THE SIX CSF OF INFORMATION TECHNOLOGY OUTSOURCING IN MUNICIPAL GOVERNMENT AGENCIES

OS SEIS FCS DA TERCEIRIZAÇÃO DA TECNOLOGIA DA INFORMAÇÃO EM ÓRGÃO PÚBLICO MUNICIPAL

LOS SEIS FCS DE LA SUBCONTRATACIÓN DE TECNOLOGÍA DE LA INFORMACIÓN EN LOS ÓRGANOS PÚBLICOS MUNICIPALES

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ABSTRACT

This research aims to identify and analyze the critical success factors (CSF) of information technology outsourcing (ITO) in a Brazilian municipal public agency. The success factors of ITO were identified through a systematic literature view, which retrieved 314 articles from the ACM and IEEE databases, 30 of which met the research protocol criteria. The Delphi technique was used as a research method to determine the CSF based on the success factors identified in the literature. The Delphi panel included thirty-five experts, and the data were collected in 2018. The results indicate the existence of six CSF information technology outsourcing: Communication, Technical Ability, Commitment, Conformity, Context and Confidence. The survey also identified that the processes of implementation, and the behavior between the client and the supplier, play a more critical role in the success of the ITO than hiring processes. The research suggests that contractual clauses, while important, are not sufficient to guarantee the success of ITO initiatives. Moreover, theories with a social perspective contribute more than economic theories when it comes to analyzing ITO in public agencies.

Keywords: Information Technology; Outsourcing; Critical Success Factors.

RESUMO

Esta pesquisa tem como objetivo identificar e analisar os fatores críticos de sucesso (FCS) da terceirização da tecnologia da informação (TTI) em um órgão público municipal brasileiro. Os fatores de sucesso da TTI foram identificados por meio de uma revisão sistemática da literatura, a qual extraiu 314 artigos das bases de dados ACM e IEEE, dos quais 30 artigos atenderam ao protocolo da pesquisa. Utilizou-se a técnica Delphi como método de pesquisa para determinar FCS a partir dos fatores de sucesso identificados na literatura. O painel Delphi contou com 35 especialistas, e os dados foram coletados em 2018. Os resultados apontaram a existência de seis FCS na TTI: Comunicação, Capacidade, Comprometimento, Conformidade, Contexto e Confiança. Além disso, a pesquisa identificou que os processos de implantação e o comportamento entre cliente e fornecedor desempenham um papel mais crítico para o sucesso da TTI do que os processos de contratação. A pesquisa sugere que as cláusulas contratuais não são suficientes para garantir o sucesso de iniciativas de TTI. Além disso, as teorias com perspectiva social oferecem maior contribuição do que teorias econômicas para analisar a TTI em órgãos públicos.

Palavras-chave: Fatores Críticos de Sucesso; Terceirização; Tecnologia da Informação.

RESUMEN

Esta investigación tiene como objetivo identificar y analisar los factores críticos de éxito (FCS) de la tercerización de la tecnología de la información (TTI) en un órgano público municipal brasileño. Los factores de éxito de la TTI fueron identificados por medio de una revisión sistemática de la literatura, la cual extrajo 314 artículos de las bases de datos ACM y IEEE, de los cuales 30 artículos atendieron al protocolo de la investigación. Se utilizó la técnica Delphi como método de investigación para determinar FCS a partir de los factores de éxito identificados en la literatura. El panel Delphi contó con 35 especialistas, y los datos fueron recolectados en 2018. Los resultados señalan la existencia de seis FCS en la TTI: Comunicación, Capacidad, Comprometimiento, Conformidad, Contexto y Confianza. Además, la investigación identificó que los procesos de implantación y el comportamiento entre cliente y proveedor desempeñan un papel más crítico para el éxito de la TTI que los procesos de contratación. La investigación sugiere que las cláusulas contractuales no son suficientes para garantizar el éxito de iniciativas de TTI. Además, las teorías con perspectiva social ofrecen mayor contribución que las teorías económicas para analizar la TTI en órganos públicos.

Palabras clave: Factores Críticos de Éxito; Tercerización; Tecnología de la Información.

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1. INTRODUCTION

The acquisition of IT services in the Brazilian public sector is regulated by laws such as Law 8666/93 (BRASIL, 1993) and Normative Instruction 04/2014 (SLTI, 2014). The former establishes general rules on administrative contracts while the latter disciplines the process of contracting IT services for the Federal Public Administration. Despite the existence of government standards covering the information technology outsourcing (ITO) process, the Federal Government Auditing found that 50% of the development of information systems in federal public institutions is carried out through outsourcing, and most of the analyzed institutions were unable to reach the planned goals (TCU, 2014; TCU, 2016). Part of this problem may be related to the execution of IT projects. According to Laia *et al*. (2011), Brazilian public organizations usually adopt a normative view of the process and there are no rules or mechanisms for the implementation of IT projects in a cohesive and harmonious way.

On the other hand, issues of noncompliance to Normative Instruction 04/2014 may occur. This instruction is divided into three stages: planning the hiring, selecting suppliers, and managing contracts. Its requirements are related to basic management principles such as efficiency, legality, and governance. According to Barboza, Silva and Souza (2016), ITO projects must present legally compliant documents in accordance with Federal Government Planning: Institutional Strategic Plan and Information Technology Master Plan. The difficulty in developing such documents has led those authors to develop a software tool to support the preparation of documents to meet the requirements of Normative Instruction 04/2014.

There is evidence that organizations have not been able to achieve the benefits provided by ITO. Mcivor (2000) found that only 5% of the organizations achieved high levels of benefits with ITO. Cullen, Willcocks, and Intelligent (2003) point out some of the reasons for that failure. The process of contracting IT services, especially those related to software, involves complex activities such as: eliciting requirements, definition of expected quality, acceptance rules, change management, among others. Therefore, ITO projects pose risks to the parties involved and therefore, conflicts in the relationship between them are common. Wirick (2011) emphasizes the specific conditions of the public sector, arguing that the complexity of ITO projects in the public sector is greater than those in private sectors. Among the reasons there are problems of overlapping supervision and the need to coordinate efforts to meet the needs and wishes of various stakeholders at different levels of the Federal Administration. These characteristics result in ambiguous and contradictory objectives, which render ITO projects even more complex.

