

SOFTWARE OUTSOURCING CONTRACTS: AN ECONOMIC ANALYSIS BASED ON AGENCY THEORY

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ABSTRACT

This paper presents an analysis of contractual outsourcing agreements in the field of Information Technology based on the postulates of the Agency Theory. This analysis reveals that the design of many outsourcing agreements, referred to as procurement contracts, is incomplete from an economic perspective. It is postulated that this degree of contractual incompleteness is the result of a trade-off between the benefits of mitigating the ex-post opportunism of agents and the costs of additional resources expended in ex-ante design. The magnitude of these opposing forces can be predicted based on the characteristics of the suppliers and the software services.

From this postulate, as well as from previous findings in the literature on manufacturing procurements, this paper suggests a model which links the degree of contractual completeness with some variables related to the potential opportunism of suppliers and the uncertainty surrounding software services. A subsequent research phase will test this model in software outsourcing environments.

1. INTRODUCTION

In many industries at the end of this second millenium, Information Technologies (IT) have become an essential organizational component, in a world where competition is becoming increasingly fierce and global, and where the pursuit of organizational growth requires re-analysis of organizational missions, rationalization of resources and a

searching for greater organizational flexibility (Patry, 1994). In this context, the outsourcing of the information technologies is even now seen by a number of organizations as another strategy for increasing efficiency, performance and competitiveness.

Although it is not possible to accurately determine the scope of the IT outsourcing phenomenon¹, the published approximations concur on its very large scale and rapid growth in the management of information services. Willcocks et al. (1996) have assessed the value of these agreements at \$50 billion US worldwide in 1995, with an annual growth rate of 15%. This market is highly concentrated in western developed countries (the USA and Western Europe) with approximately half the market (International Data Corporation, 1998), two-thirds of it in IT operations and the rest in software development and maintenance (Strassmann, 1998).

Outsourcing contracts are typical examples of make-or-buy decisions (Aubert, 1994), that is, « doing in-house or contracting out – DIOCO ». Outsourcing is also referred to as involving a process of « vertical disintegration » of the firm (Barreyre, 1988). However, because of the magnitude and scope of such IT outsourcing contracts, they have a strategic significance² for the organizations involved. Indeed, outsourcing implies relationships of a different type than those associated with the simple

¹ Information in most contracts is considered confidential because of its competitive value.

² Strategic significance in terms of competitive position of the firms involved.

procurement of services that is easily represented by single and individual (spot) transactions in a market: « the importance of the network of activities outsourced and the duration of the agreements often transform the participants involved into strategic allies »³.

It has also been observed that, for the control of the multiple individual transactions within the lifespan of an outsourcing agreement, customers and suppliers do not commit to detailed controls, but to a more consensual decision-making process. They therefore favor a longer-term agreement, often with an incomplete contractual design, rather than a fully detailed contract (where everything is specified in detail) or a sequence of shorter-term contracts (Patry, 1994). In current IT outsourcing agreements, incomplete designs can be partially explained by the uncertainty surrounding these activities and other specificities, such as IT immateriality, their instantiation mode, their higher risk, their lack of measurement capabilities and their lack of standardization (Aubert, 1994; Baetjer, 1997).

In the economic field, problems originating from the diversity of interests and information of both the customer and the supplier are referred to as an agency problem. In the next section, an analysis of outsourcing relationships from the perspective of the agency problem is presented. In the third section, the fact that IT outsourcing contracts are usually burdened by incompletely specified agreements is discussed. In section 4, a model of contract incompleteness corresponding to a manufacturing procurement environment is presented. In section 5, an adaptation of this model is proposed which takes into account variables related to software service outsourcing problems. The last section presents concluding remarks about this incompleteness in terms of the agency perspective and some proposals for further study.

