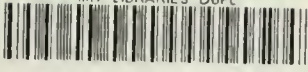


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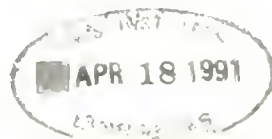


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Governance: A Cross-Sectional Analysis of Its Determinants

Lawrence Loh
and
N. Venkatraman

Working Paper No. BPS 3272-91

March 1991

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INFORMATION TECHNOLOGY GOVERNANCE:
A CROSS-SECTIONAL ANALYSIS OF ITS DETERMINANTS

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**'OUTSOURCING' AS A MECHANISM OF
INFORMATION TECHNOLOGY GOVERNANCE:
A CROSS-SECTIONAL ANALYSIS OF ITS DETERMINANTS**

Abstract

While 'outsourcing' as a mechanism of IT governance has become very popular among the practitioners, it has received scant attention from the research community. This paper attempts to develop and test a set of determinants of the degree of IT outsourcing from the perspective of production/ coordination costs. Based on an initial analytical treatment of the IT outsourcing problem, we build a research framework for the firm's decision to outsource its IT infrastructure using three explanatory constructs-- product cost structure, financing cost structure, and business performance-- with firm size and industry serving as control variables. Empirical tests using factor analysis and multiple regression on a sample of 57 major U.S. corporations established that business performance and financing cost structure are significant determinants of the degree of IT outsourcing. Subsequently, we develop directions for future inquiry.

Introduction

It is a truism that information technology (IT) has transcended beyond its traditional administrative support role towards playing a more central part of business operations (see for instance, Ives and Learmonth, 1984; Keen, 1988; McFarlan, 1984; Scott Morton, 1991). Within this tradition, the research focus has centered on the use of IT to *influence* the boundaries of a firm as it relates to its suppliers, buyers and other intermediaries (Cash and Konsynski, 1985; Malone, Yates, and Benjamin, 1987; Gurbaxani and Whang, 1991). There is, however, a glaring lack of research emphasis on the role of IT infrastructure as a *component* of the firm boundary itself. In other words, while IT has been considered a critical influence on multi-organizational business relationships, the research stream has treated the governance of IT infrastructure to be within a firm's hierarchy. Such an approach fails to recognize the recent trend towards governing the IT infrastructure through strategic alliances with key IT vendors, or what is popularly termed as 'outsourcing' (see Henderson and Venkatraman, 1991 for an exception in terms of recognizing IT strategy as involving critical governance options). The movement from a 'hierarchical' mode to a 'market' mode of IT governance has been triggered by several factors, including the need to enhance IT productivity as well as improve IT effectiveness.

While several organizations were managing the governance of their IT operations either within their hierarchies (or with a set of technology vendors on a contractual basis) the decision by *Eastman Kodak* to hand over its entire data center to *IBM*, its microcomputer operations to *Businessland*, and its telecommunications and data networks to *Digital Equipment Corporation* and *IBM* represents a major point of departure in the mode of IT governance. Beyond this specific case, IT outsourcing has become a serious strategic option for many firms. The *Yankee Group* estimated that all Fortune 500 firms would evaluate outsourcing, and a fifth

of them would actually sign outsourcing deals during the 1990s and that the outsourcing market would increase from \$29 billion in 1990 to \$49.5 billion in 1994.¹

The IT outsourcing phenomenon has been extensively documented in trade periodicals, but there is a lack of systematic theoretical and empirical research, partly due to the recency of the phenomenon. In this paper, we develop a preliminary model on the determinants of IT outsourcing using a set of *firm-level* determinants that integrates perspectives from business strategy and corporate finance. Testing the model using data from a sample of 57 major U.S. corporations, we empirically demonstrate that poor business performance and high dependence on debt financing lead to a higher degree of IT outsourcing. We conclude with a brief articulation of important directions for future research.

A Governance Model on IT Outsourcing

Within the stream of transaction cost economics (Williamson, 1975, 1985), IT outsourcing reflects a movement away from the 'hierarchy' to the 'market' mode of governance possibly due to its greater relative efficiency. Indeed, it is a specific form of vertical integration with suppliers of information resources and can be framed as a 'make-versus-buy' choice for a firm (Anderson, 1985; Monteverde and Teece, 1982; Walker and Weber, 1985).

