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**Article (Accepted version)
(Refereed)**

Original citation:

Bhimani, Alnoor, Lopes, Alessandro and De Aquino, Andre Carlos Busanelli (2016) *Measurement costs and control in outsourcing relationships*. International Journal of Managerial and Financial Accounting, 8 (3/4). pp. 296-318. ISSN 1753-6715
DOI: [10.1504/IJMFA.2016.10002756](https://doi.org/10.1504/IJMFA.2016.10002756)

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This version available at: <http://eprints.lse.ac.uk/68615/>

Available in LSE Research Online: March 2017

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MEASUREMENT COSTS AND CONTROL IN OUTSOURCING RELATIONSHIPS

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Abstract

Past research suggests that when an organization outsources an activity, its control over the execution of the service is reduced whilst service quality monitoring increases. Little accounting research has been documented on the links between measurement costs and control sharing in contracts entailing the provision of industrial services. We analyse 35 contracts involving 80 non-spot transactions and 749 contract terms at an iron and steel mill in Brazil. The study complements this data with information from 32 interviews. We find that the measurement costs of the contracted services are associated with the complexity of activities and the tightness of control maintenance by the contractor. Where such costs are high, legal contract enforcement and use of extra-contractual coordination mechanisms is low. Additionally, variances between the conceptually expected enforcement mix and that operating in practice is associated with service performance level.

Keywords: Management control; Transaction costs; Measurement costs; Outsourcing.

MEASUREMENT COSTS AND CONTROL IN OUTSOURCING RELATIONSHIPS

1. Introduction

Much academic work has been undertaken on the analysis and design of contracts in inter-organizational relationships. The evaluation of the economic impact of service failure and service quality measurement costs are relevant in explanations of the design of industrial service supply contracts. Where there is a possible significant economic impact, firms' efforts to achieve completeness of contract will likely alter as will enforcement levels. The ways in which extra-contractual mechanisms can replace or complement the enforcement of supply agreements affect the choice of the enforcement mix in firms. Residual rights can provide control over process and mitigate the suppliers' failure potential. Performance may be affected by transaction alignment, recursiveness of processes and the development of extra-contractual coordination mechanisms (see discussions in Barthélemy and Quélin, 2006; Klein et al., 1978; Williamson, 2008). Contracts, according to past research, are generally recognised to be incomplete and self-enforcement mechanisms must be designed to ensure the achievement of targeted performance (Baker et al., 2002; Berheim and Whinston, 1998; Klein and Leffler, 1981; Levin, 2003; Sako and Helper, 1998). Performance assessment and measurement costs thus permeate most aspects of outsourcing controls.

To obtain insights into these issues and other mechanisms of control which firms outsourcing certain production or service functions may deploy, some scholars have been supportive of transaction cost economics (TCE) as a useful conceptual approach to guide investigations (Baiman, 2000; Geyskens et al. 2006; Grossman and Helpman, 2004). But many researchers have contended that this form of theorising is constraining in that it considers information production problems in normative terms and neglects the assessment of

actual control dynamics since TCE based studies only minimally analyse descriptive qualitative data (Caglio and Ditillo, 2008; Ghoshal and Moran, 1996; Langfield-Smith, 2009; Mouritsen et al, 2010; Mahama, 2006; Noorderhaven, 1996; Tomkins, 2001). Whilst TCE arguments point to plausible contingencies, empirically, little accounting research concerned with contract design has explored the relationships that exist in particular outsourcing contexts taking account of different empirical data forms. Case based research on the manner in which economic impact moderates the effects of measurement costs in control sharing situations is sparse. We seek to assess how far outsourcing contracts in practice accord with TCE conceptual predictions drawing on qualitative and quantitative data. Specifically we empirically analyse information within an organization to assess associations between measurement costs and control sharing in contracts relating to the provision of industrial services.

We develop hypothesis based on a modification of the pure TCE perspective drawing partially on measurement theory (Barzel, 2005) to explain a service purchaser's contract design. Our study's data is collected from a Brazilian iron and steel group mill where 80 service transactions. We undertook content analysis of the contract documents underlying the service transactions to establish the contract design variables, and we capture extra contractual control mechanism through 32 interviews and non-participant observation. The influence of transaction characteristics on the contract design were tested for completeness, incentive terms, or use of residual control rights. Following Yvrande-Billon and Saussier (2004), we measured the extent of alignment between the conceptually anticipated enforcement mix and what was observed in practice. We then tested the degree of alignment and its influence on service performance.

2. Theory and Hypotheses Formulation

Williamson (1996, 2008) has argued that protection is an important consideration when investments are made into specific assets by service providing firms. A condition of bilateral dependence can arise in which measurement problems tied to property rights are extensive because they cannot be readily contracted *ex ante* given the impossibility to anticipate future events. This, together with the institutional environmental context influences contractual protection in the form of guarantees, penalty terms and other measures (Wiggins, 1991). Contractual protection mechanisms become essential when a firm decides to outsource an existing internal activity to an external supplier. Certain controls applied in-house may be ceded and hierarchical controls become replaced by contractual obligations placed on the supplier. According to Williamson (1991; 2008) when control is ceded, the arrangements tied to vertical integration structures alter and the following are observed: i) there is stronger intensity of incentives for supplier performance, ii) greater administrative control is maintained by the contracting company to monitor and correct the process, iii) there is less flexibility for *ex post* adaptations, iv) and the non-achievement of results decreases. The contracting company makes efforts to select and negotiate the agreement (incurring *ex ante* transaction costs) and to measure service quality, correct output flaws, enforce agreement terms, adapt agreement conditions to internal needs, resolve conflicts and assume any losses from failure of the relationship (*ex post* transaction costs). The frequency of transaction similarly enhances these effects.

