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An Organizational-Economic Blueprint for Information Technology Outsourcing: Concepts and Evidence

Lawrence Loh
National University of Singapore

AN ORGANIZATIONAL-ECONOMIC BLUEPRINT FOR INFORMATION TECHNOLOGY OUTSOURCING: CONCEPTS AND EVIDENCE

Lawrence Loh
Faculty of Business Administration
National University of Singapore

ABSTRACT

The emergence of information technology (IT) as a critical determinant for business productivity brings a fundamental need to align the IT strategy with the corporate strategy. A basic issue arising from this imperative is the choice of effective structural mechanisms to govern the IT function. Our paper constructs and tests an integrated governance model of IT outsourcing at both the firm and the dyadic levels. It extends the traditional boundary of organizational economics to develop emerging domains such as bargaining costs, influence costs, management costs, and decision information costs. Within a context of IT outsourcing, key constructs and corresponding measures inherent in each cost domain are developed and tested. The data are drawn from surveys involving a large sample of 463 senior IT managers across 209 leading corporations in the U.S.

1. INTRODUCTION

As information technology (IT) embraces a broader role in the corporation and in interorganizational relationships between firms, the productivity impact of the IT function is a key factor for business success in the competitive marketplace (Henderson and Venkatraman 1993). Disappointingly, the majority of empirical evidence has pointed to the negligible, if not negative, role IT has played in enhancing business productivity (Brynjolfsson 1992). Nevertheless, the effective governance of IT, particularly through sourcing choices, has been deemed to be instrumental in deriving maximal benefits and value for the business (Huff 1991; Loh 1993).

Strategically, having the best IT resources that can deliver the requisite competencies for the firm is a challenge confronting many firms (Huber 1993; Lacity and Hirscheim 1993). A central issue facing top management in acquiring these IT-based capabilities is whether it makes good business sense to maintain its IT organization internally or to outsource all or parts of it (Loh and Venkatraman 1992a, 1992b). Essentially, IT outsourcing is the allocation of decision rights or responsibilities of all or parts of a corporation's IT infrastructure toward an external vendor. In other words, the sourcing question is basically the choice of the most appropriate structural mechanism for managing IT vis-a-vis a vendor such that IT can be maximally leveraged for its advantages. On a analogous note, this is equivalent to the familiar "make-versus-buy" option facing any business.

Within a broader context, the importance of governance in the IT setting corresponds with the increasing attention to mechanisms for corporate governance among strategy and organization researchers (Donaldson 1990). Viewed as institutional structures that serve to influence the exchange process, these mechanisms include external arrangements such as long-term contracts, licensing agreements, and partnerships as well as internal arrangements such as executive compensation and board composition (Hesterly, Liebeskind, and Zenger 1990).

This paper extends the research agenda on governance mechanisms for the IT context. Specifically, it constructs an integrated framework for IT governance using a set of variance-theoretic (Mohr 1982) determinants involving both an exchange level (i.e., a dyadic level between the user and the vendor) and an organizational level (i.e., a firm level of the user). Traditionally, the anchors in analyzing governance choices are based on transaction cost economics (Williamson 1975, 1985) and, to some extent, agency theory (Jensen and Meckling 1976). Beyond these traditional theories, the paper proposes and tests constructs based on other new yet critical components of organizational economics such as bargaining costs (Milgrom and

Roberts 1990), decision information costs (Gurbaxani and Whang 1991), influence costs (Milgrom and Roberts 1988), and management costs (Demsetz 1988). In testing the model, our data were generated from key managers from three IT functional domains — application development, data center management, telecommunications/network management — pooled across 209 Fortune 500 corporations based in the U.S.

2. AN ORGANIZATIONAL ECONOMIC DECOMPOSITION OF GOVERNANCE COSTS

We define the entire spectrum of costs relevant to the exchange as governance costs. These costs can be categorized into firm costs and dyadic costs. Our framework is depicted in Figure 1. It broadens the existing integrative cost research in Gurbaxani and Whang as well as in Sundaram and Venkatraman (1992).

2.1 Dyadic Costs and IT Governance

Dyadic costs are those costs that arise from the level of the exchange between the buyer and the seller of an economic good. In the development of our conceptual perspectives, we propose hypotheses pertaining to dyadic costs within the specific context of IT governance.

Transaction Costs. Along a broad view, transaction costs refer to the costs connected to the exchange of goods or services across the boundary of the firm (Coase 1937). Generally, these costs arise from negotiation, monitoring, and enforcement in the contract between the participants of the relationship. Accordingly, the firm exists as a direct consequence of market failure, more specifically, in instances where the transaction costs associated with the market alternative are too high. The transaction thus constitutes the fundamental unit of organizational analysis and the focus of the transaction cost paradigm is the selection of the most efficient governance mechanism. In line with Williamson (1985), we identify asset specificity and uncertainty as the two more important constructs of these costs for the context of IT governance.

Asset specificity is the consequence of the small-numbers scenario in the original transaction cost framework (Williamson 1975). It refers to the unique or idiosyncratic investments that are sunk by a party of an economic exchange to facilitate the transaction. In our specific context of IT governance, this specificity arises when firms have their hardware, software, and communications architectures or platforms uniquely developed for customized usages. Further, this specificity is inherent, for instance, when IS staff are trained to operate only customized applications or routines that are distinctive to a given vendor or platform.

> **Hypothesis 1:** Asset specificity inherent in the structuring of a user-vendor relationship is positively related with dyadic costs that are associated with IT outsourcing.

