A FUZZY AHP ANALYSIS OF IT OUTSOURCING MONITORING IN PUBLIC ORGANIZATIONS

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Abstract
Current literature on information technology points to a scenario where resistance to change must be considered in all IT implementation processes. However, there is no consistency in the extant literature about the interplay among the several triggers to resistance to change in IT. This paper aims at surveying the literature and investigating their roles in IT change management. Fuzzy AHP (Analytical Hierarchical Process) is used to provide greater flexibility in understanding the answers. The results point to two main sets of behaviours (intrinsic and extrinsic), which find support from other management fields. This paper contributes to the literature by showing that contrary to what was formerly believed, resistance to change in IT is not as much linked to technical aspects but to personal and team-level causes. As a methodological contribution a weighting scheme to fuzzy AHP is introduced, to cope with varying degrees of information across teams, in order to add an improvement in the method used, aiming at a better precision in the results.

Keywords: IT. Outsourcing. Public sector. Multicriteria decision analysis. Fuzzy AHP.

UMA ANÁLISE DO MONITORAMENTO DA TERCEIRIZAÇÃO DE TI EM ORGANIZAÇÕES PÚBLICAS COM FUZZY AHP

Resumo
A literatura atual sobre tecnologia da informação aponta para um cenário onde a resistência à mudança deve ser considerada em todos os processos de implementação de TI. No entanto, não há consistência na literatura existente sobre a interação entre os vários causadores de resistência à mudança em TI. Este artigo tem como objetivo levantar a literatura e investigar seus papéis na gestão de mudanças de TI. O método Fuzzy AHP (Analytical Hierarchical Process) é utilizado para proporcionar maior flexibilidade na compreensão das respostas. Os resultados apontam para dois conjuntos principais de comportamentos (intrínsecos e extrínsecos), que encontram respaldo em outros campos da gestão. Este artigo contribui para a literatura ao mostrar que, ao contrário do que se acreditava anteriormente, a resistência à mudança em TI não está tanto ligada a aspectos técnicos, mas a causas pessoais e de equipe. Como contribuição metodológica é introduzido um esquema de ponderação para Fuzzy AHP,

para lidar com diferentes graus de informação entre as equipes, a fim de agregar uma melhoria no método utilizado, visando maior precisão nos resultados.

Palavras-chave: Tecnologia da informação - TI. Terceirização. Setor público. Análise de decisão multicritério. Fuzzy AHP.

1 INTRODUCTION

Outsourcing usually occurs whenever companies aim at cost reduction and greater efficiency in resource allocation (LANGER; MANI, 2018). Public enterprises are commonly pressured to replicate private companies in pursuing procedures that resemble such private organizations' strategies, in order to increase productivity and efficiency (SANTOS, 2013). However, in public enterprises, IT outsourcing is usually done through competitive bidding, as governments commonly retain control over service specification, contract management, and service provider performance assessment (JENSEN; STONECASH, 2005), which may limit the application of former private companies-based studies' findings to the public sector under such specific restrictions. As such, this study aims at evaluating relevant criteria for monitoring of outsourced IT contracts in public companies.

The main rationale for outsourcing in public IT services is cost reduction (GANTMAN, 2017). Cutting or controlling expenditures has become an important issue in the public sector, facing a competitive market. Budget control, transaction costs (including the making of IT-related contracts), as well as political arguments, are the three main factors in IT outsourcing decision (BENITO *et al.*, 2015). However, IT outsourcing in public enterprises can also be considered a market trend, in a sort of private-to-public bandwagon effect (LOH; VENKATRAMAN, 1992; QU *et al.*, 2011), becoming an institutionalized policy bandwagon (Common, 2004). The adoption of specific policies – as in the bandwagon effect – appears in public companies, aiming for greater competitiveness (ABRAHAMSON; ROSENKOPF, 1993; COX *et al.*, 2012).

The difference between the two sectors, public and private, should be considered in the IT outsourcing approach (KHALFAN, 2004). The public sector is bureaucratic and has an intrinsic aversion to the risks to which private companies are often exposed (GANTMAN, 2017). Comparatively, there are fewer studies that examine the relationship of outsourcing of public IT (LIN *et al.*, 2007; SWAR *et al.*, 2012; LIANG *et al.*, 2016; GANTMAN, 2017). Some authors consider several criteria that are sometimes inconsistent, which deserve more in-depth studies (POPPO; ZENGER, 2002; BLASKOVICH; MINCHIK, 2011; SUSARLA, 2012; LACITY *et al.*, 2017). Preliminary empirical studies on IT outsourcing in public enterprises are scarce, and little explored in the literature (KALE *et al.*, 2000; LIN *et al.*, 2007; GANTMAN, 2017).