One way to assist the implementation of IT projects in public agencies is to identify the factors that favor their success. Thus, identifying the critical success factors (CSF) of ITO in public organizations helps managers in the implementation of IT projects through the more efficient use of public resources.

Identifying CSF is an approach to the problem of improving the effectiveness of ITO processes in the public sector. CSF is a term used in the administration field to refer to an element considered as necessary for an organization to fulfill its mission (Rockart, 1979), with many examples in literature related to this issue. A search in the Scopus database (www.scopus.com) covering the past five years found a total of 112 articles related to the IT success factors in public agencies published in journals. Among these articles, 13 dealt specifically with CSF. Most of them are related to public healthcare, addressing CSF for health information systems (Handayani *et al*., 2014); CSF in service-oriented architecture for healthcare (Koumaditis & Themistocleous, 2015); or even recommending the use of CSF in the planning of information systems for healthcare (Scott, 2015).

There are also works addressing CSF of ITO in public agencies (Ghazali & Bin Hasan, 2018). These authors point out that studies in the scientific literature have addressed CSF with greater prevalence in the private sector than in the public sector. Their research sought to determine the CSF and understand their benefits. Similarly, Prado and Anastácio (2015) determined the CSF in the integration of legacy systems, analyzing a public agency in Brazil. They identified four critical dimensions of success in the public agency environment related to legacy systems.

The works published in the Scopus database show the relevance of studying the CSF in the public sector. However, as observed above, it was found that there are few studies aimed at the Brazilian municipal public sector. Within this context, this study seeks to answer the following research question: **What are the CSF of ITO in Brazilian municipal public agencies?** To answer this question, the purpose of this paper is to identify and analyze the CSF of ITO in a Brazilian municipal public agency. For such purpose, the following objectives were defined: (1) describe the main success factors of ITO in

literature; (2) identify, through a survey with experts, which success factors described in the literature are critical in the ITO process in the Brazilian municipal public sector; and (3) analyze the CSF identified herein.

2. LITERATURE REVIEW

2.1. BASIC CONCEPTS AND ITO FEATURES

Outsourcing can be characterized in several ways. The ITO characteristics related to this research are presented below.

(1) **Outsourcing concept**. There are several definitions of outsourcing in literature. Each of them highlights important aspects for a given context: (1) how outsourced activities are mainly focused on non-core business activities, but not restricted only to them (Lacity & Wilcocks, 2008); (2) outsourcing involves one or more suppliers (Prado et al., 2009); (3) outsourcing may cover part or all of the organization's IT activities (Lacity & Wilcocks, 2008); and (4) it involves cooperation between customer and supplier (Dolgui & Proth, 2013). The concept of ITO used in this research involves these four characteristics.

(2) **Offshore or onshore**. According to Amant (2009), an increasing number of organizations intensified the adoption of ITO with suppliers in other countries, that is, in the offshore modality. When the service is provided in the domestic territory, it is referred to as onshore.

(3) **Motivation**. A better understanding of the factors that motivate the adoption of ITO contributes to the understanding of cases of success and failure in adopting such practice. Among the factors mentioned in the literature as motivating ITO, the following stand out: (i) focus on core business activity (Brudenall, 2005; Lacity, Khan and Willcocks, 2009); (ii) cost saving (Heywood, 2001; Lacity, Khan & Willcocks, 2009); (iii) access to expertise, new competences, or funding (Amant, 2009; Brudenall, 2005); (iv) organizations strategic decisions (Heywood, 2001; Lacity, Khan & Willcocks, 2009); (v) resource rationalization and increasing the organization's flexibility and agility (Heywood, 2001); (vi) change to a variable cost structure, as a way of accommodating fluctuations in the workload (Amant, 2009); and (vii) improvement in the quality of services (Brudenall, 2005).

(4) **Risks**. The final decision to adopt outsourcing is based on the balance between costs, risks, benefits, and opportunities. Many of these decisions are based only on perceived benefits (Brudenall, 2005). However, it is necessary to consider the risks and difficulties that restrict the adoption of ITO.

Finally, it should be noted that there are strategies to address ITO risks, specifically in the public sector. Ning and You-shi (2012) suggested defining legal responsibilities and supervisory processes for outsourced workers based on contractual terms, using communication systems to avoid asymmetric information, increasing monitoring during the execution of the service, and testing service level agreements frequently.

2.2. INFORMATION TECHNOLOGY OUTSOURCING IN THE BRAZILIAN PUBLIC SECTOR

Reinhard and Dias (2005) analyzed the process of computerization and the use of IT in the Brazilian public sector, over time. These authors realized that from the 1980s, the public sector started to emphasize outsourcing. In recent years, it expanded the emphasis on electronic government (E-GOV). On the other hand, the Brazilian Federal Accounts Court (TCU) (2014) in its 2014 IT Governance Report, which analyzed 373 federal public agencies, found that only 6% of them reached the targets for the period.

The difficulties observed in this scenario are partially due to the fact that ITO in the public sector is complex. Lin, Pervan and Mc Dermid (2007) highlight that ITO in the public sector is highly complex due to the legal requirements of organizational processes. Additionally, the authors state that ITO is overly sensitive to political influence involving different stakeholders with conflicting issues.