To facilitate systematic research, we need a clear articulation of the definition of the phenomenon. Given that the term 'outsourcing' is viewed as a buzzword that is confusing and often misunderstood², we begin by defining outsourcing in terms of the degree of internalization of external *technological* and/or *human* resources for the governance of IT operations. By internalization, we mean the possession of ownership and authority rights associated to the deployment of the particular resource. Internalization is an important element in the governance of activities. It

¹Eckerson (1990).

²Wilder (1989-90).

is analogous to concept of property rights in the 'law and economics' literature (e.g., Alchian and Demsetz, 1972). *Technological resources* refer to the entire set of hardware and software in the computer and communications systems of the firm, while *human resources* refer to managers, administrators, programmers, technicians, and other related personnel involved in the design, maintenance, and operation of the IT resources. Further, we argue that a simple dichotomy of 'inhouse function' versus 'outsourcing' does not capture the complexity inherent in managing IT infrastructure. Consequently, we propose a continuous measure that is a superior conceptualization of IT outsourcing. Figure 1 is a schematic representation of the framework.

[Insert Figure 1 here]

Based on a critical review of the emerging literature on this phenomenon as well as discussions with academics and practitioners in the field, four modes of IT outsourcing are highlighted within Figure 1:

(1) Complete Outsourcing. This mode is the purest form of outsourcing, which involves the transfer of the entire computer and communications center together with the related IT personnels from the user to the vendor. This is the closest to the 'buy' strategy or the market mode of governance. Here the user merely specifies the strategic and operational requirements, and the vendor takes full responsibility in the management of the IT resources. *Eastman Kodak* is a popular example, while other examples are: *American Standard*, *Copperweld*, and *Dial*.

(2) Facilities Management Outsourcing. Here the IT personnel of the vendor have a significant role to operate the technological resources of the user. This is selected in those cases of shortage of specialized and competent IT staff necessary to operate the complex IT data centers. This is typically referred to as a facilities management agreement, where the user still bears the ownership of the technological resources. Some examples of this mode include: *Ford* and *Unilever*.

(3) **Systems Integration Outsourcing.** With the recent upsurge in the need to link up the information systems both within and across organizations to attain competitive advantage in the marketplace, firms find it necessary to deploy complex systems involving diverse hardware and software. In many instances, a single vendor is contracted to manage the installation and operations of the integrated systems with the overall responsibility for the quality and performance of the multi-vendor environment. Users adopting this mode include: *Allegheny International*, *American Airlines*, and *Boeing*.

(4) **Time-Sharing Outsourcing.** This mode has long been practiced by banks and other financial services companies, which cannot afford mainframe computers to run occasional batch data processing jobs. Under this category, ownership of physical IT resources by the user are kept to a minimum, while the IT personnel simply buy computer time from the vendor to perform the relevant tasks.

An Analysis of the Outsourcing Problem

We view the choice of the best mode of organization for any corporate activity as essentially an optimization problem that minimizes the production and governance costs associated with that activity. Production cost is the traditional microeconomic measure of the expenditure used in the acquisition of the relevant factors of production, which are reflected in the price mechanism. Governance cost is defined as the sum of the coordination (or bureaucratic) costs and the transaction costs associated with a particular mode of organization.³ In our theoretical development, we adopt a *production and coordination costs perspective* to the governance choice problem. In other words, we treat these costs as *endogenous* while we assume transaction costs to be *exogenous*.

³The usage of the various categories of costs – coordination, governance, production, and transaction – differs greatly between researchers in the field. Here, our definition is consistent those of Antonelli (1988).