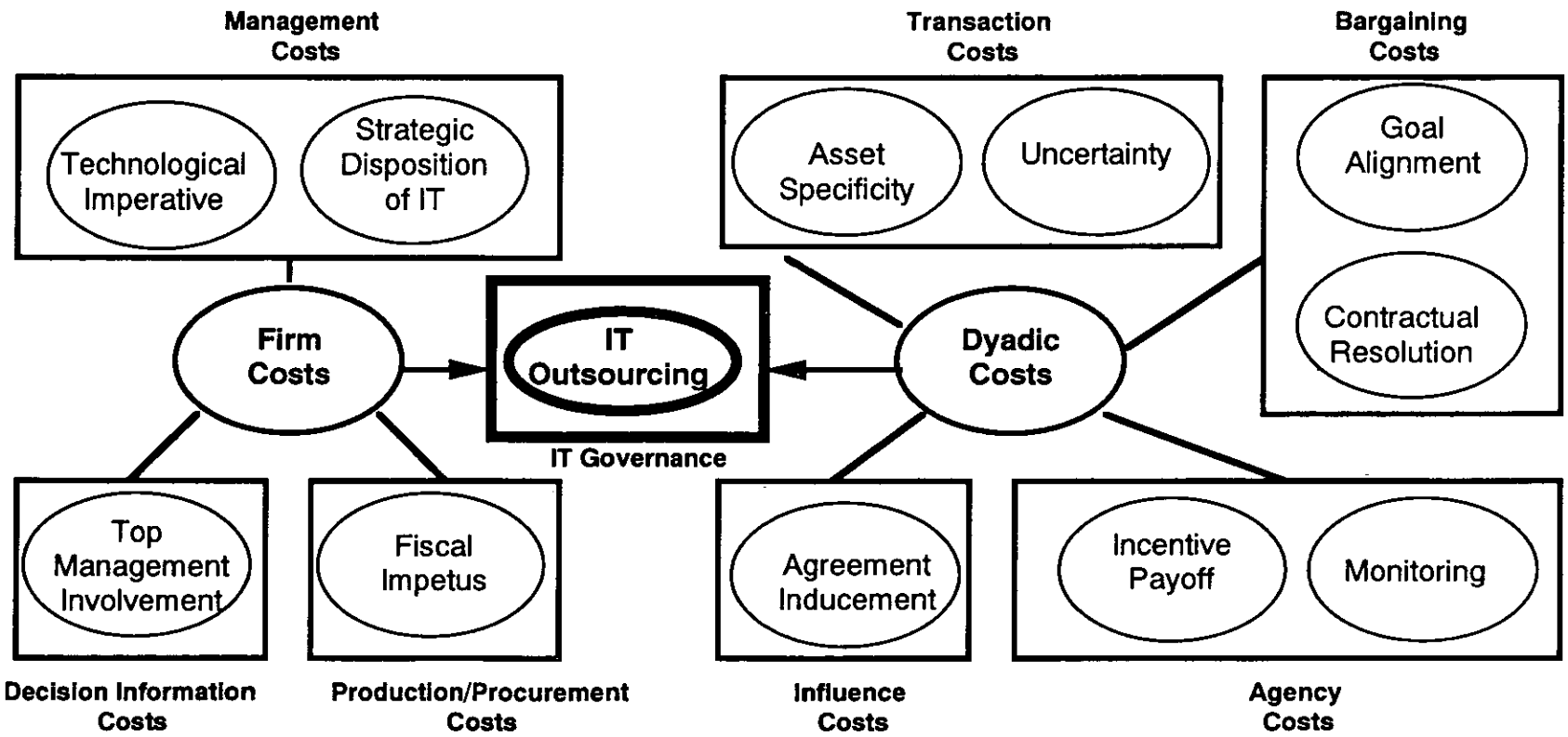
Uncertainty is another facet of transaction costs pervading a governance relationship between transacting parties. An exchange environment characterized by such uncertainty is a breeding ground for opportunism, especially when rationality of the agents is severely limited. Governance structures differ in their abilities to cope with the effects of uncertainty. Internalizing a transaction through the hierarchical mode of organization results in an authority-based relationship that can mitigate the costs of uncertainty. In an IT governance setting, technological uncertainty spanning a potential user-vendor relationship may include adoption of standards, introduction of new functionalities, and obsolescence of hardware and software. Uncertainty is also present in the measurement of cost-performance trends, productivity of IS staff, and quality of outputs associated with a vendor.

> **Hypothesis 2:** Uncertainty inherent in the structuring of a user-vendor relationship is positively related with dyadic costs that are associated with IT outsourcing.

Bargaining Costs. Milgrom and Roberts (1990) extend transaction cost theory by proposing a bargaining cost framework of contractual exchange. Accordingly, the choice between a market mechanism and a formal organization rests crucially on the costs of bargaining over short-term arrangements between independent economic agents. Milgrom and Roberts (1990, p. 65) define bargaining costs as "all the costs associated with multilateral bargaining, competitive bidding, and other voluntary mechanisms for determining a mutually acceptable agreement" Essentially, bargaining costs arise when the market mechanism fails even though transaction costs arising from the fundamental attributes (e.g., asset specificity and uncertainty) are nonexistent. For instance, within the famous "prisoners' dilemma" in noncooperative game theory, even when there are no transaction costs, it is difficult for a mutual agreement to be realized.

A major component of bargaining costs is related to goal alignment between contracting parties. When the goals of the contracting parties do not converge, there will be difficulties in the realization of an agreement. In the context of IT governance , a market mode is appropriate, for instance, if mutual trust can be promoted or if a shared vision can be cultivated.

Figure 1. The IT Governance Research Model



Hypothesis 3: Goal alignment inherent in the structuring of a user-vendor relationship is negatively related with dyadic costs that are associated with IT outsourcing.

Another basic concept in bargaining cost theory is the difficulties involved in the settlement of differences during the contract negotiation process. These impediments to contractual formation are the outcomes of instances where individuals could adopt different patterns of mutually consistent, self-interested behavior and where market institutions fail to ensure that only efficient patterns emerge. The importance of contractual resolution is underscored by the wide range of contingencies that needs to be addressed before an IT-based agreement can be finalized (see Brandon and Halvey 1990). Thus, in the specific case of IT governance, the need for contractual resolution may stem from the negotiation of contractual terms such as those that relate to staff employment, dispute settlement, and renewal or termination option.

Hypothesis 4: Contractual resolution inherent in the structuring of a user-vendor relationship is negatively related with dyadic costs that are associated with IT outsourcing.

Agency Costs. Agency theory considers an organization as a nexus of treaties among individuals (Jensen and Meckling 1976). The theory thus considers the contractual context of a principal and an agent. The two basic problems associated with a contract between economic parties are moral hazard and adverse selection. The first refers to the lack of effort by the agent to maximize the welfare of the principal (e.g., through shirking or perk consumption). The second refers to the false declaration of ability by the agent to the principal (e.g., through misrepresentation of productivity).

Agency costs can be relevant in both the firm and the dyadic contexts. In the firm context, these costs have been argued to be of limited use in the determination of alternative governance mechanisms (Sundaram and Venkatraman 1992). In the dyadic context, the problem is a consequence of conflict of interests inherent in a buyer-seller relationship; this is more crucial for the governance choice setting.