2. ECONOMIC ISSUES IN IT OUTSOURCING

Economic theories have made substantial contributions towards explaining and bringing about significant improvements in the management of organizations. For example, the rationality of decisions is based on neo-classical theory, the most widely accepted school of thought in economics. According to this theory, supporting the cost-benefits criteria in management, transactions are performed in the marketplace between vendors and buyers, and the prices and quantities are the exchange parameters established by the forces of supply and demand. The market is assumed to be the best (the sole, the natural) place in which to organize the transactions and the perfect competitive market constitutes the optimal scenario allowing the largest quantities of goods or services to be traded at the lowest prices (Stigler, 1983). In practice, the firm is over-simplified in terms of its production function and the criterion of the competitiveness of the firm results from its cost function. Each firm can have a different production function, which implies different combinations of factors that are stable in the short term. In the long run, however, the specialization of the firms generally permits cost savings to be derived from economies of scale, innovation and the firm's increased knowledge (Patry, 1994).

Consequently, outsourcing must be considered when the costs levels of a firm that produces goods or services using their own production process, and those of other firms producing the same goods or services but having different production and cost functions are compared (Patry, 1994). According to this specialization criterion, a firm should outsource the goods and services that constitute inputs to its own production process, if it produces them at higher cost than external suppliers, and the selected supplier should be the one that incurs the least cost while producing at the same level of quality.

However, recent findings in Industrial Organization have highlighted some important limitations of the neo-classical theory in the context of the outsourcing phenomenon: first, the production costs criterion is not sufficient to explain current outsourcing decisions; second, it lacks of

³ Patry (1994), page 2.

organizational insight, and third, it cannot explain the existence of long-term agreements as a means to reduce the risks associated with outsourcing relationships. Furthermore, the neo-classical approach takes for granted many rigid assumptions that are rarely found in industrial outsourcing scenarios. Among these are the perfect rationality of agents (perfect information, so no uncertainty), the existence of a market, completely defined spot transactions, and perfect identification of the costs, prices and quantities of deliverables (Patry, 1994).

In the more recent alternative theories, such as Transaction Costs Economics (TCE), Property Rights Theory (PRT) and Agency Theory (AT), several of the rigid assumptions of traditional neo-classical theory are relaxed, permitting these limitations to be overcome. Even though TCE has been the most widely used of these alternative theories for analyzing IT outsourcing, we believe that AT provides a more powerful means for explaining outsourcing management, and for motivating outsourcing management in the IT field. AT makes it possible to build upon the TCE analysis by suggesting mechanisms to modify agent behavior in both market and firm settings.

According to AT, a contractual relationship is established when a principal delegates a job to an agent. In this relationship, each of the parties looks out for their own interests and goals, and uses their own information about the tasks to be performed. However, it can be difficult for one party to assess the performance and the behavior of the other party, and the risk aversion levels of the principal and the agent can be different (Eisenhardt, 1989). From these conditions arise two kinds of risk associated with the agency costs that lead to sub-optimal situations: the moral hazard, or lack of effort of the agent, and adverse selection, or false representation of the agent's ability to carry out the task (Eisenhardt, 1989). These risks exist in both market and firm settings. Thus, "cheating" costs would be associated with the costs of the outputs⁴ and their control,

⁴ According to the specifications established ex-ante between the principal (customer) and the agent (supplier), and are derived from the difficulties in

and correspond to the market transactions, while "shirking" costs would be associated with the costs of wrong efforts⁵ and their control, and correspond to firm transactions (Hennart, (1993).

AT suggests incentives to mitigate the risk of diversionary behavior or opportunism, principally regarding additional information about the parties' tasks and performances (Sappington, 1991; Eisenhardt, 1989; Hennart, 1993; Tirole, 1989). Some examples of these incentives would be benchmarking, competition among agents, rewards based on effectiveness, links among process stages, historical data, reputation mechanisms, bond exchange, among others.

In summary, AT addresses the agency problem, providing explanations for potential deviation in the behaviors of the contracting parties, arising from their differences in terms of information and motivation, and leading to unexpected costs, or agency costs, which could be mitigated on the basis of additional information.

Examples of AT findings in the IT outsourcing domain are those of Aubert et al. (1997) and Whang (1992). Aubert et al. (1997) present two cases to illustrate some detrimental manifestations of opportunistic behavior in IT outsourcing relationships. To prevent the unwanted side outcomes, Aubert et al. (1997) recommend various contract mechanisms based on AT to help curb opportunism. Among these mechanisms there are direct monitoring, benchmarking, markets to monitor suppliers, payment tied to observed performance, linking of consecutive stages of a process, competition among agents, and use of the reputation and bonuses and penalties systems. In the other example, software development contracting is analyzed by Whang (1992), who provides an overview of software development contract characteristics in a theoretical model based on game and economic

assessing the quantity and/or the quality of the deliverables by the principal.