The specificity of the assets required for service provision increases the risk of hold-ups by the owner of those assets. The more the service involves specialized personal skills, specific training and know-how, the greater the risks to the contracting company that the supplier does not deliver the service according to specifications, as alternative service provision possibilities are restricted (Murray and Kotabe, 1999; Erramilli and Rao, 1993). On

the other hand, in certain cases, the supplier may face difficulties in reapplying the developed competencies across to other buyers. Assets can be expected to be organized internally (high specificity) or via the market (low specificity). Asset specificity is a necessary but insufficient condition to explain vertical integration. An income hold-up could occur if the relationship contains attributes that cannot be contracted. Non-contractibility is tied to income hold-up riskiness (Bréchemier and Saussier, 2001).

Non-contractibility is a characteristic of the intangible nature of service products (Merino and Rodriguez, 2007). The attributes of service performance such as service quality, cannot be observed *ex ante* and, as the assessment of this performance is at least partially subjective, performance cannot be readily verified by a third party, although it is observable by the contracting parties (Barzel, 2005). Formal contracts cannot fully ensure service provision which requires relational contracts to be applied (Williamson, 1975, 1996; Mènard, 2004). The difficulty in measuring service attributes (*ex-post* quality asymmetry), together with technological and environmental uncertainty, explain the choices made by contracting parties (Kalnins and Mayer, 2004). The non-contractibility of certain attributes in services becomes a determining element in relational contracts, in addition to asset specificity and environmental uncertainty. Barzel (2005) considers the presence of significant uncertainty and non-significant asset specificity as affecting effort to quantify the information on an object's attributes (measurement cost). Measurement costs influence the use of controls on the service delivery process vis-as-vis the use of incentives relating to supplier performance levels. The higher these costs, the lesser the use of incentives in the contract, and the greater the control of the process. Contract design covers a mix of enforcement options via third party and self-enforcement, including the threat to end the contract early. Each enforcement type seeks to focus on parts of agreements where the effect is greatest (see Lazzarini et al. (2004) on complementariness between formal terms and self-enforcement).

If contracting costs in general grow with the number of tasks involved in fulfilling the contract (Macleod, 1997), it can be expected that, in the case of services, measurement costs are also affected by service complexity. Contractual completeness decreases with difficulty in measuring service conformity to reduce *ex ante* transaction costs. Specification efforts are replaced by residual control rights in order to *a priori* establish the decision point when a non-predicted contingency occurs. We posit that:

H₁: The higher the measurement cost, the lower the expectation of enforcement via a third party, reducing contractual completeness and increasing residual control rights.

Some transactions entail high risks relating to safety, fires, large production losses etc. (Williamson, 1999, p.322). Contractual risks such as operational failure causing an accident cannot be fully reduced through financial penalties (Macleod, 1997). Generally, transactions which could open up such risks are not outsourced (Bréchemier and Saussier, 2001), or the contracting company will maintain strong residual control rights. For high unrecoverable costs in research and development projects, Ulset (1996) reports that the greater residual control maintained by the client over the supplier's process reduces efforts to contract service quality and to specify control rights. We propose:

H₂: Service failure moderates the impact of measurement costs on residual control rights and increases the effect of measurement costs on contractual completeness.

Variations in service provision generate adjustments in costs via negotiation and effort to achieve consensus. Rather than engaging in costly contract revisions, parties may reduce specification efforts by designing the contracts with flexible terms that may be less precise in defining performance obligations but which permit adjustments and higher compensation (Masten and Saussier, 2002). Another source of uncertainty is the variability of the supplier's process. As service attributes are not observable *ex ante* and which lead to *ex post* inspection (Chenhall, 2003), task uncertainty can be countered by the contractor monitoring the

supplier's efforts to act on causes of variability. Control rights on the process, rather than the service output, may therefore be established. We propose:

H₃: The greater the task uncertainty affecting the variability of the process, the lower the contractual level of detail and the greater the use of residual control rights on the supplier's process.

Finally, the more recursive the service, the greater the supplier's expectation of achieving income from the relationship and the greater the impact of early contract termination for inadequate performance (Klein, 1996). Recursiveness generates scale economies of *ex ante* costs, reducing the cost of completeness in contract revisions. We propose:

H₄: The greater the service recursiveness, the greater the use of residual control rights and the lower the contractual completeness.

Hypotheses 1 to 4 relate to substitution effects between the effort to complete contracts and the residual property right usage. The higher the measurement costs, uncertainty and recursiveness, the higher the substitution of completeness for residual property rights.

But, concurrently, it is essential to use extra-contractual mechanisms, if there is a lower level of completeness (and the possibility of regulatory enforcement usage), there is the expectation to coordinate via residual control rights. Measurement costs and recursiveness will then also induce complementary coordination enforcement through extra-contractual mechanisms. When public enforcement is not feasible, for example where there are high measurement costs, the contractor will prefer extra-contractual mechanisms, to retain- *ex ante* - residual property rights.

Conceptual arguments and empirical evidence reported in the prior literature regard extra-contractual mechanisms as the "glue" holding together the contractor and the service provider (Klein, 1996; Mènard, 2004). As services are not observed *ex ante*, they failure lead

to severe consequences to the contractor, then the economic impact of this failure increases the probability of vertical integration as a last resort, which is intensified by uncertainty and measurement costs (Barzel, 2005). Eventually, buyers' guarantees or insurance are not feasible to cover operational losses caused by unplanned interruptions in steel production. Alternatively to vertical integration, when the measurement cost is high but the economic impact of failure isn't, the contractor will adopt a relational (quasi-hierarchy) arrangement.