In the presence of divergent interests within an economic exchange, the principal can ensure the convergence of the welfare of both parties through mechanisms that provide information on the agent's efforts (Holmstrom 1979). The mode of exchange that allows verifiability of the agent's actions is termed as behavior-based contracting (Eisenhardt 1989). In the specific case of IT governance, critical assessment criteria may include operating performance (e.g., completion time), investments in technological innovation, and staff development.

Hypothesis 5: Monitoring inherent in the structuring of a user-vendor relationship is negatively related with dyadic costs that are associated with IT outsourcing.

Another key element underlying any contract between a principal and an agent is the incentive payment scheme. To reduce the conflict of interest inherent in this dyadic relationship, part or all of the agent's compensation can be made contingent on the realized outcome of the delegated work (Grossman and Hart 1983). This control mechanism is termed as outcome-based contracting (Eisenhardt 1989). One of the major factors affecting the mode of IT governance is the ability to structure a payment system based on actual service level provided. In addition, IT governance is influenced by the contractual feasibility in implementing contingent penalties or damages for nonperformance or an incentive bonus based on actual overall user's business performance.

Hypothesis 6: Incentive payoff inherent in the structuring of a user-vendor relationship is negatively related with dyadic costs that are associated with IT outsourcing.

Influence Costs. The theory of influence activities has recently been advanced as critical explanations of the inefficiencies associated with organizational modes (Milgrom 1988; Milgrom and Roberts 1988, 1990). Such costs arise because "participants inevitably care about the decisions that the central authority can make and so tend to spend too much time trying to influence the authority's decisions" (Milgrom 1988, p. 43). In other words, these are the consequences when organizations expend resources to mitigate the suboptimal redistribution and reduction of firm value, rather than its creation. In a sense, influence costs are synonymous to what Williamson (1985) refers to as "costs of bureaucracy" that result when successive production stages are joined.

In the IT outsourcing industry, there is a variety of techniques vendors can employ to induce a contractual agreement. For instance, vendors can restrict a buyer's discretion from whom to make the purchase through a "lock-in" of users. Vendors can also use exchange facilitation to influence a prospective buyer such as through efforts that are over and above what is necessary for the completion of the transaction. For example, vendors may resort to marketing activities that are not value-adding or may cultivate personal relationships with the key decision-makers of user organizations.

Hypothesis 7: Agreement inducement inherent in the structuring of a user-vendor relationship is positively related with dyadic costs that are associated with IT outsourcing.

In summary, we have specified seven components of dyadic costs in the context of IT governance based on the individual cost domains in organizational economics. In essence, this implies that dyadic costs derive the theoretical meaningfulness from the specific constructs. Synthesizing the above discussion, we propose:

> **Hypothesis 8:** Dyadic costs inherent in the structuring of a user-vendor relationship are negatively related with an outsourcing mode of IT governance.

2.2 Firm Costs and IT Governance

Firm costs emanate from the level of the internal organization in the provision of the economic activity. As in the case of dyadic costs, we advance the components of firm costs with key underlying constructs for the IT governance context.

Management Costs. Demsetz proposes the notion of management costs that characterized "firm-like organization." These costs are defined as those of organizing resources within firms. Specifically, a firm is framed within a traditional contractual perspective in three ways. First, the corporate charter is an implicit agreement for the firm to specialize. Second, the firm constitutes an agreement among the input owners to continue their association on a long-term basis. Third, team production as in a firm implies that the input owners agree to rely on a certain degree of conscious direction for guiding the usage of resources.

Demsetz further argues that management costs are linked to the costly production, maintenance, and usage of knowledge in firms. Specialization enables firms to economize on such knowledge activities. The vertical boundaries of a firm are thus determined by the economies of conservation of expenditures on this knowledge.

In the context of IT governance, a widely-held belief within the practicing profession is that a firm's IT can be effectively taken over by external vendors when it is less "strategic" or more "operational" in disposition (Hovey 1990). Conceptually, such an argument is linked to the notion of core competencies (Prahalad and Hamel 1990). These competencies refer to the collective learning of the corporation and its capability to coordinate diverse production skills and to integrate multiple streams of technologies. It is only through such specialization in knowledge activities that firms can efficiently conserve on management costs.

The management of the IT infrastructure in the information era is a sophisticated activity. Companies are often distracted from their fundamental business strategic thrusts in the marketplace by the ongoing problems related to the operation of the IT function. IT is considered to be a core competence if it is central to the basic business and a key strategy of the firm. To the extent that a firm needs to specialize in strategic IT competence as opposed to operational IT activities, in terms of firm costs, it is more efficient to contract out a part or the whole of its IT infrastructure to vendors.

> **Hypothesis 9:** The strategic disposition of IT is negatively related with firm costs that are associated with IT outsourcing.

Another aspect of management costs in relation to the imperative for knowledge specialization pertains to technology. Taking a broad view of "technology as knowledge" (Deiaco, Hornell, and Vickery 1990), we emphasize the intangible assets and capabilities embodied in the firm's ability to appropriate and benefit from the creation, dissemination, and utilization of know-how; here, technology is construed as human knowledge applied in production. Accordingly, firms need to specialize in order to mitigate expenditures in maintaining and communicating technological knowledge within the organization.

Because technology, particularly IT, is a complex and dynamic corporate resource, firms are often limited in their abilities to be on the leading edge of the technology frontier (Quinn 1992). Further, it is costly and inefficient for firms that are undeveloped in their IT capability to be innovative in their implementation of the technology. In sum, the acquisition of computing technologies and technical expertise from external sources is a means in response to this technological imperative.

> **Hypothesis 10:** The technological imperative to specialize is positively related with firm costs that are associated with IT outsourcing.

Decision Information Costs. Gurbaxani and Whang formulate the concept of decision information costs to include organizational inefficiencies due to information processing (e.g., costs of communication, costs of miscommunication, and opportunity costs due to delays in communication) and lack of relevant information. In other words, these costs are related to the acquisition and usage of information surrounding each corporate decision. Decision information costs increase higher up in the organizational hierarchy. This is because of the need of top managers to rely on the information generated by the lower subordinates to make decisions.