⁵ According to the specifications established ex-ante between the principal (owner or hierarchical superior) and the agent (worker), and are derived from the difficulties in assessing the quantity and/or the quality of the task effort by the principal.

theories to incorporate incentive and information issues associated with understanding and managing software contracting⁶.

Because of software specificity, agency-related problems in software outsourcing are numerous and to be expected: software is fundamentally an intellectual product built from the contributions of a number of heterogeneous participants. Its production process derives from very complex structures of accumulated and sophisticated technological knowledge (Baetjer, 1997). As a consequence, software services (development and maintenance) are subject to high levels of uncertainty and risk. Furthermore, informational distance among stakeholders can be considerable (e.g. between developers and users), leading to different levels of understanding, and different goals and interests. The inherently high degree of specialization of most components and most stakeholder knowledge contributes to enhancing this distance and the difficulty of mutual assessment of the participants (playing principal and agent roles). This situation, which has an impact on agency relationships in software management, could be fairly critical to mutual contracting satisfaction levels, due to the immaturity of the state of the art in some key areas:

- weaknesses in the domain of software measurement,
- lack of software process standardization,
- lack of software products standardization and
- continuing slow development of software engineering as a bona fide engineering discipline.

⁶ In the proposed model, an outside contractor is hired to develop software over several periods. Due to uncertainties about costs and technology, the developer faces the risk of abandoning the project in an intermediate phase. The user is assumed to be better informed of software benefits, while the developer discovers that development costs are increasing as the project advances. Given bounded information, both contracting parties make decisions that are in their own interests, leaving each party exposed to the other's opportunistic behavior.

Furthermore, in the MIS domain, Lacity and Hirschheim (1995) have identified several additional factors, derived from organizational outsourcing practices, which would tend to increase agency-related problems in software services outsourcing:

- the rapid evolution of IT and its penetration into business functions;
- the rapid changes in the economic aspects of IT;
- the inexperience of customers with outsourcing, and
- the fact that management practices determine the effectiveness of systems (technical criterion) instead of economies of scale (economical criterion).

3. CONTRACTUAL INCOMPLETENESS

Traditional microeconomics takes for granted that transactions are realized in a market and that they constitute complete contracts (Aubert, 1994) in which price simultaneously conveys all the information and all the enforcement conditions necessary for both vendor and buyer. In a spot transaction, price is supposed to represent the relevant data about the characteristics, attributes, qualities and conditions of the product and about the participants in the market⁷. An optimal situation presupposes perfect information, so that there is no uncertainty about the behavior of variables: the ex-ante knowledge is the same as the ex-post results.

With transactions involving increasingly complex goods, complete information about future performance is not available. When transactions occur in the market, uncertainty about some attributes of future performance arises. This explains the existence of warranty clauses to protect against these uncertainties and to prevent the possibility of potential opportunism in the behavior of the participants (Tirole, 1993). Where

⁷ The price is fixed by the intersection of demand and supply curves, demand representing the marginal revenue derived from the utility curves of the potential buyers, and supply reflecting all production and costs information of the suppliers.

anticipation of all potential contingencies is not possible, the design of the contracts is deemed to be incomplete.

In more long-term arrangements, there is uncertainty associated with the future performance of the goods to be transacted and ex-post behavior of the agents tends to arise. For example, in the outsourcing scenario that involves long-term transactions of complex goods and services, it is very difficult to know ex-ante everything about ex-post performance ex-ante, contract design will necessarily be incomplete. Tirole (1993) identifies four factors that impede complete designs in this kind of arrangement:

- The contingencies are too numerous for an exhaustive list to be considered;
- The process of estimating the probabilities attached to each contingency is highly complex;
- The high costs associated with drawing-up and managing more complete contracts are high;
- The legal costs preventing the parties from using the courts to enforce a disputed contract.