The prior literature suggests that extra-contractual mechanisms would be less prevalent in situations where compliance with contractual provisions and price incentives based on rigid performance targets are sufficient. This would be the case for medium asset specificity transactions (Satorius and Kirsten, 2005) occurring under medium uncertainty environments (Spekle, 2001). In such cases, buyers can use standards to specify tasks, in which programmability and low measurement costs are the principal characteristics (van der Meer-Kooistra and Vosselman, 2000; Langfield-Smith and Smith, 2003). Otherwise, more relational solutions (quasi-hierarchies) emerge. Additionally, repeated interactions between buyers and service providers create a context for the relationship to be more firmly embedded. Reciprocity norms, reputation and trust issues act as informal self-enforcing safeguards (Dekker, 2004). These transactions can be coordinated by relational arrangements.

We propose:

H₅: The higher the measurement cost, uncertainty and economic impact of failure, the higher the level of quasi-hierarchy assumed in the arrangement.

TCE suggests that firms minimize transaction costs by structuring governance arrangements to mitigate contractual hazards and thereby increase firm performance (Williamson, 1996). The misalignment between the theoretical and actual arrangements potentially prejudices hazards mitigation and reduces transaction performance (Minaar and Vosselman, 2013).

Gains of efficiency relating to supplier performance and associated transaction costs are shared between captured entities (production areas in the mill and their suppliers). Some gains may not be communicated by corporate performance indicators, and the supervisors may not thus see rewards tied to their efforts. A single failure if associated with a loss in the production process, will adversely affect the supervisor's performance. This will trigger a consideration of the supplier switch cost (including the loss of learning effects and organizational assets) as part of assessing contract termination.

Given the enforcement source substitution effect, noted above, the transaction characteristics will induce (mitigate) the emergence of quasi-hierarchical arrangements. The higher the measurement costs, uncertainty and economic impact of failure, the greater the depth of quasi-hierarchical arrangements. This will be the case also for residual rights. Where the observed arrangement deviates from the theoretically expected arrangement for transactions inadequate enforcement will lead to performance loss. This effect will be moderated by the supervisor's preference for secure but weaker performance rather than risky but higher performance. We propose:

H₆: The greater the misalignment between conceptually anticipated and observed arrangements, the lower the service performance. The presence of greater flexibility in the evaluation process will moderate the effect.

3. Sample and Data Collection

The study was conducted within an industrial plant (500 employees) of a multinational iron and steel group (here after called "mill") based in Brazil. The mill has contracted out certain services requirements for over two decades, including the maintenance and servicing of all transportation tracks into the mill. To test our hypotheses, we undertook a quantitative study approach complemented with qualitative field-based information (Anderson and

Widener, 2007). Following the same logic as for cross sectional field studies discussed by Lillis and Mundy (2005), Anderson and Widener (2007, p.331) recommend choosing an organizational unit at the lowest possible analysis level, in this case “industrial service acquisition transactions”. At the start of the study, the researchers accessed the contracts provided by the contract division at the corporate headquarter, following by visits to the industrial plant to access interviewers and observe the contracted services.

Managers and the contracts administrators differentiate service procurement into two types: spot transactions (contract duration lower than 30 days, using auction procedures) and non-spot transactions. The latter adopt a negotiated form to bid for services, with a formal contract that includes subsequent amendments. A contract is defined here as a set of formal documents (main contract, attachments, price tables, projects and designs negotiated, and amendments and formal requisitions agreed between the parties), with legal power of execution, which regulates the supply transaction. At the mill under analysis, a typical contract regulates a single transaction though some contracts can cover several transactions. A contract typically has 15 to 20 pages, (without attachments and tables), and covers scope, price, how to measure services deliver, assignment of equipment, guarantees and fines. The amendments (ranging from 0 to 34 per contract) are not strongly associated with the contract’s age, and mainly address term renewals and price revisions. In general, recurrent services such as mechanical maintenance or transport and logistic support, are procured under a unitary fixed price based on standard activities or man-hour reference prices. Non recurrent services are contracted according to globally fixed prices. Supplier selection, price negotiation and price reduction and service monitoring are undertaken by line operating supervisors and administrative departments, but the contract is compiled by the legal department. Conflicts are not resolved in court, except in labor cases or cases involving occupational accidents with fatalities. The mill adopts a set of performance indicators, but the managers annual bonus are

mainly tied to production costs gains and consequently to cost reduction on service contracts. The replace of suppliers to achieve price reductions is not common, as a central precept of agreements is to avoid large switch costs and disturbances. Therefore, contracts tend to be renewed.

As the research is concerned with relational arrangements (between vertical and arm's length integration), the services performed by the company itself and service transactions via spot contracts were discarded. From all non-spot service contracts (with duration exceeding 30 days), we select 35 contracts (80 transactions), slimmed down on 749 analyzed contract terms, and covering 81% of the annual service budget contracted at the mill. The selection followed the theoretical sampling (Eisenhardt, 1989, Voss et al, 2002), making fixed "service transactions in long-term arrangements", varying in relation to the service characteristics.