Our central premise is that, *ceteris paribus*, the optimal decision of a firm with a higher production and coordination cost function and a stronger *marginal* incentive to outsource is to engage in a larger degree of outsourcing. We use s to represent the degree of IT outsourcing, and denoting the optimal degrees of outsourcing as s_H^* and s_L^* for the 'high-cost' and 'low-cost' firm respectively. Let $PC(s)$ and $TC(s)$ be the production and coordination cost function and transaction cost function respectively. We further specify the production and coordination cost function for the 'high-cost' firm and 'low-cost' firm to be $PC_H(s)$ and $PC_L(s)$ respectively. We have the following:

Proposition: When $PC_H(s) > PC_L(s)$ and $PC'_L(s) > PC'_H(s)$, $s_H^* > s_L^*$.

Proof: A firm solves

$$\text{Min}_s PC(s) + TC(s)$$

We assume that the cost functions are convex and differentiable, so that an optimal solution exists. Thus $PC'' > 0$ and $TC'' > 0$. For the 'high-cost' firm, the first-order condition is

$$PC'_H(s_H^*) + TC'(s_H^*) = 0$$

while that for the 'low-cost' firm is

$$PC'_L(s_L^*) + TC'(s_L^*) = 0$$

Thus we have

$$PC'_H(s_H^*) - PC'_L(s_L^*) = TC'(s_L^*) - TC'(s_H^*)$$

Suppose $s_H^* \leq s_L^*$. Then

$$\begin{aligned} TC'(s_L^*) - TC'(s_H^*) &\geq 0 \\ \Rightarrow PC'_H(s_H^*) - PC'_L(s_L^*) &\geq 0 \\ \Rightarrow PC'_H(s_H^*) - PC'_H(s_L^*) &\geq PC'_L(s_L^*) - PC'_H(s_L^*) \end{aligned}$$

Now we have

$$PC'_H(s_H^*) - PC'_H(s_L^*) \leq 0$$

$$\Rightarrow PC'_L(s_L^*) - PC'_H(s_L^*) \leq 0$$

This is a contradiction. Therefore, $s_H^* > s_L^*$.

Q.E.D.

In Figure 2, we illustrate the shift toward more outsourcing by 'high-cost' firms. The vertical axis represents cost, while the horizontal axis represents degree of outsourcing. A point near the origin on the horizontal axis corresponds to the hierarchical mode of governance, while a point away from the origin corresponds to the market mode of governance. Basically, the effect of having a 'high-cost' position is to move the entire production and coordination cost curve upward. This results in the minimum of the 'high-cost' firm's total cost curve being shifted to the right of that for the 'low-cost' firm. The end effect is that, in the optimal solution, a 'high-cost' firm will outsource a greater degree of the IT infrastructure than a 'low-cost' firm.

[Insert Figure 2 here]

We can also relate the performances of firms to the choice of the optimal IT governance mode. Letting s_P^* and s_G^* denote the optimal degree of outsourcing for a 'poor-performing' and a 'good-performing' firm respectively, we have the following as the result of our previous proposition:

Corollary: When $PC_H(s) > PC_L(s)$ and $PC'_L(s) > PC'_H(s)$, $s_P^* > s_G^*$

Proof: Essentially, the profit maximization problem of the firm is isomorphic to cost minimization of the firm. We assume that the revenue function for a *particular* firm is independent of the degree of outsourcing. In other words, there is no difference in the quality of the products offered to the user's customers whether the IT infrastructure is managed by the user or the vendor. Using arguments similar to our above proposition, it follows from the concavity of the profit functions that the corollary holds.

Q.E.D.

The Research Framework

Our framework is based on a premise that the gains from outsourcing IT operations will be critically dependent on the 'value-added' of outsourcing stemming from a comparative advantage of the vendor in performing the IT operations relative to the user. An outsourcing vendor is very often a specialized IT service provider serving multiple users simultaneously. To the extent that the knowledge, skills, and systems could be pooled across projects, there could be benefits of economies of scale, which are otherwise absent when single users perform the same tasks. In addition, the wide variety of IT projects undertaken by the vendors permits the reaping of economies of scope. The lower costs attributable to the vendor also arise from the enhanced IT competence and experience, both of which are absolutely crucial in managing IT in the rapidly changing information era.