This complex and multidimensional problem of IT outsourcing in the public sector still needs further studies, either in the technology aspect, helping governments use IT to improve public services, or from the government enterprises standpoint, which should use IT to solve their problems. To mitigate such conceptual inconsistencies, we propose using an altered Multicriteria Decision Analysis method (Fuzzy Analytic Hierarchy Process) to elicit the criteria and their order of magnitude in strategic decision making. To do so, we have gathered data from the high echelon, middle management and operational level, in a large IT-focused public company in São Paulo, Brazil. The monitoring or control characteristics of outsourcing contracts in public IT companies are integral parts of the contractual management of the public IT company. Management and contractual oversight not only involve legal aspects, but also operational aspects such as optimization of existing resources to achieve organizational objectives.

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Four main concepts related to contractual management emerge as significant: Service Level Agreement (SLA), empirical evidence, monitoring control, and knowledge transfer from the outsourced company to the public company. However different organizational levels do not interpret these in the same manner of importance. The results point to middle management as having the less distorted view of all, if compared to the aggregate global scores. This research aims at contributing to the understanding of the relationship between the monitoring or supervision of IT contracts for the improvement of outsourcing and services rendered.

2 LITERATURE REVIEW

Outsourcing is the substitution by third parties, in the acquisition, production or offering of goods or services for internal purposes (LACITY; WILLCOCKS, 2012). By delegating processes or services to third parties, it is possible to mitigate risks, as well as adding value and transferring knowledge to an organization. However, such practice requires a transformation in public organizations, which seek to regain focus on their main activity, favoring efficiency and optimization of management processes (GUARDA, 2011).

The advantage for public enterprises is that outsourcing allows them to concentrate on the main activity, delegating to third parties, sometimes more skilled in machinery and expertise, the cost and responsibility for otherwise inefficient goods or services. Disadvantages in this process may be the low provision of services by the outsourced, especially when there are no set control procedures for the monitoring of the outsourcing contracts execution. Monitoring controls require frequent feedback from the customer in the outsourced IT task, promoting supplier knowledge of customer expectations, and improving the quality of service level and satisfaction (LANGER; MANI, 2018). All significant positive and negative results found beneficial results from detailed contracts (LACITY *et al.*, 2017).

Recent literature shows the critical importance of contract management for the success of an outsourcing enterprise. Key issues related to the public IT outsourcing contract include risk and cost assessment, maintenance of internal technical knowledge to prevent opportunistic suppliers from causing loss of control over the project, and adequate monitoring and performance evaluation processes (GANTMAN, 2017).

2.1 IT outsourcing contract

The term IT outsourcing can be traced back to 1989 when Eastman Kodak outsourced its IT operations to the IBM Corporation. The market called this the trigger for the Kodak Effect, when several US companies followed suit and started to outsource their IT infrastructure (FOOGOOA, 2008). But after this period, economics studies considered firms and their markets, showing aggravating concepts such as transaction costs or the relationship between transaction costs, and contractual relations (KRISHNAN *et al.*, 2016) that contributed for outsourcing IT studies.

The initial instances of IT outsourcing aimed at reducing costs and seeking strategic advantages in business, but when it comes to public companies, most of them are legally barred from leasing, or transferring the management of good or services to private administration, just for the sake of reducing costs or lack of expertise. Many governments see IT as strategic but treat it only as another administrative tool (CORDELLA; WILLCOCKS, 2012). As such, IT outsourcing is still seen as a 'one-size-fits-all' solution for cost reduction but provides a different way of managing that is dependent on learning and continuous effort shared between clients and suppliers (LACITY; WILLCOCKS, 2012).

