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The Influence of Supplier Assessment in the Termination of Oil and Gas Exploitation and Production Contracts in Brazil

Abstract

The supplier performance assessment literature shows that the prior identification of contracts considered unsatisfactory may prove crucial to the maintenance of a company, especially in sectors with high operational and environmental risk and significant investments, such as the oil and gas exploitation sector. Although considered important, contract termination has been little studied in the Brazilian oil segment, due to the small number of firms operating in the sector and restricted access to information from these companies. This article aims to reduce this gap by analyzing what service assessment criteria most influence contract terminations in the Brazilian sector of oil and gas exploitation and production. Therefore, the assessments of service contracts terminated between 1/1/2006 and 12/31/2014 by a business unit active in oil and gas exploitation and production located in Brazil were analyzed using logit regressions. In the resulting database, 273 contracts were found that include all specialized services in the activity, totaling 19,613 ratings. The results indicate that the Term and Logistics criteria reveal the greatest influence on contract cancelations of the sector activities. In addition, by segregating the analysis by specialty, it was found that different specialties have different requirements and therefore different contractual arrangements. These results empirically corroborate the theoretical discussions in the literature about the importance of compliance with contractual obligations, especially with regard to the negotiated deadlines.

Key words: Supplier Performance Assessment. Service Contract Termination. Oil and Gas Exploitation and Production.

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1 Introduction

Identifying outsourced service contracts with poor performance may prove crucial for the operational maintenance of contractors (Williamson, 1985; Hart & Moore, 1990; Tirole, 2007), especially in sectors that require large investments and have high operational risks, such as the exploitation and production of oil and gas. That is so because the suspension of activities by failure of the contracted company could result in significant financial losses to the contractor (Suslick, 2002; Kaiser & Pulsipher, 2004). For example, the termination of a power supply contract on an oil exploitation and production platform can lead to the paralysis of activities and, consequently, the interruption of production.

The termination of the contractual relationship can occur through the enforcement of a condition (Normal Closure), agreement between the parties (Cancelation) and lack of proper provision (Termination) (Pereira, 2003; Gasparini, 2007; Di Pietro, 2008). In the case of termination, there will be an increase in transaction costs (Williamson, 1985; Hart & Moore, 1990; Hart, 1999; Tirole, 2007), for the contracting company due to the need to conduct a new procurement process, and the costs resulting from the termination of the contract and its possible legal and operational risks (Basel Committee on Banking Supervision, 2005).

One way to minimize the effect of potential contract terminations, as well as the costs involved, would be the assessment through periodic monitoring of services provided by suppliers based on previously established criteria, such as reliability and quality of services, additional costs, flexibility, quality and speed of delivery, etc. (Williamson, 1985; Baily, Farmer, Jessop & Jones (2000); Slack, Chambers & Johnston (2002); Stueland, 2004; Bowersox & Closs, 2001).

The aim of this paper is to analyze the importance of monitoring suppliers (through ratings) in identifying contracts terminated unilaterally by the contracting company and possibly incurring transaction costs for that company. Specifically, the work seeks to study what assessment criteria of service providers that most influence the contract terminations in the oil and gas exploitation and production sector.

Although it is considered important from thefinancial and operational view point of businesses, this research topic has been little studied, due to the low number of firms operating in the (Brazilian) sector and restricted access to information on these companies. The studies relating to contracts in the oil sector include Kaiser and Pulsipher (2004), who investigated the contractual tax system for the development of deepwater fields in Angola, and Coriolanus, Kings and Delgado (2013) who discuss model contracts for exploitation and production of oil and gas. None of them, however, investigated the relationship between the evaluations of the services provided and the contract termination.

To be able to investigate the relationship between performance assessment of suppliers and contract termination, a descriptive case study was considered, which was analyzed based on the evaluations of the service providers of a unit of a multinational oil company operating in Brazil and several other countries. The initial database contained all service contracts hired and closed off between 1/1/2006 and 12/31/2014. As the focus of this study was to analyze the relationship between the performance assessments of contractors and contract termination contracts signed in the period that remained in effect as from 31/12/2014 were excluded. The resulting database contained 273 service contracts, with a total of 19,613 ratings.

In this company, the services are evaluated at least every quarter through objective scores on criteria such as: logistics (storage, transport, equipment and facilities), Management, Term, Quality, Human Resources (HR) and Safety, Environment and Health (SEH). These criteria are similar to those analyzed by Baily et al. (2000), Bowersox and Closs (2001) and Stueland (2004). The criteria of these assessments are contained in the conditions of the contract, and objective scores range from 0 to 100 points. The scores of the criteria are defined according to the specialty of the service, and the marks awarded are framed in concepts: bad, poor, regular, good and excellent.

It is noteworthy that the evaluations of suppliers are a crucial part in the decision to terminate or maintain the contractual relationship of the company. In this sense, suppliers are expected to make visible efforts to provide good services, translated into good grades. Consequently, we anticipate a negative

relationship between the notes of the assessments and the likelihood of a contract being terminated. In other words, contracts with higher quality are less likely to be unilaterally terminated by the contracting company. In this study, we used logit regressions, so that it was possible to identify what evaluation criteria for service providers that most influence the contract terminations in the oil and gas exploitation and production sector.

Based on the results, it was observed that the performance evaluation criteria that influenced the increased likelihood of termination (average and median) were "Term" and "Logistics". These results corroborate the understanding by Suslick (2002) and Kaiser and Pulsipher (2004), in which the oil exploitation and production segment has high business risks attributed to uncertainties about the outcome, the high costs and the large amount of requirements defined by law, confirming the importance of compliance with contractual obligations, especially the negotiated terms.