Software characteristics, which have not necessarily been well mastered to date, lead to outsourcing contract designs that remain incomplete. Because of the complex production structure and low level of standardization and measurement knowledge associated with this structure, the uncertainty surrounding them is high. In addition, the dynamics of knowledge advancement in this field contribute to a highly complex environment, where taking into account the key contingencies and the probabilities associated with the materialization of each one of the products, becomes very difficult. Elsewhere, the software development and maintenance domains require the participation of several people with very different specialties and knowledge, and holding very different organizational positions. An individual's knowledge tends to be very segmented, and the informational distance among the participants in the various steps and periods can be substantial. Also, having their own goals and interests implies that they will act

in a self-interested way. It would be very difficult for one participant to accurately evaluate the performance or the behavior of another participant, who has a different position or specialization in the process. The behavior of these participants thus becomes very difficult to anticipate, as do the contingencies surrounding this behavior and the estimation of their probabilities. Since contingencies are difficult to draft, and, by consequence, costly to manage and enforce, it is practically impossible to take into account all these eventualities, and contract design developed in such an uncertain environment is necessarily incomplete (Crocker & Reynolds, 1993).

By contrast, less definition in the agreements leaves more room for unexpected behaviors. The less defined a contract, the more possibilities there are of distinct behaviors in comparing ex-ante beliefs about the conduct of the agents. Fewer enforcement clauses in contracts, meaning less specification of the parameters and constraints on the contractor's behavior, can thus lead to more manifestations of opportunism on the part of the participants in the relationship. Williamson (1989) emphasizes the role of ex-post opportunism in the dissipation of the gains from trade. An incomplete contract permits participants to engage in efforts to redistribute the surplus as uncovered contingencies arise. Self-interest in the redistribution of the surplus would explain this potential opportunism (Tirole, 1993). Incomplete contracting presupposes a distribution of the surplus to be generated ex-post, but without consideration of the mechanisms to enforce this distribution ex-post. Ex-post bargaining on the ex-ante investment is implicit in incomplete contracting because the agents are unable to commit to a division of the surplus before making their unobservable investment decisions (Crocker and Reynolds, 1993). Thus, the fewer enforcing mechanisms are considered in the contract, the more room there is for surplus bargaining and the more likely it is that the agent's efforts will be directed towards redistribution of the surplus, which implies deviations from the ex-ante beliefs implicit in the contracts.

Only "where contracting costless it would be possible to design agreements complete

enough to circumscribe all surplus-eroding redistributive tactics, and intricate enough to mitigate distortions". In more complex scenarios like outsourcing, the "cost of identifying contingencies and dividing responses increases with uncertain environments, placing economic limits to draft and implement elaborate contractual agreements". In practice, the "parties may mitigate these ex-post opportunism and distortions, but at the cost of increased resources dedicate to crafting the document a priori"⁸. As a consequence, the degree of completeness of a contractual arrangement arises from a trade-off between the costs and benefits derived from the environmental uncertainty (which is derived from their complexity) and the potential opportunism of the parties. A more efficient contract, resulting from a cost-benefits analysis, is costless considering the level of information related to both, the environmental characteristics and the level of enforceability with respect to the agents' expected behavior. The concept of contractual efficiency would thus tie the level of costs to the degree of completeness (Crocker and Reynolds, 1993).

4. INCOMPLETE CONTRACTS IN INDUSTRIAL PROCUREMENT: AN EXAMPLE

Based on AT considerations about contract incompleteness, Crocker and Reynolds (1993) have proposed a model where the environmental complexity and the likelihood of opportunism have a direct bearing on the design of procurement contracts. According to these authors, the degree of specificity (completeness) chosen by the participants should reflect an efficient trade-off between the expected costs and benefits of contractual incompleteness.

The first hypothesis of the model is that the primary costs of drafting a more complete agreement correspond to the difficulties of identifying contingencies and negotiating responses that are mutually acceptable to the participants. In this sense, the marginal cost of implementing more precise agreements increases with the degree of

completeness. The second hypothesis is that the advantage of harsher agreements is to reduce the participant's propensity to engage in activities designed to effect privately favorable distributions of the ex-post surplus (constraints benefit the parties when the available redistributive tactics consume resources). So, the marginal benefit of increased completeness is a reduction in the costs associated with ex-post bargaining.