In the specific context of IT governance, one key construct underlying decision information costs is related to the

extent in which top management is involved in the strategic planning of the IT function. Traditionally, the locale of responsibility for IT strategy is vested with top management or IT management or is being shared by both groups (Applegate and Elam 1992). The basic argument is that when top management is closely involved with the strategic management of the IT function, decision information costs may arise. This is because information for effective IT planning is derived from the managers and staff of the functional domain (Keen 1988). When critical decisions are embodied with the top management, decision information costs can arise.

> **Hypothesis 11:** Top management involvement in the planning of the IT function is negatively related with firm costs that are associated with IT outsourcing.

2.3 Production/Procurement Costs

The cost of any corporate resource depends on whether it is produced internally or procured externally. If it is being acquired from an outside supplier, the cost would simply be the market price paid. The emphasis in microeconomics has, however, been to analyze how firms generate the resource outputs from more basic factor inputs. Here, firms face a fundamental problem of allocating scarce resources among alternative uses. In this respect, the firm incurs production costs which are determined by the costs of the separate factors involved. A factor can affect total production costs both directly as well as indirectly through its effects on the productivity of other factors.

In the case of IT, the choice for an efficient governance is linked to IT being a separate input resource as well as a critical determinant for other input resources in the firm's production function. In other words, the sourcing decision of a firm is fiscally motivated by cost considerations. First, these fiscal benefits for sourcing are IT-based. Investments in IT have recently escalated and account for about half of the capital expenditure for most large firms (Keen 1991). Firms thus find it necessary to adopt a better cost control approach to managing IT (Strassmann 1990). Increasingly, corporations are rationalizing their capital outlay on IT.

Second, fiscal benefits can be business-based. A firm's business cost structure (i.e., the entire spectrum of costs directly associated with the actual production and coordination of the firm's product line) is a critical source of business competence given its role in explaining business profitability (Buzzell and Gale 1987). With the ubiquitous nature of IT that pervades the entire process of transforming input into output (Porter and Millar 1985), the costs associated with a particular IT governance include not only direct technology costs but also indirect costs of supporting the administration of the firm.

> **Hypothesis 12:** The fiscal impetus to reduce IT costs is positively related with firm costs that are associated with IT outsourcing.

Following our earlier case of dyadic costs, we synthesize the above discussion for the various components of firm costs. Specifically, we posit

> **Hypothesis 13:** Firm costs inherent in the IT infrastructure are positively related with an outsourcing mode of IT governance.

In line with our organizational economic decomposition of governance costs, we contend that firm costs and dyadic costs are both critical in the choice of an appropriate IT governance option. Thus, we hypothesize in the null form:

> **Hypothesis 14:** Dyadic costs and firm costs are equally important in the context of IT outsourcing.

3. METHODS

3.1 Research Design

Our population is the set of large firms in the U.S. business sector. Our sampling frame comprises the corporations in the Fortune 500 categories. To generate a mailing list for the survey, personalized letters were initially sent to the chief executive officers (CEOs) of these corporations with an invitation to participate in our study. We required the chief information officers (CIOs) as well as the directors for three IT areas, namely application development, data center management, and telecommunications/network management. The final result was a set of 226 companies that agreed to participate.

We sent the appropriate pretested questionnaires to the IT managers in each of the participating companies. Table 1 shows the statistics for the questionnaires returned. The three area questionnaires have an overall return rate of 79.4%. Out of the 226 participating corporations, 201 of them had at least one respondent. The data are pooled across the IT areas for the data analysis.

3.2 Operationalization

Earlier, we developed a set of key constructs for dyadic costs and firm costs in the particular context of IT governance (see Figure 1). We show the measures associated with each of the constructs in the appendix.

Table 1. Survey Returns Statistics

IT Area	Questionnaires Mailed	Questionnaires Returned	Returns Percentage
Application Development	197	158	80.2%
Data Center	193	159	82.4%
Telecommunciations/Network	196	148	75.5%
Overall	586	465	79.4%

3.3 Analytical Methodology

Building an Operational Model for IT Governance. In line with our specification of Hypotheses 1 to 14, we construct an operational model with dyadic costs and firm costs as second-order constructs. The individual components of these costs constitute the first-order constructs from which the second-order constructs draw their meaningfulness. Methodologically, since the covariances of the first-order constructs are explained in terms of the second-order constructs (i.e., the degree of freedom required in the estimation is smaller), our model examines the covariation of the key components of IT governance in a more parsimonious manner (Marsh and Hocevar 1985). The rationale for our operational model is rooted in a concept of fit as covariation where a set of underlying dimensions is co-aligned (Venkatraman 1989). Thus, we are basically looking at the pattern consistency of IT governance with a range of organizational economic lower-order constructs vis-a-vis dyadic costs and firm costs as higher-order constructs. Using the earlier notations, Figure 2 depicts the operational model to be estimated where the notations follow those used by Jöreskog and Sörbom (1989). It also shows the expected signs for all the path coefficients in the model.

Testing Hypotheses 1 to 14. In general, the test of the hypotheses involves the relevant path coefficients linking the various constructs. Specifically, Hypotheses 1 to 7 and 9 to 12 are tested by examining the directionalities and significances of the γ parameters linking the appropriate first-order constructs (i.e., the constructs within the various cost domains) to the second-order constructs (i.e., dyadic costs and firm costs). Similarly, Hypotheses 8 and 12 are tested through the γ parameters linking IT sourcing with dyadic costs and firm costs respectively. Hypothesis 14 is tested by comparing a nested constrained model where the absolute values of the two γ parameters are set to be equal with an unconstrained model (i.e., our operational model as shown in Figure 2). If the difference in χ^2 statistic is significant, it means that the unconstrained model is superior (Anderson and Gerbing 1988); thus, dyadic costs and firm costs would be shown to have unequal impact on IT governance.

4. RESULTS

4.1 Preliminary Statistics

We analyzed the data using a widely used statistical package for structural equation modeling, namely, LISREL 7. Since we have both continuous and ordinal measures, the matrix of polychoric, polyserial, and product moment correlations was initially generated and subsequently used in the analysis. Any missing data were deleted pairwise. The final sample size used for the model estimation is 443. This satisfies various absolute minimum size criteria, for instance, 100 (Boomsma 1985) or 150 (Anderson and Gerbing 1984). Further, it meets the relative size criterion of five times the number of parameters to be estimated (Bentler and Chou 1987). In our operational model, there are 84 free parameters implying that a minimum size of 420 is required. Thus, using both the absolute and relative criteria, the sample size is adequate.