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The extant literature points to several aspects linked to IT outsourcing, such as contract type (SUSARLA, 2012; JOHANSSON, 2015; SOLIÑO; GAGO DE SANTOS, 2016), contractual evidence (ALAGHEHBAND *et al.*, 2011; JOHANSSON, 2015; LIN; VAIA, 2015), monitoring control (GOO, & NAM, 2007; WACKER *et al.*, 2016; SOLIÑO; GAGO DE SANTOS, 2016), SLA (SCHERMANN *et al.*, 2016; LACITY *et al.*, 2017; LANGER; MANI, 2018), contract negotiation (MOON *et al.*, 2016; LACITY *et al.*, 2017; LIANG *et al.*, 2016) and knowledge transfer (LACITY *et al.*, 2017; LANGER; MANI, 2018).

However, their instances on the literature are unequal and using a Pareto-like approach, we selected the four most important concepts (see Figure 1): Monitoring Control (MC), Empirical Evidence (EE), Service Level Agreement (SLA), and Knowledge Transfer (KT). Two other reasons for excluding concepts 5 and 6 are: a) another elbow in the number of citations which may mean they start to become residual in theoretical terms (different countries will have varying bureaucratic mechanisms to deal with this issue); b) Brazilian legislation (where data was collected) standardizes the type of contract and does not allow contract negotiation outside of this standard, making these two concepts alien to local reality.

Figure 1 –Selected (in red) and excluded (in blue) concepts

Source: Author

Our research is thus based on these four concepts related to contract management, considering that the monitoring of outsourced IT companies is directly related to contract management. The concepts found in the literature review were thoroughly checked by a questionnaire for professionals who manage outsourcing IT contracts. Noting initially the motivations that led many companies to use IT outsourcing as a solution to various problems, the supervision of IT contracts in the public company may help the execution of goals and objectives for the public service, audits and compliance.

2.2 Theoretical background

Service level agreement (SLA) is the commitment that the outsourced IT company assumes to meet the contracting public company according to the level of criticality of the problem that it will meet. SLA helps third-party IT service follow-up for contractual clauses and performance measurement. Activities encouraged by companies to be competitive can be controlled by effort when they are amenable to good measures (SUSARLA *et al.*, 2016). The effects of SLA service level agreement on relational management of outsourcing IT contracts

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are significant. SLA can stimulate a relationship of trust in the IT outsourcing (GOO; NAM, 2007).

Empirical contractual evidence – or just empirical evidence (EE) – comprises informal communication instances (telephone, e-mail, etc.) that can be used to exchange information knowledge between client and outsourced (DAVENPORT; PRUSAK, 1998; LACITY; WILLCOCKS, 2011). These empiric evidences can also be important records of commitment by the outsourced company in complying with the established contract. Such empirical evidences do not explicitly belong in the contract but support the idea that the contract is being actively considered in its full. The difference between the Service Level Agreement (SLA) and the empirical evidence is that the first case is a contractual clause, whereas the empirical contractual evidence is informal, not a mandatory part of contract performance. It occurs that the empirical contractual evidence is important as evidence for a possible audit or contractual penalty (GOO; NAM, 2007; ŠMITE *et al.*, 2010; JEONG; KURNIA; SAMSON; CULLEN, 2018).

Knowledge transfer (KT) is a process through which an organization identifies and learns the specific knowledge of another organization (HANSEN, 1999; YANG; MAXWELL, 2011), becoming a key issue for globally distributed work such as global development projects (KOTLARSKY; OSHRI, 2005). In some cases, the acquisition of knowledge from outsourced to the customer is so important that there are specific contractual clauses and increased costs with training. Excess customer costs were caused more by the need for greater knowledge transfer than by the need to protect against vendor opportunism (LACITY *et al.*, 2011).

The monitoring or supervision control (MC) is the level of control requirement of the contract, according to the importance of the asset. Considering two strategies for outsourcing: one with a single supplier and one with multiple suppliers, one argument posits that always threatens to lose business between different suppliers, will induce each supplier to a higher level of performance and quality. With a single outsourcing provider there is strong relationship development. While a single vendor's strategy leaves a company open to opportunistic bargaining and performance failure vulnerability, some have argued that it can be effective in some situations (NGWENYAMA *et al.*, 1997; KERN; BLOIS, 2002; YU *et al.*, 2009).