The proposed reduced-form relationship of the model is:

$$P^*_{it} = P_i(\omega_{it} L_{it}) + \varepsilon_{it}$$

where P^* represents the level of completeness of a contract which depends on a firm (supplier) specific P_i function. This function is derived from two exogenous variables: the parties' expectations of both the marginal cost of a more complete arrangement which derives from the environmental complexity (ω), and the marginal benefit of increased completeness which reduces the potential opportunism of the participants (L). The i and t subscripts indicate supplier and time observations, and ε_{it} represents an error term.

This model was adapted to the military procurement environment: the engine procurement for two models of airplane by the US Air Force. In this environment (like IT outsourcing), acquisition involves substantial recurring relationship-specific assets and a relatively small group of highly specialized contractors. However, because of the nature of defense activities, management of the relationships, including selection, governance and compensation, is strictly framed by several federal regulations.

In this adapted model, the dependent variable is the contract type (ordinal-type variable) and the model considers five different possible types: firm-fixed price (FFP), fixed price with economic price adjustment (FP/EPA), not-to-exceed price (NTE), fixed-price incentive with one firm target (FPIF) and fixed-price incentive with successive targets (FPIS). This order of presentation means a decreasing degree of completeness (e.g. FFP presupposes a more complete contract than FP/EPA, which is more complete than NTE, and so on).

⁸ Crocker & Reynolds (1993), page 127.

There are two groups of explanatory variables. The first group, which addresses the costs of a more complete agreement (ω), considers the period of time between the negotiations and the delivery of the engines (elapsed time), the unscheduled engine removals (reliability) and the number of quarters between contract signing and the first quarter of 1970 (technological uncertainty)⁹. The second group, which addresses the benefits of a more complete agreement (L), includes the number of disputes involving the supplier (reputation) and a dichotomous variable which indicates the availability of alternative suppliers (opportunism trends).

This adapted model was tested in the USAF with a data set based on information from these outsourcing contracts. The test sample included 44 contracts with two suppliers (Pratt and Whitney and General Electric) executed over 11 years (1973 – 1984). The statistical tests, which adopted OLS techniques, show satisfactory outcomes: high explanatory power of the several combinations of variables tested and high significance of the regression coefficients.

Moreover, the empirical results provided substantial insight into the interpretation of the evolution of management practice, as reflected in the contractual records examined. For example, in the early years of the contracts, the distant performance horizons together with the extensive technological uncertainty led to the increased costs of drafting more complete contracts. As the technological problems with the engine were overcome, the costs of more complete contracts declined, leading to the adoption of firm-fixed price contracts (more complete in economic terms) in later years¹⁰. Another example of the insight

provided was the identification of differences in the opportunistic philosophies of the suppliers, leading to different degrees of completeness of the contractual agreements. Crocker and Reynolds (1993) conclude that their empirical results provide strong support for the proposition that the degree of contractual completeness is an intentional choice of the parties which reflects the trade-off between two economic variables: the costs of drafting a more complete document and the losses associated with incomplete agreements.

5. A CONTRACTUAL INCOMPLETENESS MODEL FOR SOFTWARE SERVICES OUTSOURCING

Outsourcing is a hybrid governance mode of transaction characterized by contractual agreements that are incomplete from an economic viewpoint (Barreyre, 1988; Aubert, 1994; Patry, 1994). This incompleteness derives from the issues related to the agency problems; these issues are particularly important in software outsourcing due to the technological and environmental uncertainties surrounding these domains of activity and to distances in terms of the information and goals, that exist between the participants (Aubert, 1997; Patry, 1994). This is further exacerbated by the current immature state of the field of software measurement and by the fact that software assessment methods have emerged early recently. The newness, and immaturity, of these software-related management tools constitute key factors, which explain the pervasiveness of these agency problems in software development and maintenance outsourcing. Software services outsourcing have thus become a natural breeding ground for incomplete contracts.

Following the Crocker and Reynolds logic, the analysis of software outsourcing contract incompleteness presupposes identification of the variables that reflect the degree of contractual completeness and the costs and benefits associated with environmental

⁹ According Crocker and Reynolds (1993), this variable should capture the effects of the macroeconomic trends, the cumulative learning curve effects and the robustness of the technology used.