4.2 Main Results

Figure 3 shows the key results for the operational model based on the maximum likelihood estimates. All the estimated path coefficients (in the Λ^y and Γ matrices) have the expected signs, with the single exception of uncertainty. Further, they are statistically significant ($p<.05$), except for the relationships between dyadic costs and both asset specificity and uncertainty. In other words, we have obtained statistical support for Hypotheses 3 to 13, while evidence for Hypotheses 1 and 2 are inconclusive (see Table 2). In other words, the significances of the path coefficients linking the first-order constructs to the two second-order constructs establish the critical roles played by the constructs underlying bargaining costs, agency costs, influence costs, management costs, decision information costs, and production/procurement costs, although the importance of transaction costs has not been indicated.

Figure 2. The IT Governance Operational Model

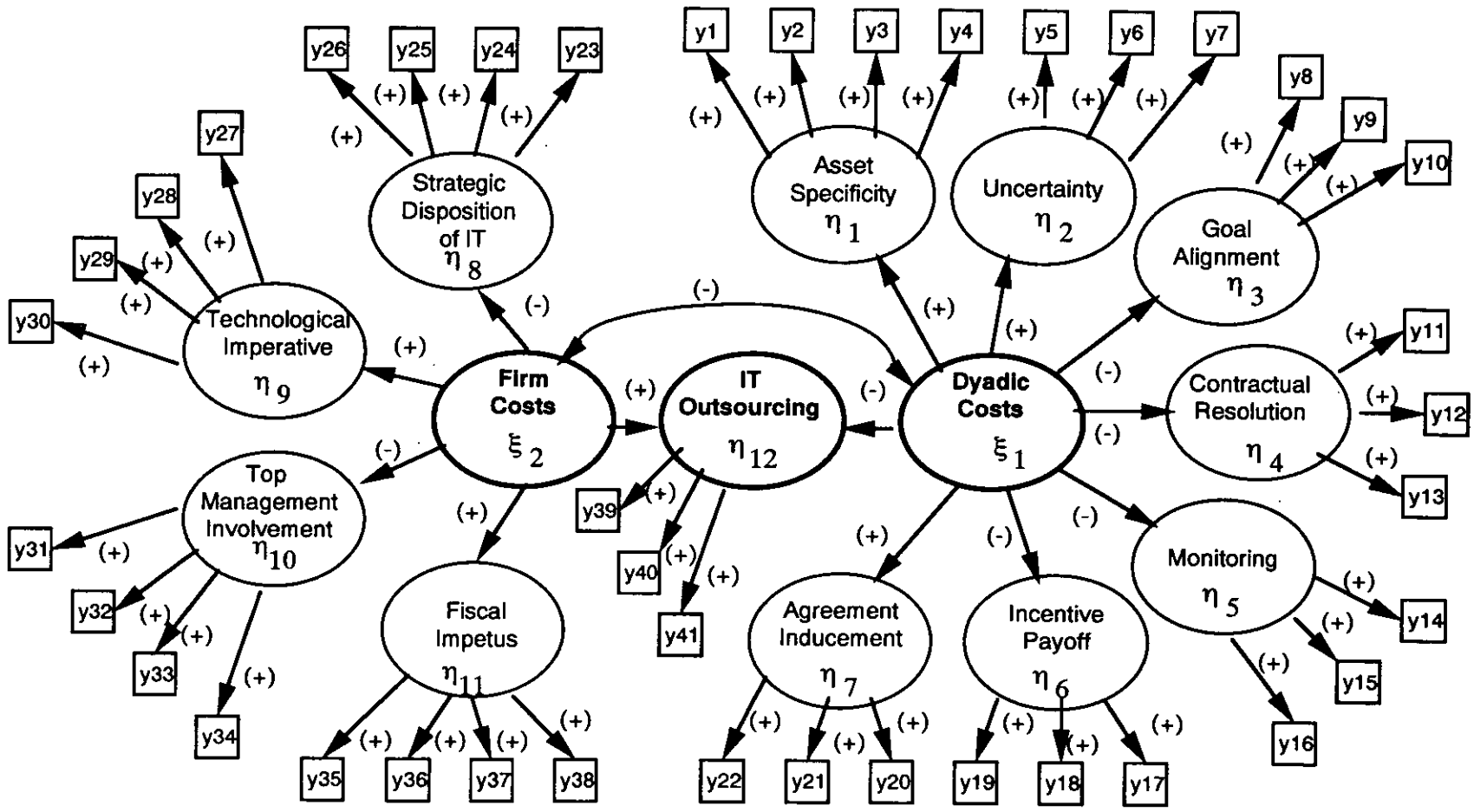
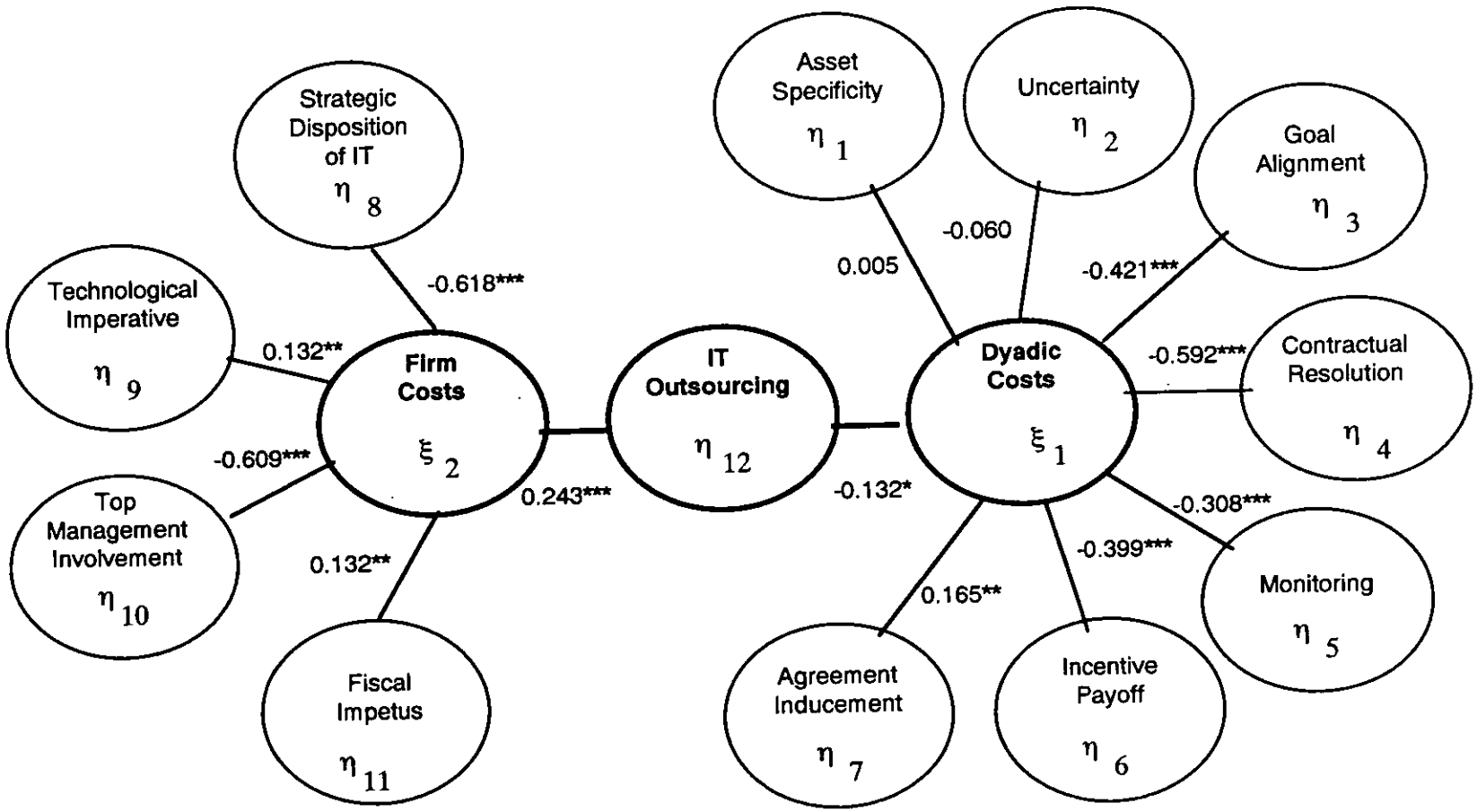