From the perspective of the user, the lower cost of the IT infrastructure also emanates from the competitive bidding process and possible negotiation with multiple vendors. Gains can then be extracted by the user from the vendor through this market mode of governance. In addition, the user can enhance its own advantage by lowering the potential 'lock-in' or switching costs by introducing "escape clauses that allows the user to migrate operations to an alternative provider should the vendor fail to meet performance or other contract stipulations."⁴

Hence, we develop our research model parsimoniously using three constructs reflecting the general *business context*, while recognizing that additional constructs reflecting the specific *IT context* may exist. The constructs used in this preliminary model are: (1) product cost structure, (2) financing cost structure, and (3) business

⁴Eckerson (1990: 58)

performance. In the following paragraphs, we argue why these are explanatory constructs for IT outsourcing.

Product Cost Structure

A well-accepted axiom in the strategy and economics literature is that a firm's product cost structure (the entire spectrum of costs directly associated with the actual production and coordination of the firm's product line) is a significant determinant of its business performance (see for instance Buzzell and Gale, 1987; Porter, 1980). Thus, firms, under *ceteris paribus* conditions, try to produce their products below the average cost. Further, given the ubiquitous nature of IT -- pervading the entire process of transforming input into output (Porter and Millar, 1985) -- the cost associated with a particular IT governance includes the direct technology cost and the indirect cost of supporting the *administration* of the enterprise. Thus, a firm in a situation of high relative cost will seriously consider the available options to reduce its cost structure including vertical integration and disintegration of its manufacturing operations and IT infrastructure. Indeed, in the three often-cited early cases of IT outsourcing, *American Standard* reportedly saved \$2 million per year for its financial and payroll operations, *Copperweld* cut its systems budget from \$8 million to \$4 million, and *Foodmaker* slashed its data processing costs by 17%.⁵ Other recent cases are *Wabco* and *American Ultramar*, which trimmed their annual processing costs from \$3 million to \$1.8 million, and from \$3 million to \$1.5 million respectively.⁶

Thus, in line with our earlier theoretical analysis, we hypothesize that the product cost structure is a crucial determinant of IT outsourcing. Formally:

Hypothesis 1: The product cost structure will be positively related to the degree of IT outsourcing, *ceteris paribus*.

⁵Rothfeder (1989)

⁶Wilder (1990)

Financing Cost Structure

Financing requirements of a business is another important component in the overall cost of production and coordination within the firm. Financing resources come in various forms, each associated with a different component of the cost of capital. Within the context of an imperfect corporate financing environment (cf. Modigliani and Miller, 1963), risky debt is a more costly source of capital, compared with internal sources such as retained earnings (Myers, 1977). This may, in part be due to the cost of financial distress (e.g., bankruptcy) (Baxter, 1967; Kraus and Litzenberger, 1973) and agency problems (Jensen and Meckling, 1976).

The cost of financing resources, thus, enters the cost position for production and coordination within the firm as highlighted in our earlier analysis. Indeed, as widely cited amongst practitioners increased debt "has been a major reason for cutting costs in the IS area, thus supporting the use of outsourcing...."⁷ We thus specify the following:

Hypothesis 2: The financing cost structure will be positively related to the degree of IT outsourcing, *ceteris paribus*.

Business Performance

As noted in a trade periodical: "Reduced profits...are causing management to look everywhere to increase margins."⁸ Under conditions of poor business performance, firms often seek to streamline their operations, including selling-off or redeploying assets (Harrigan, 1980). With the steady increase in the level of IT expenditure observed over the last decade (Weill and Olson, 1989; Strassman, 1990), it is not surprising that managers are more stringent in assessing the productivity of their IT infrastructure. Thus, the IT infrastructure is no longer off-limits to the top management team seeking superior performance. The traditional view of IT

⁷Hammersmith (1989: 90)

⁸Hammersmith (1989:89)

operations as a cost center or as a service center is rapidly giving way to the notion of a profit center. With the escalating level of IT investments needed to support business in the contemporary marketplace, there is a need to reconfigure the IT infrastructure in ways that make it possible to ascertain the benefits in a clear manner (Strassman, 1990).