Additionally, it was observed that different specialties presented demands and peculiar bottlenecks, since the criteria that more strongly affect the probability of termination differ among specialties. These results are relevant in that they can direct supplier monitoring policies to minimize potential contract terminations and, consequently, maximize the performance of the contracting firm.

The relevance of analyzing terminated contracts is evident in the results of the descriptive analysis, which indicate a high percentage of terminated contracts, corresponding to 7.69% of the quantity and 10.82% in value of the contracts closed during the period. It was also established that the contract terminations are concentrated in the General Service, and Construction, Assembly and Industrial Maintenance contracts. It is worth noting that approximately 25% of assessments in the General Services specialty show results inferior to 70 points, corroborating to justify the large percentage of contract terminations in this type of service. Similarly, you can see that the criterion Term received about 35% of unsatisfactory evaluations.

The relevance of this work is the confirmation of the importance of monitoring the economic agents in order to avoid possible events that raise the transaction costs of the company (in this case the contract terminations). The study of informational relevance is related to accounting. Specifically, the focus of this work is based on management accounting techniques of project (contract) analysis and monitoring.

In addition, the study seeks to enhance the understanding of the framework for evaluating a large company's contracts and relevance in the Brazilian economic sector. Due to the complexity and diversity of the contracts present in the study, through this case study, the intention is to contribute to a better understanding of the process of monitoring and managing contractual relations. For example, the results (and method) can help companies find potential policy directions for improving a company's contract management, as it identifies which criteria have a greater effect on the likelihood of a contract being terminated, specifically in a company engaged in oil and gas exploitation and production.

Understanding and improving the management of contracts by means of actions to reduce the possible contract terminations seems to be interesting for all companies, in line with Klein (1992), who states that the improvement in contract design can reduce the likelihood of opportunistic contract termination. The results suggest possible directions of new policies for increasing the efficiency of this management, as it identifies which criteria have a greater effect on the likelihood of a contract being terminated in an oil and gas exploitation and production company.

This work is divided into four sections, besides this introduction. The next section presents the literature review, starting with the description of the outsourcing process and continuing with the discussion of theories, such as Transaction Costs and Incomplete Contracts; in Section 3, the method that was used for this study is described, demonstrating how to calculate the data and clarifying the performance assessment criteria used, in addition to the proposed model with its dependent and independent variables; Section 4 presents the results observed based on the logit model and, finally, section 5 presents the conclusion and other comments.

2. Outsourcing and transaction cost economics

Fine (2000) argues that the design of the supply chain consists in selecting which activity should be outsourced to suppliers (make vs. buy), choosing which provider to use (selection of suppliers) and negotiating the contract. Chopra (2013, p. 428), in turn, defends that hiring decisions are essential because they affect the level of efficiency and responsiveness the supply chain can achieve. According to that author, hiring decisions must be made to increase the total amount of surplus to be shared through the supply chain.

The total surplus is affected by the impact of hiring on sales, services, and costs like production, storage, transportation and information. In such cases, the hiring of third parties becomes significant if it raises the supply chain's surplus to a higher value than the surplus generated when the firm verticalizes the production process (Mcivor, 2005).

According to Williamson (1985), the hiring decision will always be made in view of the possibility of reducing costs and the importance of asset specificity. In this context, the efficient management of service contracts helps to reduce costs and improve profitability (bulk buying can provide economies of scale); reduce waste through the selection of inputs that produce less waste (and lower costs); manage demand, for example, by just-in-time delivery; improve the cash flow for better prices and payment terms; improve efficiency, ensuring that providers deliver services under the negotiated conditions and deadlines; and improve the competitiveness of the business, looking for innovative products and services that add value.

In this study, the theory of Transaction Cost Economics (TCE) was used as a reference for the decision of outsourcing because, according to Lacity and Hirschheim (1993), TCE is most commonly used for analyses of the service outsourcing process, especially for economic development decisions, in which the relationship between cost and benefit is considered essential for choosing the winning company to be hired.

2.1 The Incompleteness of Contracts and Contract Monitoring

To act in the market, companies incur transaction costs (Coase, 1937). These costs are related to the incompleteness of contracts and opportunistic behavior of the economic agents in the transactions (Williamson 1985). The incompleteness of the contracts refers to the inability of the principals to be able to predict (ex-ante) all situations that may arise during contract execution (Hart & Moore 1990; Tirole 2007 and Williamson 1985), whether due to limited rationality (Williamson, 1985) or high contract costs (Hart & Moore, 1990).

The opportunistic behavior of agents also affects the cost of contract design (Klein, 1992) and may aggravate the financial situation of a firm whose contracts permit these agents' discretion. Since transaction costs and contractual incompleteness are characteristics inherent in the business, there is a need for companies to create monitoring and control structures to mitigate potential contract costs and reduce opportunistic behaviors (Van De Ven, 1976; Willcoks & Fenny 1998).

One way for this monitoring to occur is through supplier ratings (Gomes, 2014), that is, through periodic monitoring of services provided by suppliers based on previously established criteria, such as reliability and quality of services, additional costs, flexibility, quality and speed of delivery, etc. (Williamson, 1985; Baily et al., 2000; Slack et al 2002; Stueland, 2004; Bowersox & Closs, 2001).

2.2 The Contract Termination

The transaction cost example studied in this work refers to the termination, which results, in addition to economic losses, in trading costs of a new contract (Williamson, 1985; Hart & Moore, 1990; Hart, 1999; Tirole, 2007). The termination of the contractual relationship transmits the idea of the extinction of the contract and occurs through the enforcement of a condition, agreement between the parties or lack of proper provision (Pereira, 2003; Gasparini, 2007; Di Pietro, 2008).