Figure 3. Key Results of the Operational Model



Note: The estimated values of the path parameters are shown together with the level of significances as follows:
***p<0.001; **p< 0.01; *p<0.05

Table 2. Summary of Results for Hypothesis Testing

Hypothesis	Description	Method of Testing	Test Statistic	Inference
1	Positive relationship between asset specificity and dyadic costs in IT outsourcing	Examine directionality and significance of $\gamma_{1,1}$	t = 0.097	Not supported
2	Positive relationship between uncertainty and dyadic costs in IT outsourcing	Examine directionality and significance of $\gamma_{2,1}$	t = -1.137	Not supported
3	Negative relationship between goal alignment and dyadic costs in IT outsourcing	Examine directionality and significance of $\gamma_{3,1}$	t = -6.872***	Supported
4	Negative relationship between contractual resolution and dyadic costs in IT outsourcing	Examine directionality and significance of $\gamma_{4,1}$	t = -8.732***	Supported
5	Negative relationship between monitoring and dyadic costs in IT outsourcing	Examine directionality and significance of $\gamma_{5,1}$	t = -4.873***	Supported
6	Negative relationship between incentive payoff and dyadic costs in IT outsourcing	Examine directionality and significance of $\gamma_{6,1}$	t = -6.043***	Supported
7	Positive relationship between agreement inducement and dyadic costs in IT outsourcing	Examine directionality and significance of $\gamma_{7,1}$	t = 2.763**	Supported
8	Negative relationship between dyadic costs and outsourcing mode of IT governance	Examine directionality and significance of $\gamma_{12,1}$	t = -2.058*	Supported
9	Negative relationship between strategic disposition of IT and firm costs in IT outsourcing	Examine directionality and significance of $\gamma_{8,2}$	t = -9.498***	Supported
10	Positive relationship between technological imperative and firm costs in IT outsourcing	Examine directionality and significance of $\gamma_{9,2}$	t = 2.665**	Supported
11	Negative relationship between top management involvement and firm costs in IT outsourcing	Examine directionality and significance of $\gamma_{10,2}$	t = -11.214***	Supported
12	Positive relationship between fiscal impetus and firm costs in IT outsourcing	Examine directionality and significance of $\gamma_{11,2}$	t = 2.808**	Supported
13	Positive relationship between firm costs and outsourcing mode of IT governance	Examine directionality and significance of $\gamma_{12,2}$	t = 3.820***	Supported
14	Equal impact of dyadic costs and firm costs on IT outsourcing	Compare the theoretical model with a constrained model where the absolute values of $\gamma_{12,1}$ and $\gamma_{12,2}$ are set to be equal	χ^2_d (df:1) = 1.27	Supported

Note: * p<.05; ** p<.01; *** p<.001

As for Hypothesis 14, we compare the difference in χ^2 statistic for the unconstrained operational model and an appropriate constrained model with the path coefficients linking both dyadic costs and firm costs to IT sourcing specified to be equal. The value of this statistic χ_d^2 (df:1) is 1.27, thus indicating that there is no significant difference between the two models. The interpretation is that both dyadic costs and firm costs (which are individually significant) are equally important in their impact on IT sourcing. This result is also consistent with our earlier dichotomy of governance costs into these two cost categories.

4.3 Supporting Results

Results on Model Fit. We evaluate the model fit of our operational model while recognizing the statistical problems of large degree of freedom and sample size (Hayduk 1990; Marsh and Hocevar 1985). Hoelter (1983) derives a critical-N (CN) statistic that stipulates the maximum sample size up to which a particular model cannot be rejected under the null for the χ^2 test. Using a probability level of 0.05, the computed the CN statistic for our operational model is 239.26. This is above the proposed threshold value of 200, thus indicating an adequate model fit. An ad hoc but informative index is by dividing the χ^2 statistic with the associated degrees of freedom to obtain the χ^2/df ratio. This equals 2.33 in our model, which meets the cutoff ratio of 2 as a benchmark of acceptable fit (Carmines and McIver 1981).

