

A fuzzy-AHP analysis of IT outsourcing monitoring in public organizations

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1. Introduction

Outsourcing routinely occurs whenever companies aim at cost reduction and greater efficiency in resource allocation (Langer, 2018). Public enterprises are commonly pressured to mimic private companies in pursuing procedures that resemble such private organizations' partnerships, in order to increase productivity and efficiency (Santos, 2013). However, in public enterprises, IT outsourcing is usually done through competitive bidding, as government usually retains control over service specification, contract management, and service provider performance assessment (Jensen & Stacon, 2005), which limits the application of former private companies-based studies' findings to the public sector under specific restrictions. As such, this study aims at evaluating the monitoring of outsourced IT contracts in public companies, through its fundamental criteria for adequate execution of the service provision.

The main rationale for outsourcing in public IT services is cost reduction (Gantman, 2011). The need to cut or control expenditures has become an important issue in the public sector, facing a competitive market (Willcocks, 2011). 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, 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, 2011). On the other hand, there are few studies that examine the relationship of outsourcing of public IT (Lin et al, 2007; Swar et al., 2012; Liang, 2015; Gantman, 2017). Some authors consider several criteria that are sometimes inconsistent, which deserve more in-depth studies (Poppo, 2002; Blaskovich, 2011; Susarla, 2012; Lacity, 2017). Preliminary empirical studies on IT outsourcing in public enterprises are scarce, and little explored in the literature (Kale, 2000, Lin, 2007, Gantman, 2011, Mukhopadhyay, 2015).

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 (Fuzzy AHP - Analytic Hierarchy Process) to elicit the constructs 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 the legal aspect of legality, but also the operational aspects such as optimization of existing resources to achieve organizational objectives.

Four main concepts related to contractual management emerge as significant: Service Level Agreement (SLA), empirical evidences, 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 mainly 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, favouring efficiency and optimization of management processes (Guarda *et al.*, 2015).

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, 2018). All significant positive and negative results found beneficial results from detailed contracts (Lacity, 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, 2011).

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 not a silver bullet for success, but provides a different way of managing that is dependent on learning and continuous effort shared between clients and suppliers (Lacity & Willcocks, 2012).

The extant literature points to several aspects linked to IT outsourcing, such as service criticality (Poppo & Zenger, 2002; Lacity, Solomon, Yan & Willcocks, 2011; Lacity, Khan & Yan, 2017), contractual evidence (Alagheband, Rivard, Wu & Goyette, 2011; Johansson, 2015; Lin, & Vaia, 2015), monitoring control (Goo, & Nam, 2007; Wacker, Yang & Sheu, 2016; Soliño & Gago de Santos, 2016), SLA (Schermann, Dongus, Yetton & Krcmar, 2016; Lacity, Khan & Yan, 2017; Langer & Mani, 2018), overall service quality (Johansson, 2015; Lin, & Hekkala, 2016; Lu, Hu, Bi, Huang, & Zhao, 2018) and knowledge transfer (Lacity, Khan & Yan, 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: Monitoring Control (MC), Empirical Evidence (EE), Service Level Agreement (SLA), and Knowledge Transfer (KT). There is an elbow in the degree of influence between the 4th and 5th concepts, which is the reason for the 4-criteria selection.

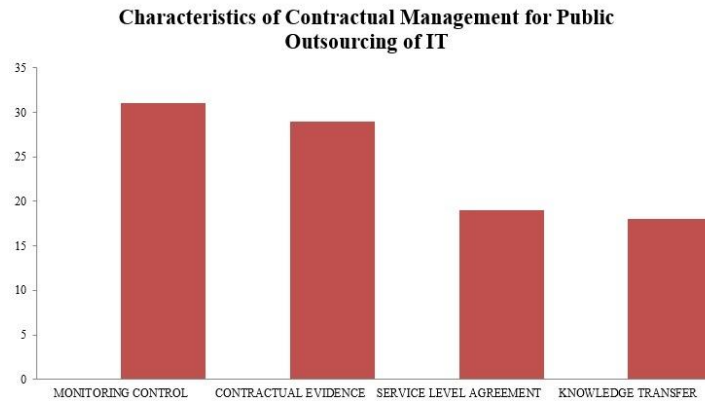


Figure 1 – Main concepts selected through a Pareto-like approach

Our research is thus based on these four concepts related to contract management, considering that the monitoring of outsourced IT companies is directly linked to contract management. The concepts found in the literature review was 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 Concepts

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, 2016). The effects of SLA service level agreement on relational management of outsourcing IT contracts are significant. SLA can stimulate a relationship of trust in the IT outsourcing (Goo, 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; Smite & Feldt, 2010; Morgan, Doran & Morgan, 2018; 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, 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, 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, 1997; Kern & Blois, 2002; Burke et al., 2007; Yu et al., 2009). See the operational definitions for this research on Table 1:

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

Table 1 – Criteria and descriptions

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, 2005), as well as IT outsourcing. Public sector outsourcing is now an established mechanism for government service delivery, but in spite of 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, 2000). 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 (Lacy & Wilson, 2001).