These four criteria and their definitions may be found on Table 1:

Table 1 – Criteria and descriptions

Criterion	Description	References
Service level Agreement (SLA	The commitment that the outsourced IT company undertakes to meet the public contracting company.	Susarla (2012); Schermann *et al.* (2016); Lacity *et al.* (2017).
Empiric evidence (EE)	Informal records of follow-up of contractual compliance.	Blaskovich & Mintchik (2011); Soliño & Gago de Santos (2016).
Knowledge Transfer (KT)	Knowledge that the outsourced company passes on to the public contracting company.	Oshri *et al.* (2008); Langer (2018).
Monitoring control (MC)	Level of supervision according to the importance of the contract asset	Kern (2002); Alaghehband *et al.* (2011); Blaskovich & Mintchik (2011).

Source: Author

2.3 IT outsourcing in public companies

Outsourcing of public service provision has become common, but despite its prevalence, there is still no consensus in the academic literature about the expected cost savings for government (JENSEN; STONECASH, 2005), as well as IT outsourcing. Public sector outsourcing is now an established mechanism for government service delivery, but in spite of

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the vast practical experience of governments, in many countries there is still relatively little agreement on whether outsourcing is uniformly beneficial or how large are the reductions of the costs for governments (POLLITT; BOUCKAERT, 2003). Different from other types of outsourcing, IT outsourcing has specific characteristics that differentiate it from other outsourcing areas, and companies make a mistake in treating IT outsourcing as a simple decision between doing or buying.

IT outsourcing in the public sector is considered highly complex compared to the private sector because of the legal requirements of governmental organizational processes and since IT outsourcing in the public sector is a politically sensitive process with many stakeholders defending different perspectives, often in conflict (LIN *et al.*, 2007). There is a greater possibility of successful outsourcing in public companies whenever there is a strong and committed IT area experienced in outsourcing and aligned with strategic objectives.
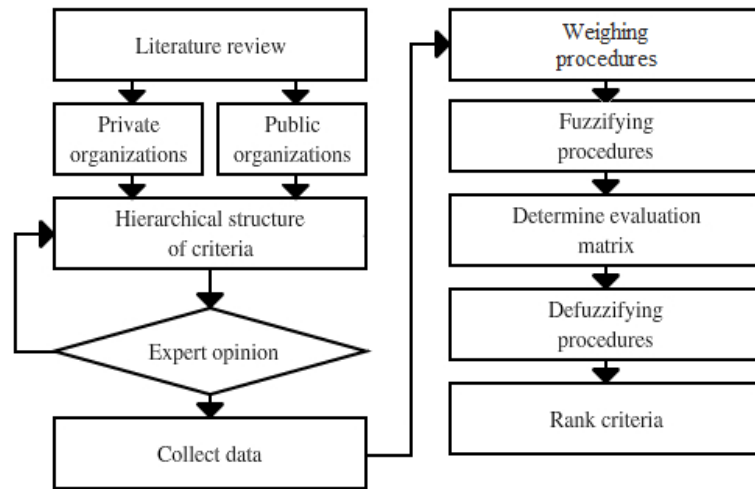
3 METHODOLOGY

Making structured decisions implies defining a structural decision mechanism. Whereas many methods were developed to cope with such wide range of possible applications, the Multicriteria Decision Analysis (MCDA) family of methods offers several options of mechanisms to define weights to criteria in order to decompose, measure and analyze multi-component problems (GRECO *et al.*, 2016). Among MCDA methods, the Analytical Hierarchical Process (AHP) offers a simple yet powerful mechanism to understand the proportional relationships between the weights of components in a given complex problem (SAATY, 2016).

AHP works by providing the possibility of pairwise comparison between components – for instance, decision-makers are asked to define whether concept A or B is more important and using a straightforward scale of importance (Saaty scale), specify quantifiable distances between those, the exception being the case of both concepts being equally important (LIBRANTZ *et al.*, 2016; OLIVEIRA NETO *et al.*, 2017). One advantage of using AHP for theoretical studies is that it separates de decision mechanism ("rules") from the alternatives ("products, processes, people, etc."), so that when decomposing theoretical problems in underlying theoretical components, alternatives are not necessary – which is not possible or easily feasible in other methods such as ELECTRE and PROMETHEE (SILVA *et al.*, 2018).