3.1. Content analysis of contract terms

To enhance the objectivity and reliability of the data, the clauses of the contract were segregated into a lower level of analysis according to their economic intent. Each part was referred to as contract terms (hereafter "terms"). The terms were coded and quantified through content analysis of the original contract, any amendments, attachments and price tables. An executive from the contract division assisted in clarifying the objective of each specific contractual term at the start of the analysis. We identified the economic rather than the legal context and, to avoid the bias of using earlier classifications based on other theories, the analysis did not depart from previous category definitions. The authors started with an exploratory reading ("fishing expedition" by Bardin, 1977, p. 95) on the 25 most complete, complex and different contracts to cover the most diverse clauses and situations aiming saturate the categorization which occurred after two further rounds. In the remaining contracts, the recurrence of similar terms confirmed the initially intended diversity, reaching

714 different terms, classified across 152 categories. We found four perspectives of service performance been contracted: (i) service conformity, security, environment or social co-responsibility. These perspectives are not mutually exclusive, for instance, accidents cause low performance in terms of security but also interrupt the production process. The 152 past categories previously identified were summarized to 5 categories through cluster analysis: (i) terms that establish best efforts; (ii) terms that define scope; (iii) terms that define the process; (iv) terms that align incentives; (v) terms that seek to control the process. Finally, the categories i to iii were reorganized under “completeness”, to reflect that they progressively completed the contracts. Categories iv and v, respectively, constituted “incentives” and “control”.

3.2. Onsite Interviews and industrial processes observation

The interviews were held face-to-face, guided by a semi-structured interview protocol. Starting with six respondents suggested by the organization, the researchers interacted with 32 interviewers, with a 90 minutes interview in average, including additional contacts when necessary to clarify information or to make further enquiries. One of the authors also remained at the plant for a month as observer to follow the industrial processes and to attend meetings, performance assessment and other routine events at the mill, which Atkinson and Shaffir (1998, p.54) call observation by ‘passive’ participation. We reconfirmed with the key informant our previous understanding concerning specific services and to anticipate potential sources of bias for that respondent (e.g. areas with lower performance or involvement in some recent operational accident which could be more sensitive to a particular question), and we also triangulated with him the perceptions from interviews. Regarding the extra-contractual mechanisms, instead of defining or adopting archetypes proposed within the management accounting literature which could bias the observer’s data collection in the field study, we

chose to identify latent coordination constructs on informal control mechanisms previously listed in the literature, and then to search for latent particular archetypes.

4. Variables

4.1. Contract variables

To observe control sharing via the contracts, we examined complementariness between the use of legal enforcement and extra-contractual enforcement mechanisms. Each transaction is considered to be regulated by a contract that covers terms that specify details (completeness) and terms identifying residual control rights (control). These two types of terms are differentiated on the basis of likely enforcement. The value attributed to the completeness and control variables is the sum of terms categorized within that type, relative to all terms in the contract related to that transaction. Terms that attempt to detail conditions present the highest expectation in terms of efficacy given by the percentage of terms used to define the scope of service attributes and operating procedures, as a way to decrease uncertainties deriving from the operation. While residual control rights are established with the expectation of avoidance of third party enforcement, they retain sufficient flexibility for *ex post* adjustments and private legal mechanisms to be applied over time. Also, during the analysis, terms were identified to encourage service performance through payments (or penalty charges) to the supplier.

4.2. Service characteristics variables

Information asymmetry between supplier and contractor can relate to the incurred service quality costs. The measurement costs of service quality, in line with Kalnins and Mayer (2004) and Poppo and Zenger (1998), are held up by the service buyer's difficulty in obtaining information on the supplier's performance. Through the interviews and in loco

observation of the processes, we identified how each supervisor seeks to reduce information asymmetry about service quality. The following scale was used: 1 if the quality observation is visual and low-cost; 2 if equipment is needed in the field; 3 if specific tests are needed; 4 if observations are not possible after assemblies; 5 if the observation is more expensive than re-delivery of the service itself.

The economic impact of failure is the potential economic loss from an unidentified non-conformity, which results in a failure. The degree of this impact is a function of the type of consequences unchained by this failure which, for the mill, represents the risk of interrupting production for a given period, without recovering the production losses. Production continuity, measured by the maximization of monthly production capacity, besides unit cost, is the areas' main target, each of which has its specific indicator. Hence, the impact of the failure on the potential interruption of subsequent processes is more critical than in local economic losses, such as the rejection of a product that is in production progress. In the interviews and observations, it was observed that the impact of the service failure is mainly a function of the point in the process where the service is executed (support vs. main processes), and the capacity of the buffers in the production process to absorb the failure, avoiding its transfer to other production steps. That is, the effects of a failure can range from simple rework to generalized production loss. For each transaction, the following score was attributed in terms of the potential impact in the case of failure: 1 for rework, without direct impact on production, or detectable in time (either by existing buffers or by physical separation through other intermediary processes); 2 for loss of pig steel runners or sequences in continuous casting (due to steel leaking); 3 for a production stop without impact on shipping; and 4 for shipping interruptions (interrupting production, affecting shipping, general performance decrease at the mill in tons/month, losing income).

Task uncertainty relating to compliance with service delivery specifications is a function of the variability implicit in the supplier's operations. Service delivery is dependent on labor and a considerable portion of conformity rests on the operators' capacity to follow procedures, or on their expertise and experience to achieve conformity. Variability is thus a function of the service executor's capacities and skills, mainly in new processes, in test phases or in processes that cannot be standardized. However, the application of technology and other solutions stabilize the production process and permit the elaboration of norms, models and standards (which place demands on the executor's capacity to follow these procedures). The proxy used captures reliance on the executor's skills, whereby a score 0 is given for a modelled automated activity (with less reliance on the executor's skills), 1 for an activity guided by norms and procedures (in which the executor will draw on previous skills and experiences) or when the activity is repetitive and simple, and 2 for activities that need case-by-case adaptation (one solution, one practice for each case).