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, 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. Method and data collection

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 analyse 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. One advantage of using AHP for theoretical studies is that it separates the 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). 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 numbers (Buckley, 1985; 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:

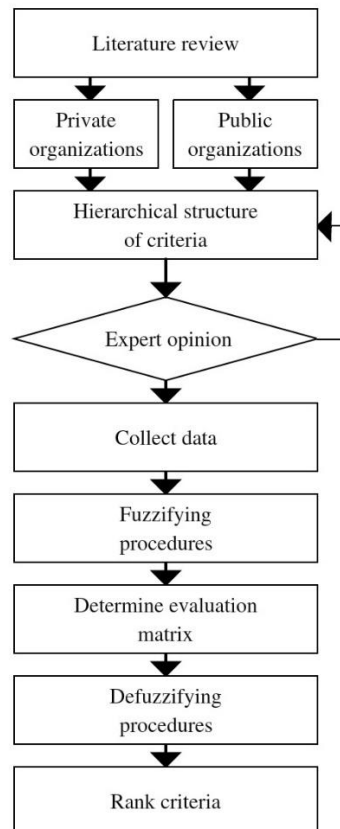


Figure 2 – Proposed steps

To analyse the data, we have used Ayhan’s (2013) procedures, but altered it by introducing a weighting scheme that privileges higher strategic choices rather than operational personnel’s input (yet such differences are discussed further ahead) – see equation 1. To gauge the criteria via linguistic expressions, the decision-maker uses Saaty scale (see table 1).

Saaty Scale	Verbal description	Fuzzy triangular numbers
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)

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

Table 2 – Saaty scale numbers and intermediate values

To simplify data collection and reduction noise in the responses, decision-makers were offered only the (triangular) central value (1, 3, ..., 9) and the full triangular set was used only in the computation phase.

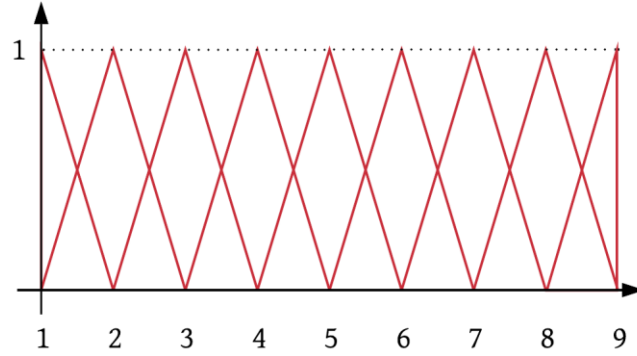


Figure 2 – Overlapping values for all possible choices

As an example, when a decision-maker states that Criteria A is fairly more important than 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 2. As a weighting scheme, every number in \tilde{d}_{ij}^k is multiplied by a p weight, where strategic personnel's weight is unchanged, tactical personnel is multiplied by 0.66 and operational personnel by 0.33 – penalization of 1/3 and 2/3 (see eq. 01) if over the average strategic, and the opposite when under average strategic response.

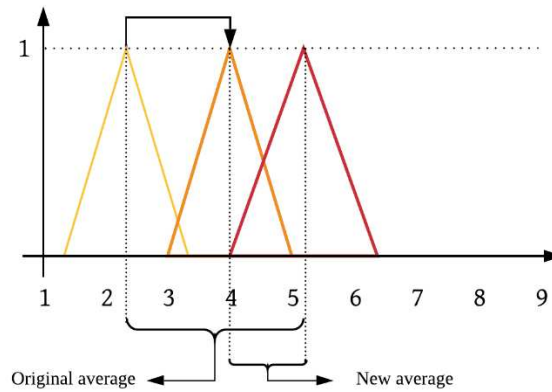


Figure 3 – Weighting procedure (example)

Such weighted pairwise triangular numbers \tilde{d}_{ij}^k express the k^{th} decision-maker's preference of the i^{th} criterion over the j^{th} 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, for example (2, 3, 4).