The enforcement of a condition, ie the compliance with the conditions agreed in the contract, extinguishes the obligations of the parties and, therefore, the contract itself. In this work, these contracts will be called Normal Closure. The agreement between the parties or bilateral cancelation, then, is the agreement between the parties to anticipate the end of the contract. The contracts terminated this way will be called Cancelation. Finally, the lack of proper provision presupposes the non-fulfillment of obligations by one of the parties, which may give rise to the termination of the contract by the other party. In this work, unilaterally terminated contracts will be called Termination (Gasparini, 2007; Di Pietro, 2008).

Some of the reasons that result in contract terminations are: unwarranted delay in the start of the service; irregular compliance with obligations; interruption of service, without just cause; and protesting of bills or checks without sufficient provision of funds. The termination may give rise to the responsibility of the contracted company and the contractual consequences that are established by law, in addition to the application of the following sanctions: warning; fine; suspension of participation in bidding; and ban to participate in bidding (Brasil, 1998b).

In the case of termination, this may lead to increased transaction costs (Williamson, 1985; Hart & Moore, 1990; Tirole, 2007) for the contracted company, which will have immediate costs for the demobilization of the resources allocated and may suffer sanctions defined by law (Brasil, 1998b). The same applies to the contractor, because of the need to conduct a new hiring process, which includes the negotiation, contract drafting and expenses arising from the start of this new contract, besides the costs arising from the termination of the previous contract and its possible legal and operational risks.

According to the Basel Committee on Banking Supervision, legal risk includes, but is not limited to exposure to fines, penalties, or indemnities arising from lawsuits, as well as private settlements. Similarly, operational risk is defined as the risk of losses resulting from inappropriate or failed internal processes, people and systems or even external events (Basel Committee on Banking Supervision, 2005).

Studies on the theory of transaction costs and contract features are found especially in case studies in the construction sector, for example, Greenwood and Yates (2006), Eriksson (2008) and Gomes (2014). Specifically, Greenwood and Yates (2006) found that partnership relations helped to mitigate transaction costs arising from contractual incompleteness and the opportunistic behavior of agents. In turn, Eriksson (2008) studied the characteristics of the contracts that are linked to the relation of partnership in the construction sector (specificity, frequency, uncertainty) and noted that these are relevant at the moment of hiring. These results are supported by Gomes (2014).

Like in the oil sector, the motivation for studies in the construction sector derives from the complexity of the sector, aligned with the high transaction costs present (Gomes 2014). It is noteworthy that the activities of oil exploitation and production involve various geological, economic and financial risks (Nepomuceno, 2000). As an example of financial risks, we can mention the financial figures submitted by the largest operator in Brazil, Petrobras, which employs high technology and financial resources, with investment planned for the five-year period 2014-2018 corresponding to US$154 billion (PETROBRAS, PNG 2014-2018).

However, the difficulty to get access to data in the oil sector reveals a major reason for the lack of studies on contractual relations and the theory of transaction costs, especially in Brazil, where the National Petroleum Agency (ANP) regulates oil exploitation via tenders (Brazil, 1998a).

3. Method

3.1 Sample Selection Procedure and Empirical Design

The study was elaborated through a descriptive analysis (Yin, 2001) and was analyzed based on the procedures used for the assessment of service suppliers of a multinational oil company with a strong presence in Brazil and other countries. It was developed based on a database composed of all service contracts closed between 1/1/2006 and 12/31/2014. Since the focus of this study was to analyze the influence of supplier performance assessments on the termination of contracts, contracts signed during this period and which remained in effect as from 12/31/2014 were excluded. It is worth noting that all the contracts examined were unilaterally terminated by the contracting company.

The company analyzed in this work, in the contractor role, uses its own mechanisms to regulate transactions (Jensen & Meckling, 1976; Azevedo, 2000), which in this case is the follow-up and monitoring of service contracts. For this purpose, the services are evaluated through performance assessments that are conducted mandatorily at least every quarter. The items evaluated include: management, logistics (storage, transport, equipment and facilities), Term, Quality, Resources and Safety, Environment and Health (SEH). These criteria are consistent with those presented by the authors mentioned (Williamson, 1985; Baily et al, 2000; Slack et al 2002; Stueland, 2004; Bowersox & Closs, 2001).

The criteria of these assessments are contained in the contract terms, as well as the objective scores, ranging from 0 to 100 points. The scores of the criteria are defined according to the specialty service and the marks awarded are framed in concepts: poor (score <30) Insufficient (30≤ score <50), Regular (50≤ score <70), Good (70 ≤ score <90) and Excellent (score≥90).

For the contractor analyzed, the assessments carried out by the inspection (at least quarterly for each contract) that are considered unsatisfactory, i.e. which received the concepts Regular, Insufficient or poor, may have their contract terminated and their participation in future bidding processes may be at stake. One assessment with the concepts Poor or Insufficient or two assessments considered Regular make the presence of the supplier in future contracting processes unfeasible.

As the purpose of this article is to analyze, based on the terminated contracts and their assess, which are the criteria that are more representative for the termination of contracts, the following assessment criteria were adopted: Management, Logistics, Term, Quality, Human Resources and SEH (Safety, Environment and Health) (Williamson, 1985; Baily et al., 2000; Slack et al., 2002; Stueland, 2004; Bowersox & Closs, 2001). In addition, a number of related services specialties, i.e. which are contracted and monitored by observing similar characteristics, were consolidated into four types of services: Construction, Assembly and Industrial Maintenance; Exploitation and production; Safety, Environment and Health (SEH); and General Services.

Examples of construction, assembly and industrial maintenance services are: studies and projects; construction and industrial maintenance of production plants in boiler shops; electricity; cranes; equipment; chemical cleaning; tank cleaning; mechanics; engines; turbines; and machinery. Exploitation and production are services such as diving and ROV operations (remotely operated vehicles); probes operation; operation; and maintenance of undersea equipment and drilling. SEH services are: analyses (physical, microbiological, chemical and toxicological); fire brigades; waste management; environmental impact; and occupational health. Finally, General Services includes: food; land conservation; industrial cleaning; reception and monitoring; road transport; cargo handling; construction of access roads and buildings; pipelines; and gas pipelines over land.