Recursiveness was identified as: 0 - non recurrent and 1 – recurrent. For operations involved in production and production support, the service demand frequency is intense and uninterrupted in many cases. Examples of high intensity are the haulage operation of a torpedo car, dreg pot movements and the removal of residues from the bays. Examples of less intense operations are the reconstruction of fire-resistant materials and routine maintenance. Other operations may be in demand, but are set at regular intervals, such as maintenance during programmed stops.

As a control variable, the need for the supplier's investments in specific assets, *ex ante*, in equipment or installations, was indicated as 0 or 1. Erramilli and Rao (1993) and Poppo and Zenger (1998) used a similar scale for human assets. However, we wanted to distinguish between the effect of physical assets (equipment and installations) and the

potential broad hold-up that can happen as a result of intellectual assets developed along the relationship and as a result of economic dependency.

4.3. Extra contractual mechanisms

From contract theory and the management accounting literature, the following coordination constructs are used to segregate formal and informal arrangements: (i) Competence trust (Dekker, 2004; Coletti et al, 2005; Tomkins, 2001); (ii) Information-sharing (Mahama, 2006); (iii) Supervision (Mastem, 2000), and (iv) Goodwill trust (van der Meer-Kooistra and Vosselman, 2000; Dekker, 2004).

Trust is an expectation (belief) concerning the behavior of another (Dekker, 2004), even in absence of information about the actions of that other party (Tomkins, 2001). Competence or capability trust refer to the buyers' confidence on the supplier's capacity to perform according to technical requirements (Dekker, 2004). A supplier develops competence trust through frequent service delivery, attempting the contracted attributes. We proxy competence trust via the time duration (months) of the relationship with the same supervisor.

Goodwill trust refers to the buyer's expectation that the supplier will not behave opportunistically. It is associated with integrity, responsibility and dependability (van der Meer-Kooistra and Vosselman, 2000). Employees switch employments between suppliers and the mill frequently. Many managers who work for suppliers previously worked for the contractor. These managers tend to work in the same function for either party. The supplier employees' hiring by the mill is regarded as a promotion, constituting an incentive for high performance. This type of trust is at the individual level. It reduces information asymmetry in the relationship and lowers individual moral hazard. Based on the relationship records, we analysed for employee interchanges, including at the supervisor or manager level (we ascribe a 0 for no switch and 1 for evidence of a switch found). One approach is to substitute an *ex*

ante specification of technical requirements, mainly where it is not viable to anticipate all schedules, quantities and solutions for unexpected events in the mill's plant. Here both parties must be willing to adopt flexible responses to unanticipated changes and conditions (Mahama, 2006). In these situations each part will have to be detailed about what should be done, the next step, when, where or how. Sharing information related to process technology and current performance (0 for evidence not found, 1 for evidence found) increases integration between suppliers and contractors, who work on technological solutions collectively and share intellectual capital. The performance achieved by the supplier and the way that supplier execute the activities is shared and discussed in order to support periodical planning meetings, improve quality processes, engage in environmental accident syndication and carry out quality auditing routines. Beyond the trust-based patterns of control (e.g. Langfield-Smith and Smith, 2003; van der Meer-Kooistra and Vosselman, 2000), there are transactions where "trust" in the supplier capabilities is not enough and the buyer will exercise residual control rights. This follows from incomplete contract theory arguments (Masten, 2000). When intense information sharing at the operational level is required, while there is a concern of failure, the buyer will benefit from extensive monitoring of the process itself rather than only obtain periodical production schedule information. This will induce the buyer to impose vertical lines of authority acceptable to the supplier as a condition agreed over the contract life.

Supervision and direction in real time, schedule and priority control, discretionary allocation of resources between contracts under the same supplier are signs of supervision power usage by the contractor – fiat – (0 for evidence not found, 1 for evidence found). The area that coordinates the supplier manages the supplier's team schedule in order to reduce the risks of non-attendance of deadlines. This authority may be routine or eventual, occurring in critical events when the mill's teams assume entire control of the process. Depending on the required coordination, it is common to have meetings at the beginning and at the end of the

workday with the possibility on on-going real time contact. Other forms of supervision include the authority used by the mill to validate the suppliers' team composition in order to refuse a non-qualified or cheaper workforce.

Such mechanisms are not excludable themselves. We undertook factor analysis, reduced to two factors, the first capturing shared information and competence trust, and the second summarizing supervision and goodwill trust. Theory suggests that the time duration of a relationship increases competence trust. First, the supplier's expectation of renewal and obtaining future contracts reinforces performance (correlation between trust and sharing information is higher for recursive transactions compared to those that are non-recursive). Second, past experience increases supplier capabilities and cooperation (Coletti et al., 2005). Both are positively associated with superior sharing information contexts.

Through cluster analysis, we identified three clusters that represent typical arrangements: (i) contract regulation, (ii) relationship, (iii) quasi-hierarchy. The average presence of the four mechanisms defines each service arrangement (Figure 1). Each transaction was classified within the typical arrangement. We used 1, 2 and 3, respectively, for regulation by contract only, relationship and quasi-hierarchy. This ordinal scale represents Williamson's (1996) market-hierarchy continuum.

Figure 1: Service arrangements based on extra-contractual mechanisms

Arrangement	Competence Trust	Shared Informaton	Supervision	Goodwill Trust	% (n)
Quase-hierarchy	++	++	++	++	21.2 (17)
Relationship	++	++	-	-	50.0 (40)
Contract regulation	+	-	-	-	28.8 (23)

n = 80

Note. (++) indicates predominant incidence, (-) indicates weak incidence. The categories consider the incidence of each mechanism in each cluster.