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

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 in Eq. 3.

$$\tilde{d}_{ij} = \frac{\sum_{k=1}^k \tilde{d}_{ij}^k}{k} \quad (3)$$

After the weighting scheme and averaged preferences, the matrix is as follows (Eq. 4)

$$\tilde{A} = \begin{bmatrix} \tilde{d}_{11} & \dots & \tilde{d}_{1n} \\ \tilde{d}_{21} & \dots & \tilde{d}_{2n} \\ \dots & \dots & \dots \\ \tilde{d}_{n1} & \dots & \tilde{d}_{nn} \end{bmatrix} \quad (4)$$

According to Eq. 5, \tilde{r}_i represents the geometric mean of the fuzzy comparison (triangular) values, for each criterion:

$$\tilde{r}_i = \left(\prod_{j=1}^n \tilde{d}_{ij} \right)^{1/n}, \quad i = 1, 2, \dots, n \quad (5)$$

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 fuzzy triangular number and set them in an increasing order. To find the fuzzy weight of criterion i (\tilde{w}_i), one must multiply every \tilde{r}_i by this reversed vector.

$$\begin{aligned} \tilde{w}_i &= \tilde{r}_i \otimes (\tilde{r}_1 \oplus \tilde{r}_2 \oplus \dots \oplus \tilde{r}_n)^{-1} \\ &= (lw_i, mw_i, uw_i) \end{aligned} \quad (6)$$

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

$$M_i = \frac{lw_i + mw_i + uw_i}{3} \quad (7)$$

Finally, since M_i is not a fuzzy number, it is normalized according to equation 8:

$$N_i = \frac{M_i}{\sum_{i=1}^n M_i} \quad (8)$$

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).

3.1 Data collection procedures

Our sample was 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. Special care was taken to consider respondents of three main organisational 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 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 ($n=8$, age: mean=36.5, sd.=12.6; years working in IT: mean =11.83, sd.=6.15). 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. 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.

4. Analysis of results

The data obtained is presented as follows – sampling characteristics, weighted responses and unweighted responses. We have obtained full responses from 21 respondents (males = 66.66%, age mean=44.17, sd.=9.06; years working in public sector IT mean = 19.71, sd.=10.85). Raw numbers were weighted according to level (strategic, tactical and operational). The global weights are also provided (to compare with non-weighted original method) - see weighted versus non-weighted. Results are as follows for the four criteria:

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

Table 3 - Geometric means of fuzzy comparison values

The next step is establishing the quality criteria for the overall decision. To do that it is necessary to compute the reverse power and increasing order:

		lw	mw	uw
Total	weighted	4.05	5.39	6.65
	non-weighted	0.63	0.82	1.47
Reverse power	weighted	0.25	0.19	0.15
	non-weighted	1.58	1.23	0.68
Increasing order	weighted	0.15	0.19	0.25
	non-weighted	0.68	1.23	1.58

Table 4 – Total, reverse and increasing order

The relative fuzzy weights of each criterion are as follows:

	lw	mw	uw	M_i	N_i
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

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

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

	Weighted (all responses)	Strategic		Tactical		Operational	
1 st	0,441	SLA	0,89	SLA	0,44	SLA	0,79
2 nd	0,262	MC	0,07	KT	0,35	MC	0,15
3 rd	0,207	KT	0,03	MC	0,09	KT	0,04
4 th	0,090	EE	0,01	EE	0,12	EE	0,02

Table 6 - Compared responses – Weighted all responses versus specific roles

The final results are as follows:

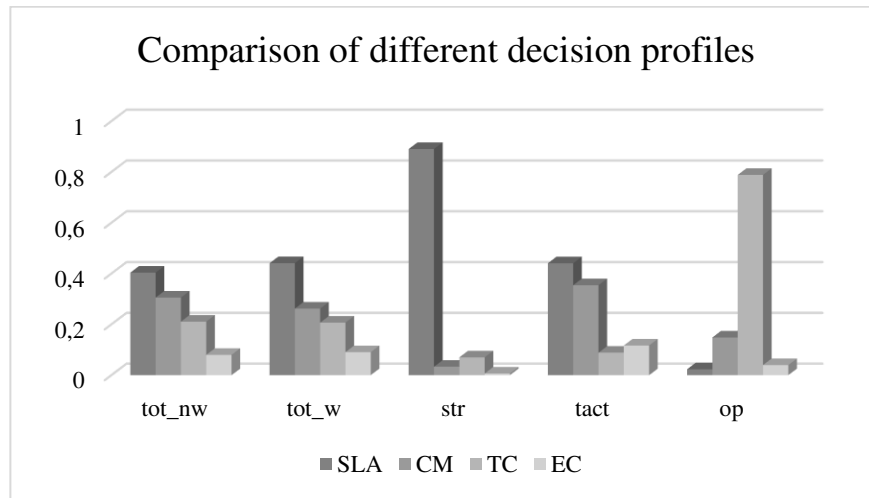


Figure 4 – Different decision profiles according to levels

5. 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 (Willcocks & Craig, 2007). In addition, it may arouse a matter of tension with external stakeholders, since it provides access to strategic data to people and organizations, and data security issues that directly affect citizens (Cordella & Willcocks, 2009).