As the assessments of suppliers are crucial in the decision to terminate or maintain the contractual relationship, it is assumed that suppliers will work to deliver good services, translated into good ratings. Consequently, we expect a negative relationship between the assessment scores and the likelihood of a contract being terminated. In other words, contracts with higher quality are less likely to be unilaterally terminated by the company studied.

3.2 Empirical Data and the Model Proposed

Based on the data collection, the contracts closed were distributed per service specialty and the way these contracts had been closed off, as shown in Table 1. Panel A shows the percentages of the quantity and value of contracts closed in the period analyzed, separated by specialty services. Panel B shows the distribution of the forms of contract closure.

Two specialty services show a larger number of contracts with 32.23% each, which are: Construction, Assembly and Industrial Maintenance and General Services, which are described in Panel A of Table 1. Similarly, it is observed that the forms of contract closure are shown in Panel B of Table 1, which shows a high percentage of terminated contracts, corresponding to 7.69% of the quantity and 10.82% in terms of value of the contracts closed in the period analyzed (1/1/2006 to 12/31/2014).

Table 1
Distribution of contracts per specialty and forms of contract closure

Panel A: Distribution of contracts per specialty		
Service specialty	**(%) quantity**	**(%) value**
Construction, assembly and industrial maintenance	32.23%	29.27%
Exploitation and production	20.15%	18.88%
Safety, environment and health	15.38%	5.77%
General services	32.23%	46.08%
Overall Total	**100.00%**	**100.00%**
Panel B: Forms of contract closure		
Service specialty	**(%) quantity**	**(%) value**
Termination	7.69%	10.82%
Cancelation	1.83%	0.92%
Normal Closure	90.48%	88.26%
Overall Total	**100.00%**	**100.00%**

Source: elaborated by the author.

The information regarding contracts closed off in the period through normal closure or termination was organized to represent the variables in a structured and reliable manner. To analyze the probability of a service contract being terminated based on the influence of the performance assessment criteria, the following logistic regression model was proposed, based on unbalanced panel data.

$$Termination_{it} = \beta_1 Management_{it} + \beta_2 Logistics_{it} + \beta_3 Term_{it} + \beta_4 Quality_{it} + \beta_5 HR_{it} + \beta_6 SEH_{it} + \varepsilon_{it}$$

The dependent variable Termination is binary and equal to one (1) if, in the i-th contract, termination was observed, and equal to zero (0) otherwise. The other variables (Logistics, Management, Term, Quality, HR and SEH) are independent and represent a score from 0 to 100 points observed in the t-th assessment of the i-th contract. In marginal regressions for each assessment criterion, analyses were conducted considering, beyond the average and median, the first quartile of the assessments. In this case, the first quartile was considered to verify the sensitivity of the results with respect to the lowest grades attributed to the contract during its operation phase. Analyses based only on average and/or median only could disregard relevant information present in assessments preceding the termination.

3.3 Measuring of Variables

Next, the dependent and independent variables to be used in the proposed model are presented

3.3.1 Dependent variable

Contract termination occurs when one of the contracting parties does not satisfactorily fulfill its part (Pereira, 2003; Gasparini, 2007; Di Pietro, 2008) and this causes an increase in transaction costs (Williamson, 1985; Hart & Moore, 1990; Tirole, 2007) for both parties, such as: financial, legal and operational (Basel Committee on Banking Supervision, 2005). In this case, we are analyzing the influence of assessments on the likelihood of a contract being terminated or not, the dependent variable (termination) was defined as equal to 1 if the contract has been terminated, and equal to 0 otherwise.

The goal is to identify, for contracts in which the termination occurred, which were the criteria (independent variables) that most influenced such termination. It is expected that contracts with higher scores on the assessments, according to the criteria evaluated, may be less likely to be terminated.

3.3.2 Independent variables: Assessment Criteria

3.3.2.1 Criterion 01: Management

The performance assessment criterion Management includes items such as, for example: administrative management, planning, administrative and financial performance. The following are appointed: organization, adaptation to planning, administrative performance and financial performance. In this criterion, the financial situation of the supplier is monitored to identify compliance with its obligations to its employees, suppliers, bank loans, tax payments, among others.

3.3.2.2 Criterion 02: Logistics

The performance assessment criterion Logistics includes items such as: warehousing, equipment, transportation, facilities, materials and workshop. The following are appointed: quantity, quality, operating conditions, maintenance and preservation and storage conditions (Benetti, Girardi & Cortes, 2008; Chow, Heaver & Henriksson, 1994). In this criterion, the logistic support conditions for the execution of the contracted services is monitored.

3.3.2.3 Criterion 03: Term

The performance assessment criterion Term assesses compliance with the deadlines contracted and agreed upon (Atkinson, 1999; De Wit, 1988; Shenhar, Dvir, Levy & Maltz, 2001). In this criterion, the deadline for service provision and the partial deadlines agreed upon are monitored, such as: mobilization/demobilization, delivery of legal documents, partial service provision, among others.

3.3.2.4 Criterion 04: Quality

The performance assessment criterion Quality (Atkinson, 1999; De Wit, 1988; Kumar & Wolf, 1992) includes items like: quality of services, quality of systems and quality control tool. The following are appointed: fitness for service system, training, quality results, verification/calibration and rework. In this criterion, the quality of services provided by the contracted company is monitored to verify adherence to legal compliance with procedures and avoid misallocation of resources to carry out rework, among others.