The arrangements follow ideal archetypes previously proposed by Spékle (2001), and empirical archetypes identified in van der Meer-Kooistra and Vosselman (2000), Langfield-Smith and Smith (2003) and Satorius and Kirsten (2005). The previous literature suggests that goodwill trust reduces potential conflicts, and is associated with the reduction of formal control (Dekker, 2004), and it affects the reliability on shared performance information (Mohammad, in press). We observe goodwill trust emerging with repeated interactions, but the design of those contracts still remains the same. We suggest the following explanation. As interactions occur according to the buyers' expectations about the service, the buyer reduces some monitoring efforts. The increased trust leads the supplier to seek another contract, with the design of the contract for the former service remaining. We did not observe an evolution of informal controls as we could not conduct an analysis of informal mechanisms resting on respondent memory in order to avoid memory bias during the interviews. Thus it was not possible to distinguish if trust complements contractual completeness or if trust substitute control rights.

4.4. Service performance

In the case of the mill under analysis, the main dimension considered in the service performance assessment, is the compliance with specifications and ready service availability upon demand. The value attributed to the variable is the score weighting of the mill's area attributes to service provider related to one specific service in the assessment system. Scores were standardized from 0 to 1. Transactions without formal assessment (25% of the transactions) were scored according to the supervisor's judgment during the interview, based on the threshold used by mill's managers to indicate insufficient performance during the formal assessments.

We observed during the interviews that managers prefer not to change the supplier even where the performance is lower than expected making a ‘bad with him, worse without him’ argument. We found only one case of anticipated termination caused by low performance, which occurred after the same supplier had mis-performed twice (both during a general maintenance program causing extreme sequential schedule delays in four production areas). In order to control this behavior the presence of this symbiotic relation was identified by the tolerance level the supervisor showed when low performance occurred.

The symbiotic relation between the mill's supervisor and supplier was considered as present when the relation displayed: (i) low variance in the values of the mill supervisors' assessment of suppliers' performance, without target improvements; (ii) values below the lowest acceptable target, even in case of problems in the service process during the same period, (iii) absence of formal performance assessment, or (iv) contracts with more than one renovation, with performance below the critical target appointed by the respondent (who demands the service) during the interviews. The variable assumes one for transactions with evidence of a symbiotic element, or zero.

As noted, one explanation for supervisor's preference is the existence of intellectual capital in the relationship once he/she avoids going to the market to select another service provider to replace the current provider. The direct effect of such a replacement entails switching costs such as retraining costs. But another potential effect associated with the service provider substitution is the disturbance in the process during the time taken up for the new supplier adaptation. Both represent intellectual capital take up.

Summary statistics are presented in table 1. The first column shows statistics for all samples, and the second and third segregated by type of service that contracts lead to. Operation services are those where the provider participates at some stage of production

having the potential to directly affect the volume of steel production. For such services, there are generally buffers to prevent failures affecting others production stages.

Table 1: Summary statistics

Contracts and services variables	All sample (n=80)			Operation services (n=50)	Non-Operation services (n=10)
	Mean (Std.Dev)	Min	Max	Mean (Std.Dev)	Mean (Std.Dev)
Duration	29.09 (22.67)	1.5	72	36.95 (23.74)	14.22 (15.40)
Completeness	0.45 (0.14)	0.2	0.71	0.46 (0.15)	0.52 (0.06)
Incentives	0.08 (0.07)	0	0.25	0.09 (0.07)	0.03 (0.03)
Control Rights	0.46 (0.17)	0.14	0.8	0.44 (0.20)	0.43 (0.05)
Service performance	0.78 (0.17)	0.00	0.98	0.83 (0.07)	0.65 (0.23)
Measurement Cost	2.55 (1.55)	1	5	2.02 (1.49)	3.9 (1.20)
Economic Impact of Failure	2.23 (1.18)	1	4	2.02 (0.99)	1 (0)
Asset Specificity	0.01 (0.11)	0	1	0.02 (0.14)	0 (0)
Recursiveness	0.91 (0.28)	0	1	1 (0)	0.3 (0.48)
Uncertainty	0.92 (0.38)	0	2	0.9 (0.30)	1.1 (0.31)
Symbiosis	0.35 (0.48)	0	1	0.28 (0.45)	0.20 (0.42)
Competence trust	52.78 (32.17)	1.00	109.05	60.64 (29.55)	18.93 (28.56)
Information sharing	0.78 (0.41)	0	1	0.96 (0.19)	0.2 (0.42)
Supervision	0.6 (0.49)	0	1	0.6 (0.49)	0.1 (0.31)
Goodwill Trust	0.41 (0.49)	0	1	0.28 (0.45)	0.2 (0.42)

Correlations between variables are not viewed to present risks for the statistical analysis².

5. Tests and Results

Table 2 shows a consistent negative relationship between the effect of the measurement cost and completeness and a positive relation with the presence of residual control. As a result, hypothesis 1 can be confirmed. The result also indicates the complementariness of the third party's enforcement and self-enforcement, in line with Lazzarini et al (2004).

² Correlations significant at 1% shown between brackets are: completeness and measurement cost (-0.577), control rights and measurement cost (0.573).