Not only the legal requirements, but also the particularities of public agency processes make ITO more complex than in the private organizations. According to Swar *et al*. (2012), the differences between public and private organizations include

decision-making processes, responsibility for purchasing decisions, organizational culture, employee management, and information systems.
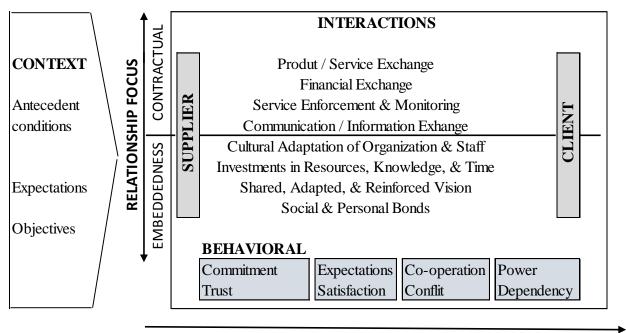
The recognition of the differentiated context of the public sector can be observed in the audit carried out by TCU in 2015 to evaluate the IS development and maintenance services contracts. This audit found that the contracts were not sufficient to mitigate risks related to factors such as IT architecture, technological tools, software development processes, and professional qualification. As a consequence, TCU recommended to consider the following success factors when contracting systems development services: simultaneous hiring of different suppliers; specification of service level agreement compatible with the contractor's inspection skills; effective inspection of compliance with contractual clauses; and adoption of continuous communication processes between client and supplier.

2.3. FRAMEWORK FOR INFORMATION TECHNOLOGY OUTSOURCING

Frameworks are useful instruments to guide ITO processes. They provide input for the identification of ITO success factors. There are several frameworks in the literature that addresses specific contexts of ITO. Applegate et al. (2003) developed a framework to analyze the role that IT plays in the organization and classified this role in four categories: support, factory, alignment, and strategy. On the other hand, the model by Lacity and Willcocks (2001) assesses IT activities from an economic point of view. Through this framework, the authors found that organizations that are successful with ITO, from an economic point of view, take two factors into consideration: economy of scale obtained internally and adoption of updated management practices.

Kern and Willcocks (2000) studied the relationship in ITO and developed a framework for it. This framework was chosen due to its alignment with the research objectives, since it is based on a literature review on theories involving company relationships and the social theory of contractual relationships. Combining these theories with research on ITO, these authors developed the framework that is shown in Figure 1, which is composed of three dimensions:

(1) **Environment**. The outsourcing relationship have a strong dependance on this dimension, which includes the objectives, the preceding conditions, and the expectations surrounding outsourcing, which will be incorporated into the contract and will reflect the basis of the relationship.

(2) **Interactions**. The interactions among the parties can be characterized by opportunities, values, regularity, quality, and content.

(3) **Behaviors**. The several interactions that take place between customer and supplier depend largely on the atmosphere surrounding the outsourcing contract. This dimension is characterized by commitment and trust, satisfaction and expectations, cooperation and conflict, and power and dependence.

Figure 1. Framework for Information Technology Outsourcing
Source(s): adapted by the authors from the framework by Kern and Willcocks (2000). Exploring information technology outsourcing relationships: theory and practice. Journal of Strategic Information Systems, 9(4), 321-350.

2.4. SUCCESS FACTORS OF INFORMATION TECHNOLOGY OUTSOURCING

The search for ITO success factors in the scientific literature was carried out in two IT-related databases: Association of Computing Machinery (ACM), and Institute of Electrical and Electronics Engineers (IEEE). The search was based on a systematic literature review (SLR). In contrast to an *ad-hoc* literature review, the SLR is a methodologically rigorous approach (Kitchenham *et al*., 2009). Based on the SLR, a total of 314 articles were found. The SLR protocol adopted the following criteria:

(1)   **Inclusion criteria**: studies that described ITO success factors; publications since 2007, which describe the current reality; English-language publications for being internationally accepted for scientific works, and Portuguese-language publications for specific research regarding the Brazilian context; and only works with sufficiently detailed descriptions to allow the interpretation of the meaning and the context of ITO success factors.

(2)   **Exclusion criteria**: works not fully available; success factors related only to offshore outsourcing; preliminary works; and works related to specific outsourcing issues, such as Cloud Computing and Crowdsourcing.

After applying these criteria, 30 articles remained, which were thoroughly read and analyzed. Some factors were repeated among the articles. Other factors, despite being worded differently in the articles, represented the same concept and, therefore, were grouped under the same factor. A total of 27 success factors were identified in the selected articles, which are shown in Table 1, in decreasing order of frequency in which they appear in the literature.

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Table 1
ITO success factors found in the literature

Success Factor	N**	Reference *	Success Factor	N	Reference
SF01-Hiring	11	6,7,10,12,16,19,21,24,26,27,28	SF15-SLA	3	5,11,16
SF02-Communication	8	2,5,8,9,16,22,24,25	SF16-Satisfaction	2	2,5
SF03-Environment	7	9,15,18,20,24,28,30	SF17-Culture	2	10,18
SF04-Control	7	2,3,8,11,13,16,22	SF18- Competence	2	2,16
SF05-Commitment	6	5,7,10,16,23,27	SF19-Turnover	2	14,15
SF06-Knowledge	6	1,5,8,9,10,16	SF20-Complexity	2	19,28
SF07-Capacity	6	3,10,16,23,27,29	SF21-Conflit	1	5
SF08-Trust	6	4,5,10,13,19,24	SF22-Location	1	28
SF09-Relationship	6	1,9,13,15,16,26	SF23-Business	1	5
SF10-Sponsor	6	2,9,14,16,18,28	SF24-Payment	1	16
SF11-Risks	5	5,16,17,19,25	SF25-Subsidies	1	14
SF12-Compliance	5	3,16,18,19,29	SF26-Support	1	11
SF13-Guidelines	3	3,15,19	SF27-Test	1	14
SF14-Vendor history	3	8,21,29			

Notes: ***** Literature references are presented in Appendix A.

   ** Frequency in which the success factor appeared in the literature.

Source: developed by the authors.

3. RESEARCH METHOD

This is an exploratory research, since it seeks to provide a better understanding of CSF for ITO in the Brazilian municipal public sector (Selltiz, Wrightsman, & Cook, 1976). It aims at increasing the knowledge related to the ITO phenomenon. The techniques and approaches for collecting, analyzing, and interpreting the data in this research are predominantly qualitative according to Gil (2002). In qualitative research, the data obtained are analyzed inductively and the procedures for obtaining the data include observations, interviews, and questionnaires (Trumbull, 2005). In addition, Wilson (2000) states that the study of information systems based on the understanding of users in their work context can point the way to practical innovations in information services.