3.3.2.5 Criterion 05: HR (Human Resources)

The performance assessment criterion HR (Human Resources) includes items such as supervision, management, execution, inspection and working conditions (Lacombe & Albuquerque, 2008). The following are appointed: leadership and control, number of professionals, training and logistical support. In this criterion, the training of the professionals working to execute the contract is monitored, including managers and supervisors, besides the logistic support necessary for compliance with the conditions agreed.

3.3.2.6 Criterion 06: SEH (Safety, Environment and Health)

The performance assessment criterion SHE (Safety, Environment and Health) (Kumar & Wolf, 1992; Shenhar *et al.*, 2001) is responsible for the assessment of the SEH conditions of the hired company during the service provision. In this criterion, the contract conditions are hired, such as: quantity and quality of the accidents occurred during the service provision, compliance with safety requirements, absenteeism rate, compliance with legal requirements to preserve the environment, such as, for example: waste disposal, among others.

4. Results

4.1 Descriptive Statistics

Table 2 shows the distribution of the types of contract closure for service specialties that occurred in the period from 1/1/2006 to 12/31/2014. The company unilaterally terminates the contract when the contracted company does not fulfill its part.

The contract terminations are concentrated in the contracts of General Services (48% of terminations or 3.66% of total contracts closed) and Construction, Assembly and Industrial Maintenance (38% of terminations or 2.93% of total contracts closed). One potential explanation for this fact derives from the existence of greater number of contracts in these specialties (32.23%).

Table 2
Specialties per type of closure

Contracts terminated	Service specialties	(%) quantity closed	(%) amount closed	(%) quantity terminated	(%) amount terminated
Termination	Construction, assembly and industrial maintenance	2.93%	3.44%	38.10%	31.79%
	Exploitation and production	0.73%	0.38%	9.49%	3.51%
	Safety, environment and health	0.37%	0.05%	4.81%	0.46%
	General services	3.66%	6.95%	47.59%	64.23%
Total Termination		**7.69%**	**10.82%**	**100%**	**100%**

Research data: elaborated by the author.

Next, the average of the supplier assessments in the terminated contracts was calculated. Table 3 shows the mean, standard deviation and median of the criteria assessed in the contracts terminated without any distinction by specialty. The data suggest that the terminated contracts have lower scores and higher dispersion of the ratings, which indicates the existence of a possible correlation between the classification of a contract to be terminated and its scores.

Table 3
Descriptive statistics of criteria per terminated contract

Classification / Statistics	Mean	Standard Deviation	Median
Logistics	63.2	28.2	72.0
Management	61.8	28.1	67.0
Term	39.4	36.7	34.0
Quality	66.2	25.6	67.0
HR	63.5	25.9	66.7
SEH	79.9	24.4	90.0

Source: elaborated by the author.

Table 3 presents evidence, however, that even terminated contracts can score high on certain criteria, such as SEH for example. Two potential explanations for this fact are observed. The first is that even unsatisfactory contracts can score well on SEH due to the suppliers' commitment. Second, suppliers may behave opportunistically, seeking good grades on easier criteria in order to increase the overall average assessment.

The 273 contracts analyzed received 19,613 performance assessments, carried out by surveillance at least every three months for each contract. That is, all contracts have at least one evaluation every three months and, if a contract has more than one assessment, this was also considered in order to avoid loss of information. It is observed that about 21% of evaluations received unsatisfactory concepts (score <70).

Suppliers that receive concepts below the concept "Good" (<70) may lead to the supplier's exclusion from new hiring processes. This exclusion stems from only one instance of the concepts Poor and Insufficient and two or more instances for the concept Regular. In addition, the supplier with such concepts should draw up a plan to improve the service quality, under penalty of having the contract terminated.

Table 4 shows the percentage frequencies of each assessment in the service specialties. Initially, it is observed that almost 20% of the contracts have unsatisfactory scores, which may mean potential transaction costs for the company in the future, in case the contracts need to be terminated or renegotiated.

In addition, Table 4 shows that about 25% of the concepts in the specialty General Services are inferior to 70%, which explains the high percentage of contract terminations in that type of service. A similar analysis can be made in the specialty Construction, Assembly and Industrial Maintenance.

Table 4

Distribution of concepts per specialty

Consolidated per Specialty		Assessment Concept					
		Very Bad < 30	Insufficient = 30 < 50	Regular = 50 < 69	Good = 70 < 90	Excellent = > 90	Total
C& A and Industrial Maintenance	(%)	8.32%	2.82%	11.62%	23.87%	53.37%	100.00%
Exp. and Production	(%)	2.60%	2.67%	10.07%	28.19%	56.47%	100.00%
SHE	(%)	5.67%	2.07%	11.08%	25.49%	55.70%	100.00%
General Services	(%)	10.17%	3.26%	11.57%	25.02%	49.99%	100.00%
Total	**Quant**	**1555**	**568**	**2219**	**4928**	**10343**	**19613**
	(%)	**7.93%**	**2.90%**	**11.31%**	**25.13%**	**52.74%**	**100.00%**

Source: elaborated by the author.

Table 5 shows the percentage distribution in the service specialties of each criterion assessed. In addition, the percentage of assessments in each criterion is shown per specialty, revealing the highest concentration of ratings in the criterion Human Resources (25.8%), followed by Logistics (21.8%). The evaluation criterion HR is present in virtually all service contracts. In addition, Table 5 shows that not all contracts are evaluated based on the same criteria. If this were the case, then we would expect a fair distribution among specialties and among the evaluation criteria.

Table 5

Distribution of specialties among criteria

Criterion assessed	(%)	C&A, industrial maintenance	Exploitation and production	SEH	General services	Total
Management	(%)	36.42	12.66	12.01	38.92	100
Logistics	(%)	35.65	13.52	5.09	45.75	100
Term	(%)	35.46	16.24	15.96	32.34	100
Quality	(%)	36.33	17.83	8.95	36.89	100
Human resources	(%)	34.89	15.41	10.5	39.2	100
SEH	(%)	38.12	15.7	10.02	36.16	100
Total	**Quant**	**7.056**	**2.959**	**1.887**	**7.711**	**19.613**
	(%)	**35.98**	**15.09**	**9.62**	**39.32**	**100**

Source: elaborated by the author.