In fact, "much of what is fanning the fire for...outsourcing is that business is having to restructure to remain competitive."⁹ When the firm does not perform well vis-a-vis its competition, the need to re-evaluate the traditional governance modes of all its functions, including the IT arena becomes even greater. Consistent with our earlier corollary, we thus seek to test:

Hypothesis 3: The firm's business performance will be negatively related to the degree of IT outsourcing, *ceteris paribus*.

Methods

Sample

We began with a sample from the list of companies in a study of 200 major U.S. corporations carried out by *G2 Research, Inc.*¹⁰ that provided data on their level of IT outsourcing. We also required that the level of total IT expenditures be available to normalize the outsourcing data so as to arrive at a meaningful measure of the degree of IT outsourcing. Data availability (*Information Week*, September 10, 1990) across these two variables limited our study sample to 57 firms (see the Appendix for the list of companies). Further, we collected data on the independent constructs for the fiscal year 1989 from *Standard and Poor's Compustat II* and *Lotus' One Source* on CD-ROM. Thus, our data represents the use of multiple primary and

⁹Hammersmith (1989:90)

¹⁰ A ranking of the IT outsourcing expenditures within four numerical ranges is provided for 153 firms (*Information Week*, September 10, 1990). Discussions with G2 Research, Inc revealed that the outsourcing expenditures were for the period July 1988 to June 1989, and were generally consistent with our definition of IT outsourcing. Due to the confidentiality of individual companies' data, we did an interpolation within each category to estimate the actual outsourcing expenditures for the list of 153 firms.

secondary sources corresponding to the study objectives. Based on discussions with the managers of G2 Research, we ascertained that this data base is an integral part of their professional service to their clients and our overall assessment is that their method of data collection and verification appeared adequate for our research purposes. The reliability of the secondary data sources for the independent constructs has been widely accepted.

Operationalization

We need to operationalize four key constructs. For the degree of outsourcing, we developed a ratio of IT outsourcing expenditure to total IT expenditure for each firm. The business cost structure was computed as the sum of the cost of goods sold and the selling, general, and administrative expenses, normalized by net sales and total assets.¹⁰ For financing cost structure, we took the ratios of long-term debt as well as of total liabilities with shareholder equity. Business performance is represented by return of assets and earnings per share (fully diluted and excluding extraordinary items).

In addition, we specified two control variables, one for firm size and another for industry. The size variables include net sales and total assets, while binary dummy variables are formed for each of the following industries: computers and electronics, conglomerate, financial, manufacturing, natural resources, service industries, telecommunications, transportation, and utilities.

Analysis

Most studies involving financial ratios in multiple regressions assume the absence of collinearity between the various variables. In our case here, due to the possible high correlations among different accounting-based measures, we had to ensure that the independent constructs are orthogonal. To achieve this, we first

¹⁰It is necessary to sum these two 'costs' as the accounting treatment is not consistent for 'product-type' firms and 'service-type' firms in the sample.

carried out a factor analysis using the principal components method. We then applied a varimax rotation to discern the factor pattern inherent in the data structure. We obtained the corresponding scores associated with a pre-specified set of the four factors. In our multiple regression, we used the proportion of IT outsourcing expenditures as the dependent variable. The set of four factor scores and the industry dummies were used as the independent variables.

Results

Descriptive Statistics

Table 1 shows the means, standard deviations, and correlation matrix for the key variables. The mean proportion of degree of IT outsourcing is 0.1537 with a standard deviation of 0.1822.

[Insert Table 1 here]

Factor Analysis

In Table 2, we summarize the results of factor analysis. The proportion of total variance explained by the four factors is 0.8307. With a varimax rotation, we can directly discern four factors as follows: (1) business performance; (2) product cost structure; (3) firm size; and (4) financing cost structure. The standardized scoring coefficients for the factors are also reported.