3.1. RESEARCH FRAMEWORK

The research framework is shown in Figure 3 and consists of two dimensions: environment and customer-supplier relationship. The customer-supplier relationship dimension has three components. The first two components are related to interactions with contracts and implementation processes.

ENVIRONMENT	CLIENT-SUPPLIER RELATIONSHIP
	1. Contract-focused interactions
SF03	SF01 SF07 SF15 SF24 SF26
SF10 SF20	**2. Implementation-focused interactions**
SF13 SF22	SF02 SF04 SF06 SF09 SF11
SF14 SF25	SSF12 SF18 SF19 SF23 SF27
SF17	**3. Behavioral**
	SF05 SF08 SF16 SF21

Before hiring   After hiring and starting the relationship

SF01-Hiring	Penalty or reward mechanisms
SF02-Communication	Effective and timely communication
SF03-Environment	Company environmental factors
SF04-Control	Monitoring and control of costs
SF05-Commitment	Exchange relationships to serve the customer
SF06-Knowledge	Bidirectional knowledge transfer
SF07-Capacity	Technical capacity of suppliers
SF08-Trust	Mutual trust between supplier and customer
SF09-Relationship	Effective relationship management
SF10-Sponsor	Top management engagement
SF11-Risks	Risk analysis and management
SF12-Compliance	Compliance and service delivery
SF13-Guidelines	Institutional policies and practices
SF14-Vendor history	Success stories on previous projects
SF15-SLA	Flexible and reliable service level agreements
SF16-Satisfaction	Both are benefited and feel satisfied with the relationship
SF17-Culture	Cultural compatibility between customer and supplier
SF18- Competence	Building employee skills through relationships
SF19-Turnover	Lower employee turnover of client and supplier companies
SF20-Complexity	Criticality of the contracted service
SF21-Conflit	Constructive conflict resolution mechanism
SF22-Location	Specific solution and proximity to the organization
SF23-Business	Mutual understanding of the Business
SF24-Payment	Punctuality in supplier payment
SF25-Subsidies	Effective subsidies for outsourcing activity
SF26-Support	Technological support of tools and systems
SF27-Test	Test center for validating deliveries

Figure 2. Research framework
Source: developed by the authors

The processes related to contracts have different relevance and characteristics when compared to the processes related to implementation. In addition, contractual processes occur before implementation processes take place, and are more formal. On the other hand, the implementation processes are intended to comply with the agreements established by the contract and are composed of formal and informal processes.

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The 27 success factors were attributed to the dimensions and components in the research framework. This assignment was developed based on the description of the framework factors and components. To analyze the content validity, the Judge Analysis method as defined by França & Schelini (2014) was used. Five judges were selected based on their experience in ITO: two of them with more than 15 years of experience in scientific research on ITO; and three of them with more than 10 years of professional experience with ITO, in public and private companies.

The following attribution procedure was adopted: (1) the agreement among four judges was evaluated, that is, when three or all four of the judges agreed with the attribution of the factors to the framework component, this attribution was considered valid; (2) when only two of four judges agreed, the opinion of the fifth judge was used to decide the assignment; and (3) the process was repeated until all factors were attributed. The result of the assignments is shown in Table 2. Only factors FS17 and FS23 did not reach a consensus by the four judges and the opinion of the fifth judge was thus required.

Table 2
Attribution of success factors to the research framework

Factor	J1*	J2	J3	J4	Factor	J1	J2	J3	J4	Factor	J1	J2	J3	J4	Factor	J1	J2	J3	J4
SF01	B	B	B	B	SF08	D	D	B	D	SF15	B	B	B	B	SF22	A	A	B	A
SF02	C	B	C	C	SF09	C	C	B	C	SF16	C	D	D	D	SF23	C	A	C	B
SF03	B	A	A	A	SF10	A	A	C	A	SF17	C	A	C	A	SF24	B	B	C	B
SF04	C	B	C	C	SF11	B	C	C	C	SF18	C	C	C	A	SF25	A	A	B	A
SF05	A	D	D	D	SF12	C	B	C	C	SF19	C	C	B	C	SF26	B	C	B	B
SF06	C	B	C	C	SF13	A	A	B	A	SF20	A	A	A	D	SF27	C	C	C	C
SF07	B	C	B	B	SF14	A	A	C	A	SF21	D	D	D	B					

Key: * Judges
A – Environment   B - Contract-focused interactions
C - Implementation-focused interactions D – Behavioral

Source: research data

The object of study is the ITO success factors. In this research, ITO covers only non-core business activities, which may be the activity, or part of it, and performed by one or more suppliers. The scope of the research is limited to the processes involved in the relationship between customer and supplier in ITO projects in municipal public agencies.

The success factors were assessed in outsourced processes carried out in Brazil, that is, the type of outsourcing analyzed was onshore. This is due to the fact that outsourcing involving public agencies covers legal issues that limit the possibilities of applying an offshore outsourcing.

3.2. CASE DESCRIPTION

The panelists were chosen from an IT public institution located in the city of São Paulo. This company is responsible for information systems in the city of São Paulo and is called PRODAM. PRODAM is an information technology partner of the Municipal Government of São Paulo. It develops technological solutions and provides technical support to administrative systems, having the Municipal Administration as its main client, which also includes the various municipal departments. It also provides services to the Board of Auditors of the City of São Paulo.

PRODAM employs approximately 868 people distributed as shown in Table 3. Its organizational structure is composed of five directors, 32 managers, a Board of Directors, and an Audit Committee. At least 88.5% of its employees work in IT activities. Therefore, it can be considered as a municipal public agency relevant to the study of ITO.

Table 3
PRODAM staff

Type of activity	Position	Frequency	
		Absolute	Relative (%)
Information technology	Consultant analyst	1	0.1
	IT Analyst	581	66.9
	Process analyst	55	6.4
	IT technicians	131	15.1
Administrative area	Senior manager	5	0.6
	Manager	54	6.2
	Advisory	26	3.0
	Support activities	15	1.7
Total		868	100.0

Source: adapted from PRODAM (2018).