Nevertheless, a consistent criticism to basic usage of AHP is that the original method is not sensible to vagueness in the definition of discrete weights (CHAN *et al.*, 2008; MARTINS *et al.*, 2017). One option to handle such limitations is by integrating fuzzy logic to traditional AHP (NAZARI-SHIRKOUHI *et al.*, 2017). Fuzzy logic extenuates the crispness in the decision-making process, by increasing the sensitivity to vagueness. By using fuzzy logic AHP (FAHP), the linguistic variables are reworked in triangular fuzzy numbers (TFN) (CHANG, 1996; AYHAN, 2013). FAHP has been used, for instance, in IT procurement (Diabagaté *et al.*, 2017), IT implementation barriers (KUMAR; KANSARA, 2018) as well as IT personnel selection (SAMANLIOGLU *et al.*, 2018).

The following figure defines the proposed steps for the current analysis:

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Figure 2 –Proposed steps

Source: Author

Concisely, the literature was surveyed for IT outsourcing criteria in both private and public contexts. These were adjusted after expert opinions (both academic and practitioners). To analyze the data, we have used Ayhan's (2013) procedures, but altered it by introducing a weight adjustment procedure that privileges higher strategic choices rather than operational personnel's input (such differences are discussed further ahead). To gauge the criteria via linguistic expressions, the decision-maker uses Saaty scale (see table 2).

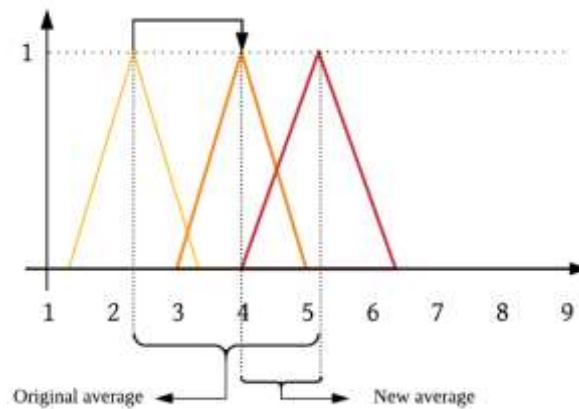**Table 2** –Saaty scale numbers, verbal descriptions and triangular fuzzy numbers

Saaty Scale*	Equivalent Verbal description	Triangular fuzzy numbers computed
1	Equally important	(1, 1, 2)
3	Weakly important	(2, 3, 4)
5	Fairly important	(4, 5, 6)
7	Strongly important	(6, 7, 8)
9	Absolutely important	(8, 9, 9)

Source: Author

* Numbers 2, 4, 6, and 8 are used when individuals have intermittent perceptions, their triangular fuzzy numbers' ranges are n-1 and n+1, just as the Saaty numbers above.

As an example, when a decision-maker states that Criteria A is fairly more important that Criteria B (A fairly > B), it is realized internally as triangular fuzzy numbers (4, 5, 6). Comparatively, if it were the opposite (A fairly < B), these would be operationalized as (1/6, 1/5, 1/4) on the contribution matrix. This pairwise choice is represented by $\tilde{d}_{ij}^{k}$ in the equation 1. As a weight adjustment procedure, first strategic personnel's average is computed and then all other (tactical, operational) responses in $\tilde{d}_{ij}^{k}$ are multiplied by a p weight, where for each tactical personnel's $\tilde{d}_{ij}^{k}$, 0.33 is added if under or 0.33 is taken if over the strategic personnel's average. The same happens for operational personnel, but with a different weight (0.66 penalty/award). We have collected both weighted and non-weighted data in the model for comparison.

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Figure 3 –Weighting procedure (visual example).

Source: Author

Such weighted pairwise triangular fuzzy numbers $\tilde{d}_{ij}^k$ express the kth decision-maker's preference of the ith criterion over the jth criterion and are included in the contribution matrix ($\tilde{A}^k$). The tilde emphasis sign marks the triangular number expression thereof. For instance, $\tilde{d}_{12}^1$ represents the first decision-maker's preference for the relationship between the first and second criteria, whose parameters are l, m and u – for example (2, 3, 4).

$$\tilde{A}^k = \begin{bmatrix} \tilde{d}_{11}^k & \tilde{d}_{12}^k & \dots & \tilde{d}_{1n}^k \\ \tilde{d}_{21}^k & \dots & \dots & \tilde{d}_{2n}^k \\ \dots & \dots & \dots & \dots \\ \tilde{d}_{n1}^k & \tilde{d}_{n2}^k & \dots & \tilde{d}_{nn}^k \end{bmatrix}$$

(1)