Another issue to consider is the value of services: the value of the private service can be assessed by financial indicators, but the public value is not so easy to estimate because it is linked to the achievements and objectives of government programs, and delivery of public services to citizens. In this way, public value is not linked to the efficiency of the public machine, but to the effectiveness of governmental programs (Moore, 1995). From a bureaucratic perspective, outsourcing IT is not only a way to reduce bureaucracy, but also to support administrative functions. If different levels of control and monitoring are more outsourced, there may be a more efficient and less bureaucratic governmental decision-making process (Cordella & Willcocks, 2009).

As such, discussing IT outsourcing in public bodies is a very relevant issue, albeit a complex one, 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. We 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. While public enterprises have a political bias and a focus on social achievements, private companies are mainly concerned with market competition and their survival.

The objective of this study was to analyse the monitoring characteristics of outsourcing IT contracts in public companies, through contractual management, whose main focus for the evaluation is the monitoring or monitoring of contractual clauses, mandatory in Brazil. Contracts with the public sector in Brazil must be supervised by a manager and a fiscal designated formally for the purpose of correct execution of contract (Brazilian federal law 8.666, 1993) (Da Costa, 2013; Neves, 2018). This law aims at guiding bids by guaranteeing the impartiality of the participants of the contest that offer goods or services to the public administration, selecting the best proposal offered, in addition to promoting the public good. It also establishes mechanisms to ensure the legal basis of the bidding contest, non-targeting of a product or service, decorum,

disclosure to the interested public, and legality of the basic principles for public administration. (Da Costa, 2013). This legal obligation makes explicit those responsible for this important task in the public sector, whose focus on contractual management aims more at compliance with contractual clauses than a closer relationship with outsourced IT companies, unlike what is observed by a trend in the private sector.

But in spite of this obligation in Brazil, or even the increasingly current use of outsourcing IT outsourcing services in public companies around the world, the academic literature is still sparse and not consensual in this regard. Current literature review shows the interests for outsourcing IT in the private sector, whose focus is relational management increasingly directed to business partnerships through stakeholders. In the public sector IT outsourcing is still complex and multifaceted, with several agreements that fail or have problems of completion. As a market success factor, the tendency to prioritize relational management over contractual management is not followed by the public sector, and literature studies on this subject are still rare (Neves, 2018).

Since many criteria emerge, with varying degrees of conceptual overlapping, four main constructs related to contractual management were reached, through a Pareto-like approach. To treat these constructs, we employed MCDA methodology - multicriteria decision analysis - Analytic Hierarchy Process - because it is a well-established method in the academic literature, besides addressing a complex survey between these relations, precisely because they are of character personal or subjective of the specialists and often of difficult exhibition. The wide acceptance of the AHP method is its ability to capture unexplained criteria, handle them and measure them, rank them and establish weights, obtaining a score (Mohanty, Agarwal, Choudhury & Tiwari, 2005). The method initially decomposes the problem in n different criteria, defines a scale of values and their weights, and submits these criteria to the experts for Saaty's decision two by two, assigning them a value of scale, through interviews or questionnaires. Next, the hierarchy of these criteria and the defuzzification are made, transforming the opinions into values and diminishing the subjectivity of the answers.

Two major advantages of the AHP multicriteria decision analysis method are the measurement of often intangible factors and the attainment of the expertise of the specialists who elaborate the Terms of Reference, which is the technical part of the contracts, as well as the monitoring and supervision of the companies outsourced IT companies in public enterprises. Several lessons have been learned, both in the implementation of the method and in obtaining the data from the questionnaires, which were sent together with an earlier presentation and a simple example of response to the specialists who perform the contractual technical management.

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.

6. Conclusions, limitations and considerations for practice

Most studies on outsourcing IT in public companies do not consider the expenses and the importance of monitoring or supervising the contracts with outsourced companies for their success. This research shows this importance for the success of service delivery to the population. On the other hand, IT outsourcing in the public sector does not receive so much attention from the scientific literature. Studies on the outsourcing of IT in public companies are little studied. There are no empirical studies or appropriate reference literature on the subject (Lin *et al.*, 2007).

The scope of this research considers the professionals that perform the contractual management of outsourced contracts, not worrying about the levels of strategic hierarchy of the public company. Another limitation of this study is the focus on an IT provider for the public sector, whose business purpose is to provide IT services to the public sector.

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.

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