¹⁰ One of the main characteristics of the contractual record analyzed is that the arrangements tend to become more complete over time. " This monotonic relationship is a consequence of the natural resolution of technological and intemporal uncertainties as events unfold, which appears to be the driving behind the design of the engine procurement contract. This one-way ratchet reflects participants' realistic

expectations about technological progress and, in particular, the lack of mistakes serious enough to warrant renegotiation towards less, as opposed to more complete agreements" (Crocker and Reynolds, 1993 – page 144).

uncertainty and the potential opportunism of the participants. These variables and their relationships can be identified in the existing AT, software measurement and software outsourcing literature, and need to be tested further in a software outsourcing contract environment.

Degree of completeness can be addressed by considering the different pricing practices that exist in software outsourcing. As mentioned in Crocker and Reynolds (1993), an ordinal-type scale can measure this dependent variable. Based on various sources (Jones, 1996; Strassmann, 1996; Radford and Lawrie, 1998), four completeness levels can be proposed, ordered by increasing degree of completeness according to the economic criteria¹¹:

- Global fixed price (GFP), meaning that the supplier often estimates the total costs that are accepted by the customer. At this level, the customer (principal) knows the total amount that he or she has to pay for the job, but has only a little control over the deliverables.
- Time and materials (TM), meaning that the supplier conveys to the customer the cost of the services (based on the two principal components), which includes a capital remuneration or supplier profit. Neither the supplier nor the customer knows the full price in advance.
- Fixed price with performance adjustment (FP/PA) meaning two-part compensation: a fixed part, established ex-ante and judged by the participants to be "normal" according to an expected level of contingencies; and a variable part, determined ex-post according to the performance level reached¹².
- Fixed unit price (FUP), to be established by service modality. This presupposes

the identification, on a unit basis, of the deliverables and the capacity of the participants to make commitments about their unit costs and values. It is also recognized as a more complete contract format in an economic sense¹³, assuming that all the relevant information for the transaction is contained and reflected in the price-fixing mechanism.

The first group of explanatory variables, which addresses the environmental uncertainty of the software services outsourced (ω in the Crocker and Reynolds model notation), includes, in an initial proposition, the two variables presented in table 1.

¹¹ Where unit price, resulting from the supply and demand interaction, represents the more complete contract possibility.

¹² This level would correspond to a "second best" optimal setting in the agency relationship where the performance of the agents or suppliers is aligned with the performance goals of the principal or customers (Levinthal, 1988; Gauthier, 1990).

¹³ The basic assumption is that the (spot) market in a perfect competition scenario has a bearing on the optimal economic situation.

Table 1: Explanatory variables of environmental uncertainty

Variable	Description	Expected impact and mechanisms	Source
Elapsed Time (ELA)	Elapsed time between contract signing (or service specification) and service delivery (acceptance by the user). Addresses the complexity of the outsourced task.	A longer elapsed time is associated with a more complex task, then with a higher cost to arrive at a more complete contract.	Crocker and Reynolds (1993)
Reliability (REL)	The reliability of the service could be approached through the number and degree of severity of the adjustments made after service delivery.	A less reliable service presupposes a less control of the supplier, then greater cost to arrive at contract completeness.	Crocker and Reynolds (1993)

The second group of explanatory variables, which influences contract completeness through the potential opportunism of the agents ("L" group variables in the Crocker and Reynolds model notation), would be made up of the following variables described in Table 2:

Table 2: Explanatory variables related to potential opportunism

Variable	Description	Expected impact and mechanisms	Source
Measurement (MEA)	The availability of measures for assessing service performances (e.g. productivity).	When more measures are available, then there are more possibilities for assessing the services outsourced, and there are more benefits to investing in the control of potential opportunism and the contract would tend to be more specific.	Eisenhardt (1989), Hennart (1993), Aubert (1997).
Disputes (DIS)	The number and severity of the suppliers' contractual disputes in the past indicates the agents' propensity to try to capture more ex-post benefit than presupposed ex-ante.	The more numerous the disputes, the more common the opportunistic behavior of the agent and, consequently, the more profitable the investments in constraining the redistributive activities.	Crocker and Reynolds (1993)
Suppliers (SUP)	The number of alternative suppliers will also address the propensity for opportunistic behavior on the part of the agents.	The existence of alternative suppliers would tend to deter the agents from opportunistic behavior. The existence of more suppliers tends to prevent collusion. The suppliers would tend to control their desires, knowing that they could lose a future contract, which could be channeled to a competitor. This kind of self-control improves the negotiating power of the customers, and would thus favor less specific agreements.	Richardson (1993), Tirole (1993).
Benchmarking (BEN)	Benchmarking accessibility permits more information to be gained about participants' performance and behaviors relative to information about alternative participants.	Benchmarking accessibility would play a similar role to measurement availability in preventing potential opportunism and in diminishing the requirements of costly investments associated with more complete agreements.	Richardson (1993), Tirole (1993).

As the Crocker and Reynolds (1993) model suggests, the degree of completeness will depend on the interaction of several factors having different impacts. These impacts, for each category of service, could be expressed in a multiple regression as follows:

$$Y_s = \alpha_s + \beta_s(ELA)_s + \delta_s(REL)_s + \phi_s(MEA)_s + \gamma_s(DIS)_s + \eta_s(SUP)_s + \varphi_s(BEN)_s + \varepsilon_s$$

where Y_s represents the degree of completeness of the contract corresponding to service “s”; α the service-specific effect; the terms $\beta, \delta, \dots, \varphi$ the factors indicating the variance of Y explained for each of the variables; (ELA) and (REL) the variables addressing the environmental uncertainty; and (MEA), (DIS), (SUP) and (BEN) the four variables concerning the costs and benefits relating to the potential opportunism of agents (Tables 1 and 2).

However, to test the model, several constraints would have to be considered. The experimental site would need to be a large organization that manages manifold contracts corresponding to different categories of software services (development and maintenance). This host organization would have to have enough documentation, in quantity and quality, to satisfy the data requirements of the sample model. Adjustment of the definitions of the variables with the availability of data thus becomes a critical testing restriction related to the possibility of a proper statistical analysis, which should consider covariance analysis among the variables as well. The expert’s availability is also another condition of testing the model, since they would be the data source for some variables (i.e. MEA, BEN).

6. CONCLUDING REMARKS

The economic scope of IT outsourcing is difficult to understand when looked at only from the traditional perspective of neo-classical economic theory. However, new trends in Industrial Organization provide additional valuable insights. Among these, Agency Theory gives us a more realistic understanding of the outsourcing

phenomenon. Outsourcing is considered as a contractual relationship between a principal and an agent, each of whom has different information and goals, all of which can have a bearing on the possible opportunistic behaviors of both parties.

Because of the current impossibility of taking into account all the contingencies surrounding the execution of software contracts, the agreements are presupposed to be incomplete from an economic perspective. The degree of this incompleteness is determined in a trade-off between the benefits and costs derived from environmental uncertainty and potential opportunism. Incompleteness can, as a consequence, be a voluntary choice of the participants, according to the costs they are prepared to assume in drawing up and executing the contract.

Crocker and Reynolds (1993) have tested this approach in the equipment procurement environment and have provided strong support for it through empirical results. This initial study, which involves a field somewhat similar to the software services outsourcing field, has revealed that agreements become more complete over time, especially because increasing knowledge makes it possible to reduce the technological uncertainty and improve the assessment of the participants’ performance. These authors also suggest the case-by-case treatment of the contracts according to the particular features of the products and suppliers.

Extending these results to the software services outsourcing field would involve drawing and testing a model in this precise environment. This research has identified some preliminary variables and relationships that could be taken into account in an explanatory model for the software services outsourcing domain.

However, to obtain an acceptable level of conclusive evidence requires a more in-depth analysis, and testing the model in an empirical environment will be necessary in order to overcome several constraints associated with the present analysis.

ACKNOWLEDGMENTS

We wish to thank Bell Canada, and the Natural Sciences and Engineering Research Council of Canada for research funding. The opinions expressed in this paper are solely those of the authors.

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Appendix 1: Proposed Model