[Insert Table 2 here]

Multiple Regression

The results of the multiple regression are shown in Table 3. The overall model has a F-value of 2.11, significant at $p < 0.05$, and the value of R^2 is 0.37. For the key independent constructs, financing cost structure and business performance are significant at the 0.1 and 0.01 levels respectively with consistent (expected) signs. We thus accept Hypotheses 2 and 3. On the other hand, the results for Hypothesis 1, as reflected in the coefficient for product cost structure, does not seem conclusive. As

for the control constructs, firm size is not significant and only the industry dummy variable pertaining to utility industry is significant (at 0.1 level).

[Insert Table 3 here]

Discussion

Explaining the Results

The empirical results generally support the theoretical model proposed in this paper. Specifically, it appears that the business performance factor is the most critical determinant for the change in the mode of IT governance. In a way, this reflects a colloquial American maxim: "If it ain't broken, why fix it?" Low profitability, however, strongly motivates drastic restructurings, moves that may signal to the capital markets the strong commitment of corporate management to improve the firm's future performance. Furthermore, the 'bottom line' can be better controlled by the 'variable costing' advantage of IT outsourcing, as opposed to the traditional 'fixed costing' of inhouse function. Indeed, one of the 'top ten tips for IS survival in the 1990s' recommended by a trade periodical is: consider outsourcing, where the reason is: "Tougher competition and profit pressures will force more IS executives to take a hard look at outsourcing functions and services that traditionally have been done in-house."¹¹

The need to mitigate debt financing is also supported by our results. Financial resources are the driving force in funding critical fixed asset investments of the company. These resources are scarce and need to put to their most efficient use. As aptly noted by a top IS executive whose company outsourced its IT function, "...another important reason why we turned our data processing over to outsiders was the proper allocation of resources."¹²

¹¹Ludlum (1989-90: 14)

¹²*Computerworld* (1989: 72)

The results relating to the product cost structure (cost of goods sold and selling, general, and administrative expenses) are insignificant and hence not conclusive. The direction of change is also contrary to expectation. One explanation could be that the proportion of IT infrastructure costs on the overall product costs is minimal, and that the imperative to outsource IT operations does not necessarily stem from a high level of product costs (with lower IT proportion). Given our data, we could not develop a better measure to capture this proportion.

Firm size as a control variable is not significant. The specific implication is that the traditional view that small companies tend to outsource the expensive IT infrastructure is not supported. In fact, the recent spate of IT outsourcing has involved many large firms. As underscored by a trade periodical: "No matter what the reasons for outsourcing, companies of varying size can benefit from it."¹³

As for industry variables, except for utility industry which is negatively significant, none seems to be critical. The utility industry, often associated with the status of a natural monopoly, is a highly regulated one, with strong limitations on pricing and profits. The propensity to improve efficiency via IT outsourcing may hence be smaller. Although higher profits can be attained in the short run via IT outsourcing, the gains may eventually be eroded by more stringent control on allowed rates of return in the future.

Toward a Comprehensive Model of IT Governance

Transaction Cost Perspective. Our approach has been to delineate a set of constructs related to the internal costs and performance of a firm from the perspective of production and coordination. A natural extension will be to include constructs from external governance costs (i.e., transaction costs), reflected in specific constructs such as asset specificity, complexity and small numbers. In addition, it

¹³Hammersmith (1989: 92)

may be appropriate to reflect refinements such as the articulation of bargaining and influence costs (Milgrom and Roberts, 1990) in the organization of economic activity. Within the dataset assembled here, archival data for such constructs were not available. A future line of inquiry – presently under design stage by the authors – would be to understand and predict not only the degree of IT outsourcing but also the type of outsourcing (see Figure 1) along such an extended transaction cost perspective using primary data.

Explanatory Variables Reflecting the IT Context. The preliminary model developed here primarily captured the business context that directs the shape of IT activities. While this represents an important facet, an equally relevant facet is the IT context. This could capture emerging constructs such as: criticality of IT in operations, the role of IT in products/ processes/administration, IT scope and systemic competence as a way of aligning the business context with the IT context of the firm (Henderson & Venkatraman, 1991). To reflect such constructs, we attempted to adopt the approach of structured content analysis of annual reports employed by Jarvenpaa and Ives (1990). However, using our sample, only 26 Chairman/President's letters to the shareholders were available; and within these, only five occurrences of relevant key phrases (far less than the Jarvenpaa and Ives study – possibly due to the heterogeneous nature of the industries represented in our sample) were found. However, a meaningful line of future inquiry would be to operationalize a set of constructs relating to the IT context via primary data as a way of testing the *relative importance* of business and IT contexts in explaining the degree and type of IT outsourcing.