3.3. DATA COLLECTION - DELPHI TECHNIQUE

Information was anonymously collected using a printed form. The form included clarifications on the purpose of the research and instructions for completing it. The instrument was personally delivered to all participants. An electronic address was made available on the form to provide additional support, if necessary. It should also be noted that the Delphi panel rounds took place in June 2018.

Each success factor had a brief description so that the panelist could understand its meaning and analyze it according to their personal experiences. An e-mail was used for contact and feedback with panelists in subsequent rounds of the Delphi panel. The first round could only be completed when all participants delivered the questionnaire correctly completed, that is, with all questions answered and only one answer per question.

The first round allowed the inclusion of ITO success factors not identified in the SLR. Subsequent rounds required data collection through a personalized questionnaire for each participant. This is because the answer of each panelist was compared against the consolidated opinion of all panelists.

The questionnaire had the 27 success factors described in the research framework. Each success factor had a brief description so that the panelists could understand its meaning and analyze it according to their personal experiences. All success factors were classified by the panelist according to a six-point Likert-type scale of importance. The data collection procedures are shown in Figure 3.
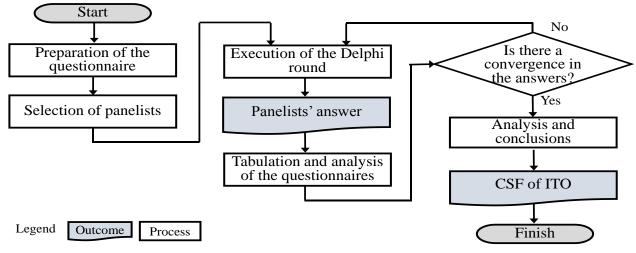

Figure 3. Data collection processes
Source: developed by the author

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Data processing was based on the Delphi technique because, according to Skinner *et al*. (2015), it is an adequate technique for acquiring recommendations from experts when addressing a research problem related to IT. The Delphi technique involves a selection of experts based on pre-established criteria, and multiple rounds of questioning with those experts through a questionnaire or interview, applied individually to avoid direct confrontation between them (Skinner *et al*. 2015).

There are several versions of the Delphi technique used for different purposes. This research used the procedures proposed by Chaves *et al*. (2012), which consist of five steps: planning the panel; selecting the group of panelists; preparing the panel round; holding the panel round; and drawing the conclusions. The need to perform a new round must be assessed by Kendall's W coefficient of agreement and the statistical significance of such coefficient. According to Schmidt (1997), Kendall's W concordance coefficient measures the agreement of the opinions provided by the Delphi panel participants.

Schmidt's (1997) interpretation of Kendall coefficient was used herein to determine the degree of consensus: up to 0.1 shows a very weak agreement; between 0.1 and 0.3, weak agreement; between 0.3 and 0.5, moderate agreement; between 0.5 and 0.7, strong agreement; above 0.7, very strong agreement. This degree of consensus was the criterion used to continue a new round or to finalize the panel.

4. RESULTS

4.1. PANELIST PROFILE

The selected panelists had outstanding performance and professional experience in ITO services. They were arranged into three groups according to the activities and roles they play in PRODAM:

(1)   **System analysis and specification**. Employees responsible for identifying business rules and requirements, and mapping and defining processes. In this study, this group was referred to as the Analysts Group.

(2)   **Systems and infrastructure implementation**. Employees whose activities are directly related to the development, operation, and maintenance of information systems. It also includes activities to implement the necessary infrastructure to support systems developed by third parties, or in partnership with them. In this research, this group was referred to as the Developers Group.

(3)   **Coordination and leadership**. Employees responsible for project management, customer relationship, and drafting and monitoring the negotiation of ITO services. In this research, this group was referred to as the Managers Group.

The different profile of each group allows the authors to obtain different views on the problem and a greater diversity of opinions. All panelists had to meet three criteria in order to be selected: acting professionally in a public organization; more than five years in the job; and more than five years of ITO experience. Forty-two panelists were selected, as shown in Table 4. The panelists were distributed in a balanced amount amongst the different groups to avoid artificial consensus or absence of diversity.

Table 4
Panelist characteristics

Group	N	%	Experience in role (years)		ITO experience (years)	
			5 to 10	Above 10	5 a 10	Above 10
Systems analysis and specification	15	35.7	14.3	21.4	21.4	14.3
System and infrastructure implementation	15	35.7	4.8	31.0	21.4	14.3
Coordination and leadership	12	28.6	4.8	23.8	16.7	11.9
Total	42	100.0	23.8	76.2	59.5	40.5

Source: developed by the authors

4.2. DELPHI PANEL ROUNDS

The first round allowed panelists to include ITO success factors not identified in the SLR. However, no success factor was included at this stage.

In the second round, participants were informed that the answers from the first round should be re-analyzed and that they could be modified, if desired. To assist them in this activity, each panelist received the average score for each success factor assigned by the other panelists in the first round. As previously stated, the collection instrument for the second round was customized for each participant.

Seven panelists did not take part in the second round, with only 35 participants remaining, as follows: 13 in the Analysts Group, 14 in the Developers Group, and eight in the Managers Group.

The results of the Delphi panel rounds are shown in Table 5. Kendall's coefficient for the first round was 0.219314. According to the ranges suggested by Schmidt (1997), this coefficient was interpreted as having a very weak agreement, indicating the need for a new Delphi round. On the other hand, the statistical significance of Kendall's coefficient was considered extremely significant. This is because the Chi-square (χ^2) statistic presented the value of 506.6164 and a p-value < 0.001 in Friedman's (1940) reference ranges.

Table 5

Delphi panel variables

Variables	1st round	2nd round
n	27	27
m	42	35
W	0.219314	0.514579
χ^2	506.6164	990.5651

Source: developed by the authors

In the second round, Kendall's coefficient (0.514579) was interpreted as of moderate agreement (Schimidt, 1997), and the statistical significance of Kendall's coefficient was considered extremely significant (= 990.5651 and p-value <0.001). According to Schmidt (1997), the panel can be closed if there is a significant increase in Kendall´s coefficient from one round to another, which occurred in this case (increase from 0.219314 to 0.514579).