Whenever the decision-making process includes more than one decision-maker, the stated preferences are aggregated in an averaged triangular number set ($\tilde{d}_{ij}$), as the following:

$$\tilde{d}_{ij} = \frac{\sum_{k=1}^k \tilde{d}_{ij}^k}{k}$$

(2)

After the weight adjustment procedure and averaged preferences, the aggregated Ã matrix is as follows:

$$\tilde{A} = \begin{bmatrix} \tilde{d}_{11} & \dots & \tilde{d}_{in} \\ \tilde{d}_{21} & \dots & \tilde{d}_{2n} \\ \dots & \dots & \dots \\ \tilde{d}_{n1} & \dots & \tilde{d}_{nn} \end{bmatrix}$$

(3)

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According to Eq. 4, $\tilde{r}_i$ represents the geometric mean of the fuzzy comparison (triangular) values, for each criterion:

$$\tilde{r}_i = \left(\prod_{j=1}^{n} \tilde{d}_{ij}\right)^{1/n}, \quad i = 1, 2, \dots, n \tag{4}$$

Then, one must find the vector summation for each $\tilde{r}_i$. Next, it is necessary to compute the (-1) power of summation vector as well as substituting the triangular fuzzy number and set them in an increasing order. To find the fuzzy weight of criterion i ($\widetilde{w}_i$), one must multiply every $\tilde{r}_i$ by this reversed vector.

$$\widetilde{w}_i = \tilde{r}_i \otimes (\tilde{r}_1 \oplus \tilde{r}_2 \oplus \dots \oplus \tilde{r}_n)^{-1} \tag{5}$$
$$= (lw_i, mw_i, uw_i)$$

The next step is de-fuzzifying the triangular numbers. This de-fuzzified number is Mi. We follow Chang and Chou's (2008) centre of area method:

$$M_i = \frac{lw_i + mw_i + uw_i}{3} \tag{6}$$

Finally, since M_i is not a fuzzy number, it is normalized according to the following equation:

$$N_i = \frac{M_i}{\sum_{i=1}^{n} M_i} \tag{7}$$

Such procedures are applied to all criteria in a given decision, as well as the alternatives, whenever those exist. Since our analysis is of theoretical nature, no true alternatives exist (although the weights found in this paper may be applied to real IT outsourcing contracts in future studies).

4 DATA COLLECTION PROCEDURES

The respondents for this research were selected from public servants of a company part of Sao Paulo's (Brazil) city council specialized in IT services. The choice of Brazil for this study is due to the very restrictive legislation in place, which means a clear opposition to the flexibility private companies enjoy, ensuring a high degree of comparison. Thus, it is straightforward to understand the contrast between the flexible environments and business engagements in private companies versus the rigidity found in the public sector in most places. Special care was taken to consider respondents of three main organizational levels (strategic, tactical and operational) to ensure a balanced hierarchy in the concepts.

As for ethical concerns, we have made sure before, during and after the data collection responders were able to contact the researchers and were also ensured of the confidentiality in the data collected. The first phase was either a personal or telephone contact to obtain

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permission to include respondents in the study. Before sending out the data collection instrument, it was thoroughly pre-tested in two groups. The first group consisted of academics currently involved in research in IT and Knowledge management (n=8), to test for conceptual consistency. The second group consisted of professionals in the IT field (n=8, years working in IT: mean =11.83). After obtaining a list of potential respondents, an email was sent with an electronic spreadsheet, where they could use the provided tables to compare weights between the criteria. Hence, the numbers of experts assigned to this work, e.g. 21, could be considered adequate. During the 2-week data collection phase, respondents were assisted when needed and reminded to fill the spreadsheet. The original questionnaires may be obtained from the authors.

5 RESULTS

The data obtained is presented as follows – sampling characteristics, weighted responses and unweighted responses. Regarding the number of respondents, works already reported in the literature report that there is no minimum number of experts to participate in the decision-making process (DEY 2010; SHARMA; KUMAR 2015). It usually varies from 3 to 20 experts and this number depends on the experience and their level of knowledge in the process. In our case, the experts have more than 15 years of experience in IT outsourcing. We have obtained full responses from 21 respondents (years working in the public IT sector: mean = 19.71). Raw numbers were weighted according to level (strategic, tactical and operational).