A Process Model of IT Outsourcing. We have developed a limited 'variance' model (Mohr, 1982) for explaining IT outsourcing in firms. A powerful extension is to focus on the organizational processes underlying the management of this IT mode of governance by developing a 'process' model. This would go a long way in

enhancing our understanding of the emerging phenomenon in the marketplace. Such a process model may incorporate new structures (e.g., shared authority; responsibility; property rights; and risk-bearing), management processes (e.g., allocation and coordination of resources; performance assessment; and joint planning), and managerial roles (e.g., liaison; decision-making; and leadership) that are required to effectively derive the benefits of this governance mechanism.

Conclusion

In this paper, we have analyzed the effects of production/ coordination costs and business performance on the IT governance choice. An analytical treatment and research framework were used as a foundation for our empirical testing. Results indicated that business performance and financing cost structure are significant determinants of the degree of IT outsourcing. Some possible directions of future research were also highlighted. The interest in IT outsourcing is definitely not a fad. With the increased cost and complexity of IT investments and operations, the shortage of skilled IT personnel, and the need to focus on core business and not problems associated with IT management, outsourcing remains a very viable alternative. Indeed, as argued, "[o]utsourcing is here to stay; it is not a flash in the pan or a temporary solution."¹⁴ The challenge for corporate management in the new era of IT rationalization is aptly summed up: "in the 1990 and beyond, the key question facing IS departments is not only *whether* to outsource, but *what* to outsource."¹⁵

¹⁴Oltman (1990: 77)

¹⁵Wilder (1989-90: 8)

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APPENDIX
List of Companies in the Sample

Aetna Life and Casualty Co	Harrier Inc
Air Products and Chemicals	Homefed Corp
Amax Inc	Illinois Power Co
Armco Inc	Ingersoll Rand Co
Ashland Oil Inc	Keycorp
Atlantic Richfield Co	Lincoln National Corp
Bank of Boston Corp	Mack Trucks Inc
Bankamerica Corp	Manufacturers Hanover Corp
Baxter International Inc	NCR Corp
Champion International Corp	Norfolk Southern Corp
Chrysler Corp	PNC Financial Corp
Consolidated Rail Corp	Quantum Chemical Corp
Continental Bank Corp	Reynolds Metals Co
Control Data Corp	Rockwell International Corp
Corning Inc	Rohm and Haas Co
CSX Corp	SCECorp
Dow Chemical Co	Security Pacific Corp
E I Du Pont De Nemours and Co	Sun Co Inc
Duke Power Co	Texaco Inc
Eastman Kodak Co	Textron Inc
Entergy Corp	Travelers Corp
First Bank System Inc	UAL Corp
Fleming Cos Inc	Union Carbide Corp
Geico Corp	Unisys Corp
General Dynamics Corp	United Technologies Corp
General Electric Co	U S Air Group Inc
General Re Corp	Valley National Corp
Great Western Financial Corp	Westinghouse Electric Corp
GTE Corp	

TABLE 1
Descriptive Statistics

1(a) Means and Standard Deviations

Variable ⁺	Mean	Standard Deviation
OSEIT	0.1537	0.1822
CSSA	0.8336	0.1555
CSTA	0.6754	0.6706
DSE	0.4783	1.9892
TLSE	5.1379	7.0049
ROA	0.0267	0.0676
EPS	3.0889	5.2566
ASSET	21004.1434	26496.4126
SALE	9404.5584	9877.2572