The classification of the success factors obtained with the end of the Delphi panel is shown in Table 6. The score ranges from 0 to 100 points. The success factors were grouped using the quartile statistics. Success factors belonging to the first quartile were referred to as CSF. They represent the six CSF of ITO that must be observed with closer attention in the specific context of ITO in municipal public agencies.

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Table 6
Classification of ITO success factors by panelists

Success factor	Score	Q*	Success factor	Score	Q	Success factor	Score	Q
FS02-Communication	67	1	FS27-Test	57	2	FS06-Knowledge	51	3
FS07-Capacity	66	1	FS19-Turnover	56	2	FS25-Subsidies	50	3
FS05-Commitment	64	1	FS26-Support	56	2	FS24-Payment	49	4
FS12-Compliance	61	1	FS09-Relationship	55	2	FS20-Complexity	46	4
FS03-Environment	59	1	FS04-Control	54	3	FS14-Vendor history	44	4
FS08-Trust	58	1	FS01-Hiring	53	3	FS16-Satisfaction	44	4
FS11-Risks	57	2	FS15-SLA	53	3	FS17-Culture	41	4
FS23-Business	57	2	FS10-Sponsor	52	3	FS13-Guidelines	40	4
FS18-Competence	57	2	FS21-Conflit	52	3	FS22-Location	31	4

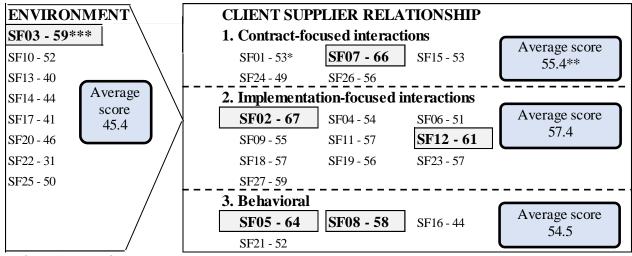**Note**. * Classification based on quartile statistics.
Source: developed by the authors

5. ANALYSIS AND DISCUSSION

5.1. CSF AND THE RESEARCH FRAMEWORK COMPONENTS

Delphi panel outcomes were inserted in the research framework and are shown in Figure 4. The analysis of each component of the framework is described below.

(1)   **Environment**. This component presented eight success factors, that is, 29.7% of all success factors identified in the study. On the other hand, the average score was 45.4 and was below the average score of the other components. This indicates that although the success factors are mentioned in the literature within the general context of ITO, they are less relevant to the specific context of outsourcing system development in municipal public agencies. It should also be noted that this component has only one CSF (SF03-Environment).

* score for each success factor
** success factor average score for each component of the research framework
*** critical success factors
Figure 4. Score of research framework success factors
Source: research data.

(2)   **Interactions focused on the contract**. This component has only five success factors, that is, 18.5% of all success factors identified in the survey. On the other hand, the average score was 55.4 and was among the highest of the framework components. This shows the importance of the component in the success of ITO. Finally, it should be noted that this component has only one CSF (SF07-Capacity). In other words, the technical capacity of the supplier to deal with the challenges of the project had a score of 66 (second highest), being a prominent aspect in the process of contracting services. The results are in line with other works on outsourcing found in literature. The importance of the contract has been highlighted in the literature since the growth of outsourcing in the 1990s. For Mc Farlan *et al*. (1995), it is essential to understand the relationship that begins between the supplier and the customer, as it arises from the operation of the contract. Similarly, Dekker *et al*. (2018) highlight that contracts are key mechanisms in the governance of relations between companies since they provide the formal arrangements on which collaboration is based and the structure within which cooperation proceeds.

(3)   **Interactions focused on implementation**. This component has ten success factors, that is, 37.0% of all success factors identified in the research. It was the framework component that had the highest number of success factors and the highest average score (57.4). In addition, it presented two CSFs (SF02-Communication and SF12-Compliance). Thus, effective communication between project stakeholders, as well as deliveries in accordance with the specifications and defined requirements, are the critical aspects of this component. For these reasons, this component proved to be the most relevant in the ITO process within the context of this research. That is, communication and compliance are essential. Holzmann and Panizel (2013) corroborate this statement when investigating the perceived success of IT projects in relation to meeting schedule, budget, performance, and customer satisfaction requirements, and concluded that effective communication is a dominant factor for project success.

(4)   **Behavior**. This component has only four success factors, that is, 14.8% of all success factors identified in the survey. On the other hand, the average score was 54.5 and was among the highest among the model components. This shows the importance that it has in the success of ITO. This component has two CSF (SF05-Commitment; SF08-Trust). In other words, issues related to the behavior between customer and supplier, especially the commitment and trust between them, proved to be critical. The literature on outsourcing highlights this issue. Sabherwal (1999) found that trust plays a critical role in information system development projects. Similarly, Langfield-Smith and Smith (2003) analyzed management mechanisms used in outsourcing relationships. Those authors concluded that the relationship management was achieved through social controls and that trust was particularly developed over time. Yuan *et al*. (2018) highlight the importance of commitment. They analyzed the relationship in a supply chain and concluded that commitment was fundamental and mediated the relationship between trust and logistical effectiveness.

The opinions of the Delphi panel experts pointed out that the Customer-Supplier Relationship dimension is the most relevant for the success of ITO in software development projects in municipal public agencies. This framework dimension has four of the five CSF, that is, 80% of them. The average score of its components was above 54 compared to the Environment dimension, which had an average score of 45.4. Thus, the Environment dimension, represented by the expectations surrounding outsourcing, is not relevant to the success of outsourcing in the specific context of this research. Exceptions should be made to the legal, political, and economic aspects of outsourcing.

The results can be compared in relation to the contexts of federal public agencies. Despite the differences between the levels of federal and municipal government, there are similarities between them in relation to their responsibility and functions, especially in relation to legal issues and outsourcing contracts.