The weighted pairwise comparison matrix (TFN) is as follows:

Table 3 –Weighted pairwise comparison matrix (TFNs)

	SLA	MC	KT	EE
SLA	(1.00, 1.00, 2.00)	(1.33, 1.41, 1.51)	(1.01, 1.11, 1.27)	(1.05, 1.10, 1.18)
MC	(0.75, 0.71, 0.66)	(1.00, 1.00, 2.00)	(1.20, 1.46, 1.73)	(0.61, 0.67, 0.77)
KT	(0.99, 0.90, 0.79)	(0.83, 0.68, 0.58)	(1.00, 1.00, 2.00)	(0.43, 0.47, 0.53)
EE	(0.95, 0.91, 0.85)	(1.64, 1.49, 1.30)	(2.33, 2.13, 1.89)	(1.00, 1.00, 2.00)

Source: Author

The global weights are also provided (to compare with non-weighted original method). Results are as follows for the four criteria:

Table 4 – Geometric means of fuzzy comparison values

SLA	lw	mw	uw	KT	lw	mw	uw
weighted	0.35	0.43	0.56	weighted	0.13	0.19	0.29
non-weig.	1.94	2.13	2.54	non-weig.	0.87	1.25	1.31

MC	lw	mw	uw	EE	lw	mw	uw
weighted	0.09	0.11	0.50	weighted	0.07	0.09	0.12
non-weig.	0.94	1.58	2.27	non-weig.	0.31	0.44	0.54

Source: Author

The relative fuzzy weights of each criterion are as follows:

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Table 5 –Quality criteria: Relative fuzzy weights of each criterion

	lw	mw	uw	Mi	Ni
SLA	0.29	0.40	0.63	0.44	0.40
KT	0.13	0.23	0.32	0.23	0.21
MC	0.14	0.29	0.56	0.33	0.31
EE	0.05	0.08	0.13	0.09	0.08

Source: Author

Finally, we have the following orders for all responses (weighted), as well as separated by level (strategic, tactical and operational).

Table 6 –Compared responses – Aggregated (weighted and non-weighted) versus specific roles

Weighted		Non-weighted		Strategic		Tactical		Operational	
1st	0.44	SLA	0.40	SLA	0.89	SLA	0.44	SLA	0.79	KT
2nd	0.26	MC	0.31	MC	0.07	KT	0.35	MC	0.15	MC
3rd	0.21	KT	0.21	KT	0.03	MC	0.09	KT	0.04	EE
4th	0.09	EE	0.08	EE	0.01	EE	0.12	EE	0.02	SLA

Source: Author

The results may be better understood using Figure 4:

Figure 4 –Results
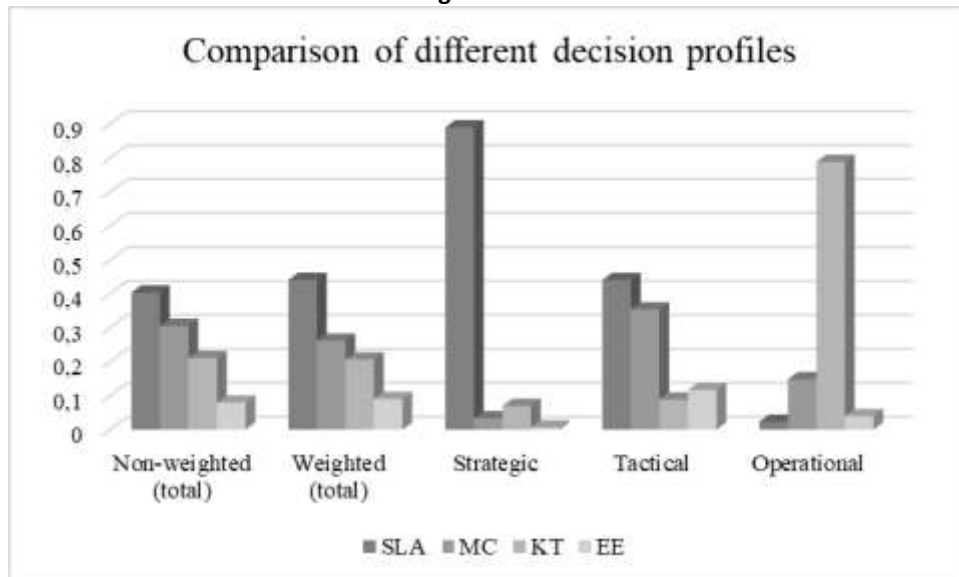
Source: Author

6 DISCUSSION

Possible IT outsourcing is always a risk which encourages weighing the trade-offs and potential outcomes between in-house IT service versus outsourcing, as well as any possible degrees of outsourcing. This issue is even more important in governmental, public bodies as political, media and population pressures may arise (GANTMAN, 2017). In addition, such trade-

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offs may never be as efficient as in private IT outsourcing contracts due to the plethora of different bureaucratic and juridical formats that surface in every country. In addition, it may arouse a matter of tension with external stakeholders, since such contracts provide access to sensitive data of people and organizations, and data security issues that directly affect citizens (CORDELLA; WILLCOCKS, 2012).