As anticipated, the moderating effect of the economic impact of the failure boosts the reduction of contract specification efforts in the presence of measurement costs. This effect is interpreted in terms of the lack of significance of economic impact of failure direct impact on completeness, and by the significance of MEC-EIF on completeness. The expected moderating effect of the impact of measurement costs on the use of control rights, on the other hand, was not observed. Instead, a direct economic impact of failure effect occurred in control rights (not stable for all tests), suggesting that, in cases of high economic impact, the use of residual control rights on the process does not depend on how costly it is to measure service quality. Hypothesis 2 is therefore only partially accepted.

These results are consistent with cases we observed in practice. Critical services lie within the space between insourcing and outsourcing. Such transactions will be contracted out only if the buyer can preserve control rights over the process' critical stages in order to anticipate delivery failures. When the potential economic impact of failure is not so significant, efforts to complete contracts will depend on measurement costs. We can observe this effect in the industrial contracts which can extend to a hundred pages, in order to constrain operational cost reduction behavior from the operator, for example by adopting less environmentally responsible processes to dispose of waste.

As expected, recursiveness reduces the completeness of the terms and, at the same time, implies the use of residual control rights. Again, the complementary nature of contractual and extra-contractual enforcement mechanisms emerges. The moderating effect on measurement costs was considered so as to verify whether the recursiveness effect affected the contract design through measurement costs. An unexpected effect was found for completeness as well as for control rights, suggesting that the tested causal mode is not additive, that is, the effects of the variables are not independent. As there is no theoretical

basis for this effect, the causal form of hypothesis 3 is compromised. It should be highlighted, however, that recursiveness affects contract choice.

If we observe the contracts under a general maintenance programming, the simplest contracts are provided by the same supplier over many years. Given the lower specificity level (intensive standard work labor input, low levels of *ex ante* capital investment), and the difficulty for the supplier to replace the contractor with another, buyer self-enforcement is based on easily observable and measurable performance.

Table 2: Expectation on contractual enforcement (Hypotheses H₁ to H₄)

	Completeness		Control Rights	
Intercept	0.451	0.458	0.471	0.459
Measurement cost	-0.095 ***	-0.082 ***	0.116 ***	0.104 ***
Economic Impact of Failure	0.019	0.003	-0.046 ***	-0.025
Recursiveness	-0.037 ***		0.029 *	
Uncertainty	0.026 **	0.024 *	-0.018	-0.027 **
MEC EIF		-0.023 **		0.013
MEC REC	-0.019 *		0.035 **	
MEC UNC		0.005		0.014
Asset specificity	-0.004		0.006	
R ²	0.503	0.403	0.480	0.374
adjusted R ²	0.455	0.354	0.430	0.323
Log likelihood	73.72	66.33	54.56	47.14
N	80	80	80	80

Significance: *, **, *** (1%; 5%; 10%)

TOBIT regressions.

MEC EIF - Moderate effect of Economic Impact of Failure on Measurement cost;

MEC REC - Moderate effect of Recursiveness on Measurement cost;

MEC UNC - Moderate effect of Uncertainty on Measurement cost.

As with recursiveness, the moderating effect of uncertainty on measurement costs was considered in order to ensure that the uncertainty effect did not affect the contract design through the measurement costs. This was not observed. The higher the uncertainty about the variability of the supplier's process, the greater the efforts made to complete the contract, and the less the use of residual control rights. This effect is contrary to expectations and not convergent with the prior literature (Caglio and Ditillo, 2008), the hypothesis 4 is not

supported. One possible explanation is the uncertainty is managed by informal mechanisms, a possible ‘shadow of the future’ (Heide and Miner, 1992, p. 265) effect at play. A second explanation is a possible path dependence effect, as there are evidences that some contracts are simply a combination of earlier used terms.

Based on the identified service arrangements operating in the mill for each transaction we tested the effects of economics impact of failure and uncertainty as drivers for the manager’s choice on coordination of a particular transaction. In the tests observed in Table 3, only economic impact of failure positively and significantly affects the adoption of a more relational arrangement.

Table 3: Drivers for the Identified Service Arrangements (Hypotheses H₅)

	Arrangement
Measurement cost	-0.189
Economic Impact of Failure	0.555 ***
Uncertainty	-0.094
LIMIT ₂	-0.914 ***
LIMIT ₃	0.634 ***
LR statistic	17.98
Probability (LR stat)	0.000
N	80

Significance: *, **, *** (1%; 5%; 10%)
ORDERED PROBIT regressions.

Hence, the greater the economic impact, the greater the probability that the arrangement will be organized through quasi-hierarchy. This partially confirms hypothesis H₅. Taking account the two considered drivers, we can surmise that in the presence of economic impact of failure the arrangement goes to the relational extreme, independent of the attribute’s measurement cost, as the failure is sufficiently costly and the company prefers to allocate it, even inefficiently, over taking the risk of large losses.

The ordered probit technique calculates the variables’ coefficients and also provides

the probabilistic limits of each arrangement's occurrence. The test shows the managers happen to select the arrangement based on their expectations on the potential impact of failure of each transaction. Recursiveness was not included in this test given the high correlation with the arrangement, as all non-recursive cases ($n=7$) are executed in the same arrangement (contract regulation).

As the managers supposedly selected the arrangement to achieve better performance, and the service characteristics also affects performance, we control the selection bias (Heckman, 1979), assessing the arrangement misalignment between the identified arrangement for each transaction and the estimated one (see Yvrande-Billon and Saussier, 2004). For each transaction, the misalignment is the difference between 1 and the probability for the occurrence of the identified arrangement. The degree of misalignment was used as an explanatory variable, and moderated by the symbiosis present in the relation.