Finally, Table 6 shows the percentage distribution of the assessment concepts among the criteria analyzed. Again, almost 20% of all contracts reveal unsatisfactory scores (less than 70). It is noteworthy that the variation of the scores permits analyzing peculiarities of both specialties as criteria, as follows.

Specifically, it is emphasized that the Term criterion had about 35% of unsatisfactory assessments, while the SEH criterion showed the lowest percentage of dissatisfaction, with about 12% of results below expectations.

Table 6
Distribution of concepts per criterion

Consolidated per Criterion		Consolidated per Criterion					
		Very Bad < 30	Insufficient = 30 < 50	Regular = 50 < 69	Good = 70 < 90	Excellent = > 90	Total
Management	(%)	7.82%	2.56%	8.89%	18.70%	62.03%	100.00%
Logistics	(%)	7.10%	2.74%	10.87%	23.27%	56.01%	100.00%
Term	(%)	11.91%	6.03%	16.81%	32.77%	32.48%	100.00%
Quality	(%)	7.58%	2.90%	12.37%	28.12%	49.03%	100.00%
HR	(%)	10.70%	2.79%	12.60%	26.96%	46.95%	100.00%
SEH	(%)	1.74%	1.95%	7.68%	24.02%	64.60%	100.00%
Total	**Quant**	**1555**	**568**	**2219**	**4928**	**10343**	**19613**
	(%)	**7.93%**	**2.90%**	**11.31%**	**25.13%**	**52.74%**	**100.00%**

Source: elaborated by the author.

In short, the descriptive analyses discussed above suggest the relevance of the contracts terminated in the sample, in terms of contract value and quantity of contracts (Table 2). As expected, the terminated contracts have lower average scores and great variation (Table 3), which may suggest peculiarities of certain specialties or the way the scores are assigned. Note that the terminated contracts still showed satisfactory averages on SEH, which may suggest the efficiency of our suppliers in meeting the demands of the firm, with respect to this criterion, or opportunistic behavior of suppliers to maximize the scores on criteria with lower requirements.

Furthermore, the large number of suppliers with unsatisfactory scores is emphasized (almost 20%, Table 4 and Table 6), which guarantees the variability of the data and analyses. Finally, it should be reminded that not all contracts, not even in the same specialty, are evaluated based on the same criteria, which may suggest greater variability in the analysis (Table 5).

Next, we carried out a multivariate analysis of the effect of the supplier assessments on the chance of a contract being terminated to ensure robustness to the analyses developed thus far.

4.2 Result of the Model

The model used to study the influence of the unsatisfactory scores on the suppliers' performance assessments on the probability of a contract being terminated or not is shown below:

$$Termination_{it} = \beta_1 Management_{it} + \beta_2 Logistics_{it} + \beta_3 Term_{it} + \beta_4 Quality_{it} + \beta_5 HR_{it} + \beta_6 SEH_{it} + \varepsilon_{it}$$

First, Table 7 shows the descriptive statistics of the criteria evaluated. On the one hand, the results show that, on average, the contracts are classified as satisfactory, which suggests that the company's outsourcing policy is good. This argument is strengthened by the analysis of the data distribution. In general, more than 75% (p25 = first quartile) of contracts have some criterion with the average concept Satisfactory. On the other hand, approximately 25% of the evaluated criteria received some evaluation Unsatisfactory (score below 70 points) totaling 851 of the 3,405 ratings observed. This high percentage shows evidence of possible weaknesses in the outsourcing process.

Table 7
Descriptive statistics per assessment criteria

Criteria	Average	Standard Deviation	p1	p25	Median	p75	p99
Logistics	80	19	7	70	83	97	100
Management	78	21	1	70	80	95	100
Term	72	29	1	60	80	95	100
Quality	79	18	14	70	80	93	100
HR	77	18	16	68	80	90	100
SEH	86	16	32	78	90	100	100

Source: elaborated by the author.

In an individual analysis of each criterion, based on Table 7, the heterogeneity of the assessments within the different types of contracts can be identified. The Term criterion has been responsible for the lowest averages and the highest standard deviation among all the evaluation criteria. Moreover, it appears that criteria related to logistics and HR are the most frequent in the supplier assessments, followed by Quality and Management criteria.

Table 8 shows the results estimated via logit in unbalanced panel data as proposed in the above model. In the logistic regression results presented, all evaluations of all contracts were used for analysis. The marginal effects are reported in Table 8. The overall fit of the model to analyze the Prob>chi2 is verified. At 1%, the null hypothesis is rejected in which the model is not significant, indicating that the termination of contracts is a function of the scores assessed in the criteria.

One peculiarity of the logit model is that the estimated coefficients have no direct interpretation of the marginal effect of the independent variables on the dependent variable. The coefficients, however, help to indicate the correlation signal of the variables and may indicate the sequence of the marginal effect. In the model in question, described in Table 8, it the negative correlation is observed in almost all criteria in relation to the contract score (Panel A and Panel B - 1st column). That is, a higher score in the assessment would result in a lesser probability of termination.

Table 8, Panel A, shows the estimated results that were proposed in the logit model. Panel B shows the correlation between the evaluated criteria.

