in their study. In the studied Municipalities and Town Hall, there is agility in the organizational procedures, due to the IS use, which helps the manager to have control over the expenditures in line with Zheng, Zhao and Stylianou (2012) with regard to agility in the organizational processes.

Matende and Organ (2013) ensure that the information system provides useful information for the decision making process. And this is confirmed in the studied administrative units, since the accounting system provides useful information for decision making, provided that such information is checked and that they are in accordance with the Brazilian Accounting Standards Applied to the Public Sector (NBCASP).

In all studied Municipalities and Town Hall, the intervieews confirmed that the information contained in the accounting IS is updated and reliable corroborating Oliveira, Lipke and Silva (2013), who describe these aspects of the information quality.

According to CPC (*Brazilian Accounting Pronouncements Committee*) 00 (CPC 2012) and Petter, Delone and Mclean (2012), the accounting information must be relevant, faithful as well as being comparable, verifiable, timely and understandable. In all studied public bodies, the the IS should present these characteristics, due to the requirement to feed the Transparency Portal.

In the studied Municipalities and Town Hall, each civil servant has an access password, according to each position and responsibility, and then the information contained in each position are consolidated as Lee et al. (2002) advocate in their study.

In the public agencies in question, according to what has been observed in the field, the service rendered by the IT staff is reliable, but such a service needs a faster response time, and this is aligned to what was found in the study of Petter et al. (2008). In the administrative units in question, the rendered IT service meets the needs of civil servants, according to which Ding et al. (2011) advocate. As for the citizen satisfaction, none of the interviewees issued an opinion.

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Nascimento et al. (2011) advocate in their study, that the provision of *internet* service is faster and more effective. In the analyzed Municipalities and Town Hall, the service via *internet* presents some problems of capacity signs, for this reason there is a demand for service improvements in the Southern Cone region, considering that some services rendered by the Municipalities and Town Hall depend on the *internet*. Therefore, the reality of the studied region are still far from the statement of the above mentioned authors.

In the public agencies studied, the accounting SI is a product of private companies, and the interviewees confirmed that the IS service is managed efficiently, corroborating what Biancolino et al. (2011) state, but with some shortcomings due to the employee turnover of private companies. Comparing the performance of the last three years, it can be said that the organizational processes are reliable and efficient, but they should be monitored daily. This statement confirms the findings in the research of Tallon (2010) and Oliveira et al. (2011).

Other benefit on the level of processes, mentioned by Tallon (2010), is the costs reduction to improve the organizational performance. Over the last three years there was a cost reduction in the paper printing, personnel expenses and time taken to draft the reports. Nascimento and Luft (2012) ensure that the information systems are part of the process due to its ability to turn raw data into a product. In the administrative units, this subcategory is confirmed since the accounting ISs are indispensable for carrying out the public activities.

In the studied administrative units, the accounting IS provides innovation in the processes, but these processes are tied to the public sector rules, so this corroborates in part Perez et al. (2012), when they state that continuous innovation in IS / IT converts the use of technology in innovative processes and applications.

These characteristics are confirmed in the studied administrative units. The IS use has provided improvement in the relationships with taxpayers, who can follow the units activities through the Transparency Portal, but there is still the problem with the *internet* server, which hinders or delays some procedure. Other aspect observed in the administrative

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units refers to the product/service improvement. This information is in accordance with Tallon and Kraemer (2007).

Over the last three years, in the studied Municipalities and Town Hall, there was an improvement in the administrative units performance due to the increase in the revenues during this period. This confirms what Ching et al. (2011) advocate, when they state that one of the benefits at the institution level is the results optimization of the government programs. Other aspect mentioned by the authors is the higher quality of public spending, and this information was observed in the field, however, this quality does not depend only on the IS, but also on the public policies and on the public manager decisions.

In all the studied administrative units, the IT investments have improved the public service rendered to taxpayers, being the Transparency Portal a link between the public agencies and the population (Silva & Moraes, 2012). All the interviewees confirmed what Machado and Holanda (2010) say about the fact that the cost information provide essential content for making more effective decisions. In the analyzed public agencies, all the interviwees believe that the information generated by the costs IS will be important for the decision making, however the priority is to meet the law rules. In none of the administrative units, the cost IS is deployed. The legal deadline for implementing it, in full, is until the end of 2014.

Over the last three years, in the studied Municipalities and in the Town Hall it were carried out cost-benefit assessments generated by the IS through the bidding, procedure in which the prices and quality of the service/product are assessed, assessment in accordance with what is said by Souza and Passolongo (2005).

5 CONCLUSIONS AND RESEARCH RECOMMENDATIONS

In this research, it was sought to propose an exploratory model of IS success in the public administration, as from the identification of items in each construct of the original model of Delone and McLean (2003). On the basis of the empirical research, it was concluded that the accounting IS

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success factors of the three studied Municipalities and Town Hall are close to those factors presented in the theoretical framework, but with some peculiarities of the public sector. It was not possible to assess the costs IS due to the fact that this system is still in the implementation phase in the analyzed administrative units.

While in private entities the ISs are important to increase revenues, in the public sector they become indirect benefits for the population. The New Public Accounting (regulated by Decree No. 200/2007) encouraged the public agencies to incorporate concepts of private entities, and, as a result, the Transparency Portal was created in order to keep the population informed about the use of public funds. It is noticed however, in this study, that the information found on this website are outdated.

The information system is an essential tool so that the information generated will be shared with society, through the Transparency Portal. There are still some problems regarding the internet signal availability in the region, and this causes some problems for the government agencies, reducing the service quality provided over the Internet. The accounting ISs enable the manager to hold greater control of public expenditure, bringing more quality of these spending.

In this research, it is highlighted two limitations: the number of cases (three Municipalities and one Town Hall) and the exploratory approach, which requires validation of the model generated by the empirical research (Chart 1).

For future researches it is suggested that case studies of other municipalities and municipal agencies are carried out, not only in Rondonia, but also from other Brazilian states. Other research opportunity is the use of the template text (Figure 1), with statistical instrumental and in a greater number of municipalities, from the conceptual framework of this research (Chart 2).

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