Despite the test's low explanatory power (Table 4), it should be noted that the transaction characteristics, except recursiveness, do not affect performance, but the transaction's misalignment does (-0.056, 1%). The direct symbiosis effect is not significant, as it emerges only there are performance problems from poorly coordinated contracts, but the moderating effect on misalignment is. Hypothesis H_6 in its above form is rejected because of its low explanatory power, although the effect of misalignment on performance and of symbiosis mitigating this effect is highlighted, without claims to validation.

Recursiveness, not foreseen in the hypothesis but used as a control variable (0.056, 1%), is positive and significantly related with performance. The possible explanation for that is recursiveness serves as a source of process stabilization and for the development of extra-contractual mechanisms, such as trust and cooperation. It also permits gains from information exchange and allows supervision to act at a time when many of these suppliers are located inside the mill.

Table 4: Misalignment effects on service performance (Hypotheses H₆)

	Service performance
Intercept	0.784
Misalignment	-0.056 ***
Symbiosis	0.002
MISALIGN _i SYM _i	0.044 ***
Measurement cost	0.009
Uncertainty	-0.012
Recursiveness	0.056 ***
R ²	0.211
Log likelihood	40.141
N	80

Significance: *, **, *** (1%; 5%; 10%)
 TOBIT regressions.
 MISALIGN SYM - Moderate effect of Symbiosis on Misalignment.

The interviews suggest that managers use formal evaluations to assess supplier performance with different intents. We followed three evaluations cycles observing that some areas reported supplier evaluation without exchanging information with the supplier, while others routinely interfaced with their suppliers before sending the report analysis. The later seems to be used as part of a bargaining game, where supervisors obtain a renewal for a supplier promising better performance in the future to smooth weak current performance. Here, the switch costs and the risks of service failure by a new supplier may not exceed the mill's potential gains but exceed the manager's potential gains. Thus, a symbiotic relationship emerges where supervisor accepts a known and more experienced supplier even with existing low performance, rather than switch to a risky unknown new supplier.

Supervisors have Total Quality Management tools largely institutionalized at the company with structured periodic 'quality meetings'. Supplier coordinators attend these meetings, so the performance (especially the underperformance) can be controlled on a daily basis. Thus, for recursive transactions, where control is largely informal, the performance evaluation that is on-going allows formal communication of what mill supervisor and supplier already know that is conditioned by the informal arrangements between the two. Only an

extremely weak level of performance would be revealed to apply a penalty that has been contractually specified. We observed one supplier which has had a weak performance twice over a 6 months period which provoked a stoppage in steel production.

6. Discussion

Service quality measurement costs are relevant in explaining the contract design of industrial service supplies. How contracts and extra-contractual mechanisms can replace or complement enforcement of supply agreements influences the choice of the enforcement mix. Additionally, choice of design is affected by assessments of the economic impact of service failure. We report in this investigation that economic impact moderates the effects of measurement costs. In instances of significant economic impact, the firm does not engage in extensive efforts to add completeness to the contract, given the low enforcement level. However, residual rights are still completed as a way of controlling the process and mitigating the suppliers' failure potential. Transaction characteristics do not influence performance directly. On the other hand, transaction alignment and recursiveness do, the latter perhaps because it stabilizes processes and creates viability for the development of extra-contractual coordination mechanisms. As indicated by Williamson (1996), the recursiveness of a transaction is relevant in explaining the arrangement as it intensifies self-enforcement strength. Among explanations suggested in this research which do not directly accord with TCE expectations, the sub-optimal performance of a supplier may be time and context-specific and can condition how supervisors and suppliers seek to maintain stability over improving performance via contract enforcement and supplier switch.

The regularities of functional forms can be organizationally determined in complex ways but this does not disallow theoretical embeddedness within a simpler economic model such as TCE to offer insight. Assessment of data within a narrow theoretical conception of

outsourcing can explain aspects of organizational complexities observed in practice but explanations for these observations may also need to make appeal to contextually localized factors. Given the cross-sectional nature of our data, we cannot postulate causal relations. But we can propose that efficient contract design is organizationally defined and may be reflective of TCE theorizing (Baiman et al, 2000). This is because friction between bureaucracies and incentives for supervisors and managers to adapt the contract design may exist. Incentive effects not isolated in a contract can mitigate low performance and where coordination mechanisms are present these may alter the anticipated use of built in contractual controls (Balakrishnan et al., 2002). One example of this is where future efforts that may be anticipated of suppliers alter the evaluation of current performance and enable local deviation from contractualized stipulations. Expectation of future contracts by a service provider can raise conformity, not because of the effectiveness of the arrangement (to reduce contractual risks), but because of a temporary incentive element. There may also be longitudinal path dependency affecting transactions affecting the nature of contracts and the way the buyer regulates relations. Change in the external institutional environment can alter enforcement (Langfield-Smith and Smith, 2003). Expectations may be placed on buyers and passed on to suppliers which detract from contractual agreement where an external event triggers pressure on costs (Kajuter and Kulmala, 2005).

The use of a unique case sample does not affect the study's validity, as the latter only aims for theoretical validity of the particular case (Eisenhardt, 1989), notwithstanding the study can be replicate outside the sampling logic in other similar buyer-supplier alliances, including joint venture settings (Porporato, 2013), interorganizational relationships systems (Abdel-Maksoud, 2011), or under a context oriented by a culture other than a common industrial provision environment, as the luxury hotels industry (Vigolo et al, in press). The replication of the study may allow the convergence of constructs and the narrowing of proxies

(Lillis and Mundy, 2005), mainly for the theoretical analysis surrounding observed action for the identified economic impact of failure on service contracts (Keating, 1995; Scandura and Williams, 2000).

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