Table 8
Results of logit model in unbalanced panel data

Panel A: Logit model (Gross coefficients)				
Classification	**Coefficients**	**Standard Error**	**Z**	**P>|z|**
Management	-0.00325	(0.00701)	-0.46	0.643
Logistics	-0.02020***	(0.00749)	-2.70	0.007
Term	-0.02350***	(0.00472)	-4.97	0.000
Quality	-0.00282	(0.00711)	-0.40	0.692
HR	-0.00519	(0.00868)	-0.60	0.550
SHE	0.01120	(0.00744)	1.51	0.130
Wald chi(6)	258.33			
Prob > chi2	0.0000			

Panel B: Correlation table between criteria							
Correlation	**Classification**	**Logistics**	**Management**	**Term**	**Quality**	**HR**	**SEH**
Classificação	1						
Logística	-0.2278*	1					
Gestão	-0.1867*	0.3266*	1				
Prazo	-0.2196*	0.1485*	0.3460*	1			
Qualidade	-0.1477*	0.3067*	0.3146*	0.3362*	1		
RH	-0.1654*	0.3970*	0.3962*	0.2946*	0.3687*	1	
SMS	-0.1346*	0.3022*	0.1797*	0.0929*	0.1603*	0.2011*	1

*** p<0.01, ** p<0.05, * p<0.1

Source: elaborated by the author

4.2.1 Marginal effect per assessment criterion

To better identify the effect of the criteria in the probability of contract termination, beyond obtaining the correlation between the variables, the marginal effect of the independent variables was estimated on the contract classification, maintaining the other variables fixed in the average, median and first quartile.

Table 9 shows the marginal effect per evaluation criterion. It can be observed that the only criteria that affected the likelihood of termination were Term and Logistics. These results suggest that, on average (median and 1st quartile), an increase in the score of these criteria has a greater effect in reducing the likelihood of an unsatisfactory rating for a contract.

The finding that the criteria Logistics and Time have greater influence on the contract terminations supports the view (Suslick, 2002; Kaiser & Pulsipher, 2004) that the oil exploitation and production segment has high business risks, attributed to uncertainty about the outcome and high costs, confirming the importance of compliance with contractual obligations, especially the negotiated deadlines.

The results presented in Table 9 also suggest the importance of the assessments and monitoring of suppliers in order to avoid contract termination and potential transaction costs. These results are in line with studies like Greenwood and Yates (2006), Eriksson (2008) and Gomes (2014). However, they differ by focusing on the contract termination process instead of the hiring process.

Table 9
Estimation of marginal effect per assessment criterion

Variables (Criteria)	Marginal Effect mean	Marginal Effect median	Marginal Effect 1st quartile
Management	-0.000132	-0.000110	-0.000223
	(0.000286)	(0.000237)	(0.000483)
Logistics	-0.000822***	-0.000683***	-0.00139***
	(0.000311)	(0.000256)	(0.000504)
Term	-0.000953***	-0.000793***	-0.00161***
	(0.000183)	(0.000160)	(0.000319)
Quality	-0.000115	-9.53e-05	-0.000193
	(0.000290)	(0.000241)	(0.000489)
HR	-0.000211	-0.000175	-0.000356
	(0.000353)	(0.000295)	(0.000597)
SEH	0.000457	0.000380	0.000771
	(0.000299)	(0.000247)	(0.000518)

*** p<0.01, ** p<0.05, * p<0.1

Source: elaborated by the author.

4.2.2 Marginal effect per specialty

In a more specific analysis of the company, the need to analyze the scores of the criteria in the contracts per service specialty was evidenced, since certain specialties have demands and bottlenecks different from others. The absence of this analysis can overlook specific effects of each specialty. For example, contracts in the specialty General Services may have scores on the Logistics criterion different from Construction, Assembly and Industrial Maintenance contracts. Therefore, it is important to analyze each specialty to observe the marginal impact of each criterion. Table 10 shows the marginal effect of the model. Of the four specialties defined in the study, two showed no terminated contracts, which made it impossible to estimate models for these, since there was no change in the dependent variable (y = 1 terminated contracts). These were: Safety, Environment and Health and Exploitation and Production. This represents that these specialties have good reviews and that the increased is the assessment score does not reduce the likelihood of termination.

Table 10 shows the marginal effect per service specialty. The results suggest that, in the specialty Construction, Assembly and Industrial Maintenance, the criteria Logistics and Term score higher. In the specialty General Services, the largest magnitude is for the criteria Management and Term.

Table 10
Estimation of marginal effect per service specialty

Criteria / Specialty	C&A and Industrial Maintenance	General Services
Management	0.00164**	-0.00117***
	(0.000672)	(0.000387)
Logistics	-0.00136***	-0.000497
	(0.000493)	(0.000431)
Term	-0.00119***	-0.000978***
	(0.000342)	(0.000253)
Term	0.000288	-0.000666*
	(0.000518)	(0.000371)
HR	-0.000739	0.000105
	(0.000563)	(0.000501)
SHE	-0.000363	0.00129***
	(0.000449)	(0.000476)

Standard error between parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: elaborated by the author.

Table 10 shows the marginal effect of the specialties Construction, Assembly and Industrial Maintenance and General Services, respectively. As shown, the specialties have different demands and bottlenecks, since the criteria that have the greatest impact on the probability of termination differ among the specialties. For the specialty Construction, Assembly and Industrial Maintenance, the criteria Logistics and Term have expected signs stating that, the higher the score of these criteria, the lower the likelihood of a contract being terminated. On the other hand, Management has a positive marginal effect. That is, the higher the Management score, the greater the probability of termination. Safety, Environment and Health also reveals this peculiarity for the specialty General Services. These results are robust to the analysis of the marginal effect on the median and the 1st quartile (omitted estimates).

In a more detailed analysis, it can be observed that the correlation between Management and termination is not statistically significant in the specialty Construction, Assembly and Industrial Maintenance (omitted table). One of the possible explanations for the lack of significance of this correlation is the high average score of the contracts. That is, both the terminated and the non-terminated contracts have a high average on the Management criterion. In this sense, contracts with low scores on other criteria, but with a high score on Management (or SEH, in the case of the specialty General Services), may indicate on possible problematic contracts in the future to the contractor, or the need to review the contractual clauses.