The contemporary approach of addressing model adequacy is the use of relative fit indices that are based on a comparison of hierarchical (or nested) models (Anderson and Gerbing 1988). We consider two reasonably specified null models through a zero-value constraint placed on (1) the two γ parameters linking the dyadic and firm costs constructs to the IT sourcing construct and (2) all γ parameters as well as the correlation parameter between the dyadic and firm costs construct. In case (1), χ_d^2 (df:2) is 25.60 ($p<.001$) while in case (2), χ_d^2 (df:4) is 300.10 ($p<.001$). For these alternative null models, the differences in χ^2 relative to the operational model are all statistically significant. In addition, we specify another alternative model where there are only two first-order constructs (dyadic costs and firm costs) affecting IT sourcing. This is estimated by imposing a constraint of one on the path coefficients linking the first-order constructs to the second-order constructs in the original operational model. Here, χ_d^2 (df:1) is 58.39 ($p<.001$), which indicated a significant difference in model fit. Overall, the fact that the full operational model performed better than two base models and an alternative model suggests that there is adequate model fit.

Results on Reliability. Table 3 shows the results pertaining to the evaluation of internal consistency using an indicator of composite reliability, ρ_c, as developed in Bagozzi (1981). All the values for ρ_c exceed 0.5, signifying that the construct variances dominate the respective error variances. The attainment of this consistency establishes the homogeneity (i.e., both unidimensionality and reliability) of the measures associated with each construct.

Results on Validity. Convergent validity can be determined by the statistical significances and directionalities of the path coefficients pertaining to the individual measures underlying the first-order constructs as well as those of these first-order constructs associated with the second-order constructs. Convergent validity is supported by the results pertaining to the λ and the γ parameters as noted earlier. In other words, we have demonstrated the agreement of the measures or constructs underlying every construct.

Discriminant validity for our operational model can be evaluated by comparing the χ^2 statistic of this model to that obtained under a nested constrained model in two ways as follows: (1) to test this validity of the first-order constructs, the path coefficients linking the first-order constructs to the second-order constructs are constrained to one; (2) to test this validity of the second-order constructs, the correlation of these two second-order constructs is constrained to one. In sum, the examination of internal consistency and validity also addresses the key components of a general notion of construct validity (Bagozzi 1980).

In the case of assessing the validity of the first-order constructs, χ_d^2 (df:11) is 778.48 ($p<.001$). For the second-order constructs, χ_d^2 (df:1) is 58.39 ($p<.001$). The difference in χ^2 compared to the operational model is significant under the two estimations, thus implying that each construct differs from one another for both the first- and second-order constructs.

Results on Sample Pooling. To justify the use of a pooled sample of respondents in three IT areas as well as in both service and industrial sectors, we performed a subgroup analysis through an appropriate splitting of the dataset. To circumvent the problem of interpretational confounding (Burt 1976) in the analysis, we used a measurement model based on two second-order constructs (i.e., dyadic costs and firm costs) and the appropriate first-order constructs. First, we compared the model fit for the case where the parameters set free to vary across the three groups (IT areas) with another model where ϕ and ψ are constrained to be invariant across the groups; this yielded χ_d^2 (df:4) is 3.92 ($p>.05$), which is not statistically significant. Second, we performed the same test using industry sectors as groups; we have χ_d^2 (df:2) is 4.84 ($p>.05$). In summary, the subgroup analyses support the pooling of respondents by IT areas and by industry sectors.

Table 3. Assessment of Internal Consistency

Construct	Composite Reliability
Asset Specificity	0.8213
Uncertainty	0.7311
Goal Alignment	0.7605
Contractual Resolution	0.7026
Monitoring	0.6105
Incentive Payoff	0.5868
Agreement Inducement	0.6337
Strategic Disposition of IT	0.7110
Technological Imperative	0.8007
Top Management Involvement	0.9327
Fiscal Impetus	0.8666
IT Outsourcing	0.6231

5. DISCUSSION

Overall, our organizational-economic model for IT governance is largely supported. Although the strength of our findings lie in the significances of path coefficients in the various dyadic and firm cost domains, the nonsignificance of the coefficients relating specifically to the transaction costs constructs is an interesting discovery. An immediate implication is that transaction costs are shadowed by the newer constructs of organizational economics. Indeed, the transaction costs approach has often been criticized for its omission in considering other market and hierarchical costs (e.g., Milgrom and Roberts 1990; Perrow 1981). Our model results represent an initial effort toward resolving this critical issue.

In our results, all the path coefficients have the expected direction of change except in the case of uncertainty. Traditionally, the relationship of uncertainty with transaction costs or, more generally, with dyadic costs has been conceptually and empirically established to be positive (e.g., Anderson 1985). Our results, however, indicate a negative but statistically insignificant relationship between uncertainty and dyadic costs. This finding is in line with recent arguments that market governance is ironically associated with some forms of technological uncertainty such as technological obsolescence (Balakrishnan and Wernerfelt 1986). Here, it can be postulated that the incidence of technological obsolescence, by making some outcome more probable, actually reduces technological uncertainty.

Our results point to the dualistic nature of market-based and hierarchical-based costs that renders a concurrent consideration of these costs as an important precursor for contractual formation. In fact, within the arena of IT contracting, "hierarchical elements" have been deemed to be critical components of market-based agreements (Ang and Beath 1992). The implication is that it is possible to mitigate dyadic nuances even while engaging in outsourcing relationships. Thus, even when dyadic costs are high, firms can still engage in market-oriented IT governance, provided it is possible to implement adequate control mechanisms in the contracts.

In conclusion, the empirical results provide a preliminary endorsement of our organizational economic model for IT governance. They show that using dyadic and firm costs as second-order constructs can effectively demonstrate the significance of the path relationships. In particular, they provide empirical support for developing constructs for the determination of IT governance using the emerging domains of organizational economics; namely bargaining costs, agency costs, influence costs, management costs, and decision information costs.

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APPENDIX
Operationalization of Constructs

Asset Specificity (Measures y1 to y4):
Please indicate the degree of uniqueness (or similarity) of your specific IT area in relation to other firms within your industry.

	Unique to our firm						Similar to others in our industry
Overall architecture	1	2	3	4	5	6	7
Operating procedures	1	2	3	4	5	6	7
IT knowledge/experience base	1	2	3	4	5	6	7
IT staff training	1	2	3	4	5	6	7

(Measures y1 to y4 were reverse scaled for the analysis.)

Uncertainty (Measures y5 to y7):
How do you rate the level of uncertainty for the following within your specific IT area?