TCU (2015), for example, made four recommendations for success in system development activities:

(1)   Adoption of continuous communication processes between the teams at the contractor and contracted parties. This recommendation is related to the CSF with the highest score in the Delphi panel (SF02-Communication). It can be inferred that communication issues are relevant both at the federal and municipal levels.

(2)   Simultaneous hiring of different suppliers. This recommendation seeks to address risk issues. It is related to the SF11 factor (Risks), that is, it refers to risk management and mitigation activities. Although it was not classified as CSF, this factor has the highest-rated score for non-critical success factors (57).

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(3)   Effective inspection of compliance with contractual clauses. This recommendation is in line with the SF01 factor (Hiring). Although relevant to the federal level, this factor was not considered critical for the panelists who analyzed ITO at the municipal level. It should be noted that the outsourcing contracts of public agencies are the result of a tender process, which gives little flexibility to the process. It can be inferred that this is one of the reasons why panelists assigned greater importance to CSF SF05 (Commitment) and SF08 (Trust), as they realized that contractual issues are important, but they are not enough. Based on the Contract Theory (Bolton & Dewatripont, 2005), which analyses how economic agents build contractual arrangements, mechanisms can be identified, such as performance-based contracts, that create incentives for the agent (supplier) to act in the interest of the principal (customer).

(4)   Definition of service levels compatible with the contractor's inspection capacity. This recommendation is associated with success factor SF15 (SLA). It is also another factor that was not considered critical by the panelists. Despite the importance of SLA in IT activities, the degree of importance varies depending on the type of activity. In infrastructure activities SLA is more important than in system development activities. This can be seen in the results of the study developed by Prado and Anastácio (2015). The researchers analyzed CSF in the integration of legacy systems in a federal public organization. They identified four CSFs, the least important one was related to the definition of system requirements. The issue of specifying service levels or system requirements had a similar result in this research and in the research by Prado and Anastácio (2015). Perhaps because both surveys were developed in public agencies that provide IT services to other public agencies. On the other hand, TCU (2015) recommendations are widely applicable to all public agencies.

5.2. CRITICAL SUCCESS FACTOR ANALYSIS BY PANELIST GROUPS

This section analyzes the result of the Delphi panel considering each group of panelists. Table 7 shows the CSF classification by group of panelists.

Table 7
Classification of CSF by panelist group

Entire Delphi panel			Analysts group			Developers group			Managers group		
N*	CSF		N	CSF	Gap**	N	CSF	Gap	N	CSF	Gap
	Code	Name		Code			Code			Code	
1	FS02	Communication	1	FS02	0	1	FS02	0	1	FS02	0
2	FS07	Capacity	2	FS07	0	2	FS07	0	2	FS07	0
3	FS05	Commitment	3	FS05	0	3	FS05	0	3	FS05	0
4	FS12	Compliance	4	FS12	0	4	FS12	0	4	FS12	0
5	FS03	Environment	5	FS03	0	8	FS23	3	6	FS08	1
6	FS08	Trust	8	FS23	2	9	FS18	3	10	FS27	4
Sum of ranking differences			2			6			5		

* CSF rank
** Ranking differences between a panelist group and the entire Delphi panel
Source: developed by the authors

The four CSF with the highest scores by the panelist groups (Analysts, Developers, and Managers) were the same that received the highest scores on the Delphi panel. These four CSFs are unanimous amongst the different types of professionals who participated in the Delphi panel.

The fifth CSF (SF03-Environment) with the highest score on the Delphi panel was ranked in the same position by the Analysts Group but was in the tenth position for the Developers Group, and in the eighteenth for the Managers Group. Likewise, the sixth CSF (SF08-Trust), which the highest score was in the eighth position for the analysts' and developers' groups, but in the fifth position for the Managers Group. Figure 6 shows the differences of opinion between the Delphi panel (all panelists) and the three groups. The results show a greater alignment amongst analysts and managers than between developers and managers. This is in accordance with common sense, since developers have a more technical profile, managers a more administrative profile, and analysts an intermediate profile between the first two.
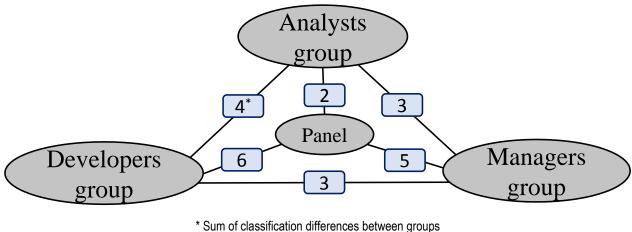
* Sum of classification differences between groups
Figure 5. Results by panelist group
Souce: research data.

It could be observed that there are differences of opinion among the Delphi panel groups, but these differences were small. This is because the Delphi technique has led to a convergence of opinions. Several authors (Bozeman & Kingsley, 1998; Feeney & Bozeman, 2009) have highlighted that stakeholders, with different expectations for the outsourcing process, tend to evaluate the success of outsourcing differently.

5.3. RESEARCH LIMITATIONS

The limitations of the research were summarized in two topics.

(1)   **Internal validity**. Result limitations due to the methods used to identify the CSF.

   • The success factors were summarized from a literature review, through content analysis of the text, developed by the researcher, which gave subjectivity to the process.

(2)   **External validity**. Limitations on the application of research outcomes to other contexts.

   • The results obtained do not cover all specific contexts of the Brazilian municipal public agencies.

   • Advances in IT take place very quickly and can change the degree of importance of the success factors identified herein.

   • Changes in the regulatory environment can change the importance of CSF.

6. CONCLUSION

The purpose of this research was to identify and analyze the CSF of ITO in a Brazilian municipal public agency. To achieve this goal, a descriptive research was carried out using the Delphi technique, which was supported by 35 experts in ITO projects in municipal public agencies. The answer to the research question and the conclusions of this study are grouped below according to the objectives:

(1)   **Describe the main success factors for ITO described in the literature**: the literature review identified 27 success factors for ITO described in 30 articles selected through an SLR that initially selected 314 articles.