4.3 Analysis of Results

Figure 1 displays the consolidated results of this study, which was aimed at analyzing what service assessment criteria most strongly influence the contract terminations in the oil and gas exploitation and production sector.

Item	Result	Explanation for the results
Criteria	Term	Criterion with strongest influence on contract termination: • 35% of the scores were unsatisfactory (below 70 points); • In the logit model, this criterion obtained the highest score. It was observed that, if the supplier obtains better results, increasing the assessment score on this criterion by one point, on average, the probability of contract termination will drop by 0.9%.
	Logistics	Criterion with second strongest influence on contract termination: • In the logit model, this criterion obtained the second highest score. It was observed that, if the supplier obtains better results, increasing the assessment score on this criterion by one point, on average, the probability of contract termination can drop by 0.8%.
Specialties	General Services	Service specialty with largest number of contract terminations: • 48% of the number of contracts terminated (or 3.66% of the total contracts terminated. • In the estimation of the marginal effect, it was observed that the criterion Management and Term showed the greatest impact on the probability of contract termination. For both criteria, if the supplier improves the assessment score by one point, on average, the probability of contract termination can drop by 1%.
	Construction, Assembly and Industrial Maintenance	Service specialty with second largest number of contract terminations: • 38% of the number of contracts terminated (or 2.93% of the total contracts terminated). • In the estimation of the marginal effect, it was observed that the criterion Logistics and Term showed the second greatest impact on the probability of contract termination. If the supplier improves the assessment score on these criteria by one point, on average, the probability of contract termination can drop by 1%.

Figure 1. Summary of results

Obs. Source: elaborated by the author.

The results are relevant because they confirm the importance of monitoring agents in economic transactions as factors related to transaction costs (i.e. termination). This result is consistent with case studies such as Greenwood and Yates (2006), Eriksson (2008) and Gomes (2014). However, it differs from these by focusing on the termination process instead of the hiring process. In addition, the analyses permit a better understanding of the contract assessment framework of a large and important company in the Brazilian economic sector. Due to the complexity and diversity of the contracts in the study, through this case study, the intention is to contribute to a better understanding of the monitoring and management process of contract relations.

Understanding and improving the management of contracts by means of actions to reduce the possible contract terminations seems to be interesting for all companies, in line with Klein (1992), who states that improvement in the design of contracts will reduce the likelihood of opportunistic contract terminations. The results suggest possible directions of new policies for increasing the efficiency of this management, as it identifies which criteria have a greater effect on the likelihood of a contract being terminated in an oil and gas exploitation and production company.

5. Conclusions

This study examined 273 service contracts (and their assessments) in oil and gas exploitation and production activities in order to study which performance assessment criteria that have greater influence on the termination of contracts in that sector. To avoid a survival bias, we used only contracts started and terminated within the analysis period.

Through descriptive analyses and estimations via logit, we observed an effect of the criteria Term and Logistics on the probability of termination. It was observed that an increase in the Term and Logistics score helps to reduce the likelihood of termination. Subsequently, the analysis of the criteria was extended per service specialty. Peculiar effects could be observed per specialty, confirming inferences that different specialties have different requirements and, therefore, different contract models.

The relevance of the analysis of terminated contracts is evident in the results of the descriptive analysis, which indicate a high percentage of terminated contracts, corresponding to 7.69% of the quantity and 10.82% of the value of contracts closed during the period. It was also established that the contract terminations are concentrated in General Services and Construction, Assembly and Industrial Maintenance contracts. Approximately 25% of assessments in the specialty General Services receive results below 70 points, corroborating to justify the large percentage of contract terminations in this type of service. Similarly, it can be observed that the Term criterion had about 35% of unsatisfactory assessments.

The results suggest the importance of monitoring agents in economic transactions as factors related to transaction costs (i.e. termination). These results are in line with case studies such as Greenwood and Yates (2006), Eriksson (2008) and Gomes (2014). However, they differ by focusing on the termination process instead of the hiring process.

Understanding and improving the management of contracts by means of actions to reduce the possible contract terminations seems to be interesting for all companies, corroborating Klein (1992), who states that the improvement in the design of contracts will reduce the likelihood of opportunistic contract terminations. The results suggest possible directions of new policies for increasing the efficiency of this management, as it identifies which criteria have a greater effect on the likelihood of a contract being terminated in an oil and gas exploitation and production company.

Because of the difficulty to obtain data and the small number of studies on the performance assessment of service contracts in the oil and gas exploitation sector, future research should address the financial effect of termination on the results of companies, as well as analyze the suppliers profile to assess the organizational relationship in outsourcing contracts. Due to the unavailability of data, in this study, no other explanatory variables for the termination of contracts were included, for example, those based on the Resource-Based View (RBV) Theory (Barney, 1991), besides other controls, such as the maturity and nature of the contracted companies (national, foreign, public, private, etc.) and some other accounting variables.

These analyses, however, are important to contribute to the optimization of contract management through the prior analysis of the factors that lead to potential terminations. Also, they permit a better understanding of the evaluation structure of contracts in a company belonging to a relevant sector for the Brazilian economy. It is specifically associated with project (contract) analysis and monitoring techniques of management accounting.

The description of the systematic evaluation of service providers contributes both to the contract literature and to the business community by identifying the criteria used in the systematic evaluation of the and oil and gas exploitation and production segment, as well as by presenting the results of the assessments of the respective companies in the segment. The monitoring of these criteria can assist service contracts in defining strategies for a more efficient contract management. Additionally, it can provide information for the service providers to evaluate and adapt their processes to continue working in this industrial segment.

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