	Low level of uncertainty						High level of uncertainty
Obsolescence of current hardware/software	1	2	3	4	5	6	7
Cost-performance trends	1	2	3	4	5	6	7
Quality of final outputs	1	2	3	4	5	6	7

Goal Alignment (Measures y8 to y10):
A healthy relationship with an IT vendor depends critically on the compatibility of goals in both contracting parties. To what extent would you feel that the following are potential problems in a *contractual relationship* with a vendor?

	Not a potential problem						A potential problem
Subordinating self-interest to joint interest	1	2	3	4	5	6	7
Having a bilateral understanding of roles and responsibilities	1	2	3	4	5	6	7
Cultivating a shared vision	1	2	3	4	5	6	7

(Measures y8 to y10 were reverse scaled for the analysis.)

Contractual Resolution (Measures y11 to y13):
Whether you are engaged in insourcing or outsourcing, the ease of negotiation toward a mutually agreeable arrangement is a critical issue in the choice of a sourcing strategy. How easy or difficult would you think it is to resolve the following issues during the *contract negotiation process* with an IT vendor?

	Easy to resolve with a vendor						Difficult to resolve with a vendor
Staff employment	1	2	3	4	5	6	7
Dispute settlement	1	2	3	4	5	6	7
Renewal/termination option	1	2	3	4	5	6	7

(Measures y11 to y13 were reverse scaled for the analysis.)

Monitoring (Measures y14 to y16):
After the contract is signed with an IT vendor, it is necessary and important to oversee the efforts of the vendor. How easy or difficult would you think it is to monitor the vendor with respect to the following?

	Easy to monitor						Difficult to monitor
Operating performance	1	2	3	4	5	6	7
Investments for technological innovation	1	2	3	4	5	6	7
Investments in staff development	1	2	3	4	5	6	7

(Measures y14 to y16 were reverse scaled for the analysis.)

Incentive Payoff (Measures y17 to y19):
The implementation of a pricing mechanism is an important issue in a contract with an IT vendor. There is a large variety of mechanisms such as "fixed-price," "cost-plus," and "pay-per-service." How easy or difficult would you think it is to structure the contract using the following?

	Easy to structure						Difficult to structure
A payment system based on actual level of requirements and services provided	1	2	3	4	5	6	7
Penalties or damages in the events of specific contingencies	1	2	3	4	5	6	7
An incentive bonus based on our actual overall business performance	1	2	3	4	5	6	7

(Measures y17 to y19 were reverse scaled for the analysis.)

Agreement Inducement (Measures y20 to y22):
Your business is valuable to the IT vendor community. In general, vendors have a variety of ways, some of which are counter-productive, to approach potential customers like yourself. How frequent (or infrequent) would you view the following as being used by IT vendors to secure an outsourcing contract in a *counter-productive* sense?

	Infrequent						Frequent
Intensive sales promotion efforts	1	2	3	4	5	6	7
Emphasis on cultivating personal relationships	1	2	3	4	5	6	7
Attempts to lock-in customers	1	2	3	4	5	6	7

Strategic Disposition of IT (Measures y23 to y26):
Companies have different ways of positioning IT in the context of their overall businesses. *How would you perceive your specific IT area in relation to your firm?* Please check the appropriate box on the bipolar scale provided.

Peripheral to the core business of our firm	|___|___|___|___|___|___|___|	Central to the core business of our firm
Relates to operational aspects of our business	|___|___|___|___|___|___|___|	Relates to strategic aspects of our business
Entails competencies easy to be imitated by competitors	|___|___|___|___|___|___|___|	Entails competencies difficult to be imitated by competitors
Contributes to perceived benefits of our final customers	|___|___|___|___|___|___|___|	Does not contribute to perceived benefits of our final customers

(To maintain consistency in the directionality of all measures in this construct, y26 was reverse coded.)

Technological Imperative (Measures y27 to y30):
How relevant (or irrelevant) are the following *benefits* of outsourcing for your firm?

	Irrelevant						Relevant
Access to critical computer technologies	1	2	3	4	5	6	7
Access to technical expertise	1	2	3	4	5	6	7
Promoting innovation in IT usage	1	2	3	4	5	6	7
Reduction of IT staff shortages	1	2	3	4	5	6	7

Top Management Involvement (Measures y31 to y34):
Top management of companies have different philosophies pertaining to the appropriate role of IT in relation to the overall business. How would you perceive the attitude of *top management* of your firm toward IT in the context of your specific IT area?

	Seldom						Always
Incorporating IT as an integral part of our firm's mission or goals	1	2	3	4	5	6	7
Having a clear articulation of the IT planning process	1	2	3	4	5	6	7
Contributing actively to the IT planning process	1	2	3	4	5	6	7
Considering IT as a strategic investment	1	2	3	4	5	6	7

Fiscal Impetus (Measures y35 to y38):
How relevant (or irrelevant) are the following *benefits* of outsourcing for your firm?

	Irrelevant						Relevant
Increase in business performance	1	2	3	4	5	6	7
Increase in IT productivity	1	2	3	4	5	6	7
Savings in IT expenditures	1	2	3	4	5	6	7
Savings in operating the entire business	1	2	3	4	5	6	7

IT Outsourcing (Measures y39 to y41):
Please indicate how the *decision rights or responsibilities* pertaining to your specific IT area are distributed for the following processes.

	Fully vested within our firm			Jointly Determined			Fully vested with an IT vendor
Overall architecture	1	2	3	4	5	6	7
Specific platform	1	2	3	4	5	6	7
Procurement of hardware/software	1	2	3	4	5	6	7
Management of personnel	1	2	3	4	5	6	7
Quality control	1	2	3	4	5	6	7
Installation/integration	1	2	3	4	5	6	7
Operating and monitoring	1	2	3	4	5	6	7
Maintenance	1	2	3	4	5	6	7
Upgrading and migrating	1	2	3	4	5	6	7
Cost control	1	2	3	4	5	6	7

(Measure y39 is computed as the sum of 3 components of outsourcing, technological resource, human resource, and technical procedures. Technological resource component is calculated as the average of the first three items above, human resource component is the fourth item above, while technical procedures component is the average of the last six items above.)

How do you rate the *overall* degree of outsourcing in your specific IT area?

Low relative to other firms in our industry			Same			High relative to other firms in our industry
1	2	3	4	5	6	7

How has the outsourcing of IT requirements *changed* in your specific IT area?

Decreased over last 3 years			No change			Increased over last 3 years
1	2	3	4	5	6	7