(2)   **Identify, through survey with experts, which success factors described in the literature are critical in the ITO process in the Brazilian municipal public sector**: a Delphi panel was created with 35 experts who, based on the 27 success factors listed in literature, identified six CSF: Communication, Capacity, Commitment, Compliance, Environment, and Trust.

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(3)   **Analyze the CSF identified in this study**. Analyzes were performed based on the research framework. It was possible to identify that the Customer-Supplier Relationship dimension is more critical to ITO success than the Environment dimension. Within the Customer-Supplier Relationship dimension, two components stood out: interactions focused on implementation and behavior. In addition, the analysis showed that the three groups of experts presented little difference in relation to the classification of the CSF, with the greatest divergence occurring between two groups with different professional profile: one presenting a technical and the other an administrative profile.

6.1. CONTRIBUTIONS

The research results can provide contributions to the management of ITO services in municipal public agencies and identified research opportunities to improve theories related to outsourcing in the context of public agencies.

ITO services in public agencies are contracted through formalized tenders. On the other hand, the majority of CSF identified in this research are not related to legal and juridical issues (Environment dimension) nor to formal contracting processes (Interactions with Focus on the Contract component). They are related to the implementation processes and to the behavior of suppliers and customers during the outsourcing relationship. As a consequence, the results point to the need for improving the control over the implementation processes and improving the management of the outsourcing relationship as a way to increase the success in ITO projects in municipal public agencies. In other words, the contractual clauses, although important, are not sufficient to guarantee the success of these initiatives.

The results also identified research opportunities. Much of the literature on outsourcing uses economic theories to explain the outsourcing process (Perunovic, 2007). In the context of municipal public bodies, as analyzed in this research, theories with a social perspective can offer a greater contribution in the analysis of outsourcing. This is because a common focus amongst theories that address the social perspective is the relationship between agents, including levels of trust and power, feelings of mutual obligation, and social norms. Lacity and Willcocks (2008) mention examples of theories that fit this perspective: Theory of Social or Relational Exchange; Theory of Social Capital; Theory of Institutionalism; Theory of Power and Politics; and Theory of Social Cognition. The analysis of ITO in the public sector using a theory with a social perspective can explain, from a theoretical point of view, the importance that constructs such as trust and commitment play in the outsourcing process.

6.2. FUTURE RESEARCH

The authors suggest, as future work, new research that: (1) can generalize the results obtained by replicating this research in other municipal public agencies; and (2) analyze the relationship between customer and supplier in ITO in municipal public agencies through theories with social perspectives.

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APPENDIX A

Appendix A presents the list of articles selected by the systematic literature review. They are shown in Table 8.

Table 8
Articles selected by systematic literature review

#	Author	Title	Database
1	Arshad e Ahlan	Understanding ITO decisions and implementations in Malaysia public healthcare sector: The evidence from a pilot case study	IEEE
2	Boehm *et al.*	Innovate on purpose-factors contributing to innovation in IT outsourcing	IEEE
3	Bu e Xu	Developing a decision model for IT outsourcing using analytic hierarchy process	IEEE
4	Dibbern, Chin e Kude	The sourcing of software services: Knowledge septicity and the role of trust. Theoretical foundations to information	ACM
5	Fan e Luna-Reyes	Theoretical foundations to information technology outsourcing research in the public sector	ACM
6	Gellings	Outsourcing relationships: the contracts IT governance tool	IEEE
7	Goo e Nam	Contract as a source of trust-commitment in successful IT outsourcing relationship: an empirical study	IEEE
8	Haiwei e Xiquan	Study on strategic factors of software outsourcing in China	IEEE
9	Hamid e Salim	Exploring the role of transactive memory system (TMS) for knowledge transfer processes in Malaysia e-government IT outsourcing	IEEE
10	Hamzah, Sulaiman e Hussein	A review on IT outsourcing approach and a proposed IT outsourcing model for Malaysians mes in e-business adoption.	IEEE
11	Hao	IT outsourcing risk assessment for Chinese enterprises based on service sciences and factor analysis	IEEE
12	Huai	Develop it outsourcing contract based on QFD.	IEEE
13	Huang e Goo	Rescuing IT outsourcing: Strategic use of service-level agreements.	IEEE
14	Kato	Software industry in Okinawa: the critical success factors for the Japanese Bangalore.	ACM
15	Kazmi e Manarvi	A methodology of identifying factors influencing foreign direct investment in ICT industry	IEEE
16	Kronawitter, Wentzel e Papadaki	IT application outsourcing in Europe: long-term outcomes, success factors and implications for ITO maturity	IEEE
17	Le, Huang e Zhang	China as a software outsourcing outlet: Status enabling factors, international impact, and growth determinants.	IEEE
18	Mann	Information technology and the related services industry: Evaluating India's success factors	IEEE
19	Oladapo *et al.*	Managing risk of IT security outsourcing in the decision-making stage. Antecedents of IT outsourcing	IEEE
20	Pfaller *et al.*	Antecedents of IT outsourcing- a longitudinal approach	IEEE
21	Ping, Fuji e Jian; Oladapo *et al.*	A multi-objective model of information system outsourcing decision for supplier's selection	IEEE
22	Ridchenko	Specifics of entry-level IT project managers in eastern Europe	IEEE
23	Thatcher *et al.*	IT outsourcing: assessing the antecedents and impacts of knowledge integration	IEEE
24	Wan *et al.*	Empirical study on IT outsourcing partnership with relational exchange theory	IEEE
25	Wiedemann, Weeger e Gewald	Organizational structure vs. capabilities: examining critical success factors for managing it service delivery	IEEE

#	Autor	Título	Base de dados
26	Wiesinger e Beimborn	How management actions affect social exchanges in outsourcing relationships	IEEE
27	Xia *et al*.	Customer satisfaction feedback in an IT outsourcing company: a case study on the Insigmahengtian company	ACM.
28	Yao, Watson e Kahn	Application service providers: market and adoption decisions	ACM
29	Yuanyuan e Suang	Contract renegotiation and bargaining power: evidence from IT-related outsourcing agreements	ACM
30	Zhang, Liu e Yan	A research of outsourcing decision--making based on outsourcing market maturity	IEEE