As such, discussing IT outsourcing in public bodies is a complex issue, given the mismatch between expected IT outsourcing procedures in private versus public organizations. During the survey of the literature, it was observed that there are many attributes related to the supervision or monitoring of IT contracts, but that they are strictly related to private sector practices. Thus, one must consider an inherent difference between public and private companies because they end up reflecting on how these different sectors treat IT outsourcing and contract management. As such, it is natural to perceive that the same criteria may appear in both contexts, but their orders of importance as well as their relative weights may differ significantly.

The literature review elicited four main criteria (excepting those linked to local legislations) that may have significant impact on public IT outsourcing performance (SLA, Monitoring Control, Empirical Evidence as well as Knowledge Transfer). The analyses validate those criteria for the public bodies' context, yet in a different order of importance and weight. This may cause studies to reconsider their results and outcomes since their measured behavior or variables may diverge from what was expected in the literature due to this mismatch.

This research results point to a slight difference between the data collected with the weighted and non-weighted procedures, which may be link to the fact that more weight was given to strategic responses. On the other hand, three decision profiles were also analyzed – strategic, tactical and operational areas. The interpretation of the results suggests a concern for contractual management level professionals is greater in complying with contractual clauses, such as SLA - service level agreement. Professionals who are often not present in the outsourced contractor's IT service, firmly rely on stiffer and punitive clauses, ensuring compliance with outsourced IT service. On the other hand, operational-level professionals, who often accompany outsourced IT service, have greater communication, and consequently value the transfer of knowledge, which not only serves them better knowledge of the environment they accompany, but also receives others knowledge, both tacit and explicit, aiding in the prediction and prevention of the environment.

Finally, it is important to cite the important role played by the middle management (tactical area) as tactical-level professionals or mid-level managers (located below top managers and above first-level supervision in the hierarchy) have a more balanced view (Dutton and Ashford, 1993). The standpoints between the strategic level (which has a more specific-oriented view) and the operational level (with a more technical view) are often antagonistic, which is not the case with the tactical hierarchical level. This corroborates the current literature, according to which middle management has a more balanced view and shows that middle managers are fundamental to explain the main organizational results and balance out extreme distortions in the strategy deployment (WOOLDRIDGE, 2008).

7 CONCLUSIONS, LIMITATIONS AND CONSIDERATIONS FOR PRACTICE

Most studies on public IT outsourcing do not consider the expenses and the importance of monitoring or supervising the contracts with outsourced companies for their success. On the other hand, IT outsourcing in the public sector does not receive so much attention from the scientific literature. This research points to the possibility that studies on public IT outsourcing may suffer from distortions in the theory generation and empirical measurement because of adoption of private IT outsourcing without adaptation.

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This study has some limitations. First, data was collected in only one country (Brazil). While this is an advantage in terms of comparison (Brazil has a fairly conservative legislation that does not allow flexible public-private partnerships as in other countries), this can be a problem for replication. Another limitation is the fact that Brazil is undergoing a severe financial crisis that may affect high echelon's responses and augment salience of law-related aspects (MARTINS; LUCATO, 2018; MARTINS *et al.*, 2019).

This research offers gaps to future research in public IT companies, such as greater oversight of outsourced companies that outsource contracted activities. Another possibility is a strategic level research, observing the influence of top management on IT outsourcing. We also suggest a relational management study encouraging the public sector to consider the inclusion of more flexible contractual clauses during IT contract enforcement, emphasizing greater stakeholder management and knowledge sharing among outsourced IT companies and public companies. As a final advice for both academics and practitioners, future studies may need to consider an initial validation phase before collecting empirical data. This also points to the fact that studies that directly employ private IT outsourcing literature in public contexts may have to be more conservative in their discussions and theory generation.

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