1(b) Correlation Matrix

	OSEIT	CSSA	CSTA	DSE	TLSE	ROA	EPS	ASSET
CSSA	0.0114							
CSTA	0.0817	0.4582 (***)						
DSE	0.1303	-0.0573	-0.0228					
TLSE	0.0622	-0.2055	-0.4130 (***)	0.5079 (***)				
ROA	-0.4957 (***)	-0.0949	-0.0347	-0.1775	-0.2447 (*)			
EPS	-0.3263 (**)	0.0603	-0.0056	-0.0934	-0.2148	0.7390 (***)		
ASSET	0.1131	-0.3132 (**)	-0.3759 (***)	0.1348	0.4799 (***)	-0.0474	0.0605	
SALE	0.0851	-0.0163	0.0740	0.1069	-0.0586	0.1549	0.2548 (*)	0.6031 (***)

Note: (***) , (**), and (*) denote significance at 0.01, 0.05, and 0.10 levels respectively.

⁺Definitions of variables are as follows: OSEIT=outsourcing expenditures/ IT expenditures; CSSA=(cost of goods sold+selling, general, and administrative expenses)/ sales; CSTA=(cost of goods sold+selling, general, and administrative expenses)/ total assets; DSE=long-term debt/ shareholders' equity; TLSE=total liabilities/ shareholders' equity; ROA=net income/ total assets; EPS=earnings per share excluding extraordinary items and fully diluted as provided by *Compustat II*; ASSET=total assets; SALE=net sales. All financial statement figures are converted to million dollars for our analysis.

TABLE 2
Factor Analysis Results

2(a) Factor Pattern

	Factor 1	Factor 2	Factor 3	Factor 4
CSSA	-0.5082	-0.2422	0.5388	0.1535
CSTA	-0.6206	-0.2078	0.5722	0.0425
DSE	0.4968	-0.1452	0.3861	0.6614
TLSE	0.8246	-0.1385	0.0286	0.3381
ROA	-0.3367	0.7945	-0.2271	0.3010
EPS	-0.3024	0.8148	-0.0151	0.3494
ASSET	0.7336	0.4431	0.2712	-0.3092
SALE	0.2075	0.5937	0.6434	-0.3334

2(b) Rotated Factor Pattern

	Factor 1	Factor 2	Factor 3	Factor 4
CSSA	-0.0287	0.7909	-0.0645	0.0187
CSTA	-0.0191	0.8611	-0.0194	-0.1233
DSE	-0.0270	0.0981	0.0513	0.9172
TLSE	-0.2323	-0.4195	0.1128	0.7561
ROA	0.9257	-0.0861	0.0009	-0.1503
EPS	0.9257	0.0474	0.1319	-0.0324
ASSET	-0.0586	-0.4225	0.8217	0.2159
SALE	0.1780	0.1413	0.9321	-0.0132

2(c) Standardized Scoring Coefficients

	Factor 1	Factor 2	Factor 3	Factor 4
CSSA	-0.0106	0.4859	0.0340	0.1329
CSTA	-0.0354	0.5133	0.0910	0.0279
DSE	0.1387	0.1985	-0.0795	0.7195
TLSE	-0.0185	-0.1380	-0.0416	0.4710
ROA	0.5344	-0.0796	-0.0945	0.0335
EPS	0.5392	0.0330	-0.0068	0.1262
ASSET	-0.0908	-0.1489	0.5053	-0.0181
SALE	-0.0036	0.1767	0.6421	-0.0886

TABLE 3
Multiple Regression Results

	Parameter Estimate	Standard Deviation	Significance
Intercept	0.2191	0.1336	(*)
Product Cost Structure	-0.0434	0.0347	
Financing Cost Structure	0.0345	0.0259	(*)
Business Performance	-0.0979	0.0243	(***)
Firm Size	0.0109	0.0259	
Computers and Electronics	-0.0495	0.1570	
Financial	-0.1534	0.1511	
Manufacturing	0.0070	0.1383	
Natural Resources	0.0993	0.1526	
Service Industries	0.0967	0.1819	
Telecommunications	-0.1128	0.2069	
Transportation	-0.1364	0.1567	
Utilities	-0.2373	0.1708	(*)

Note: (***) , (**), and (*) denote significance at 0.01, 0.05, and 0.10 levels respectively.

FIGURE 1
A Definitional Framework of Outsourcing

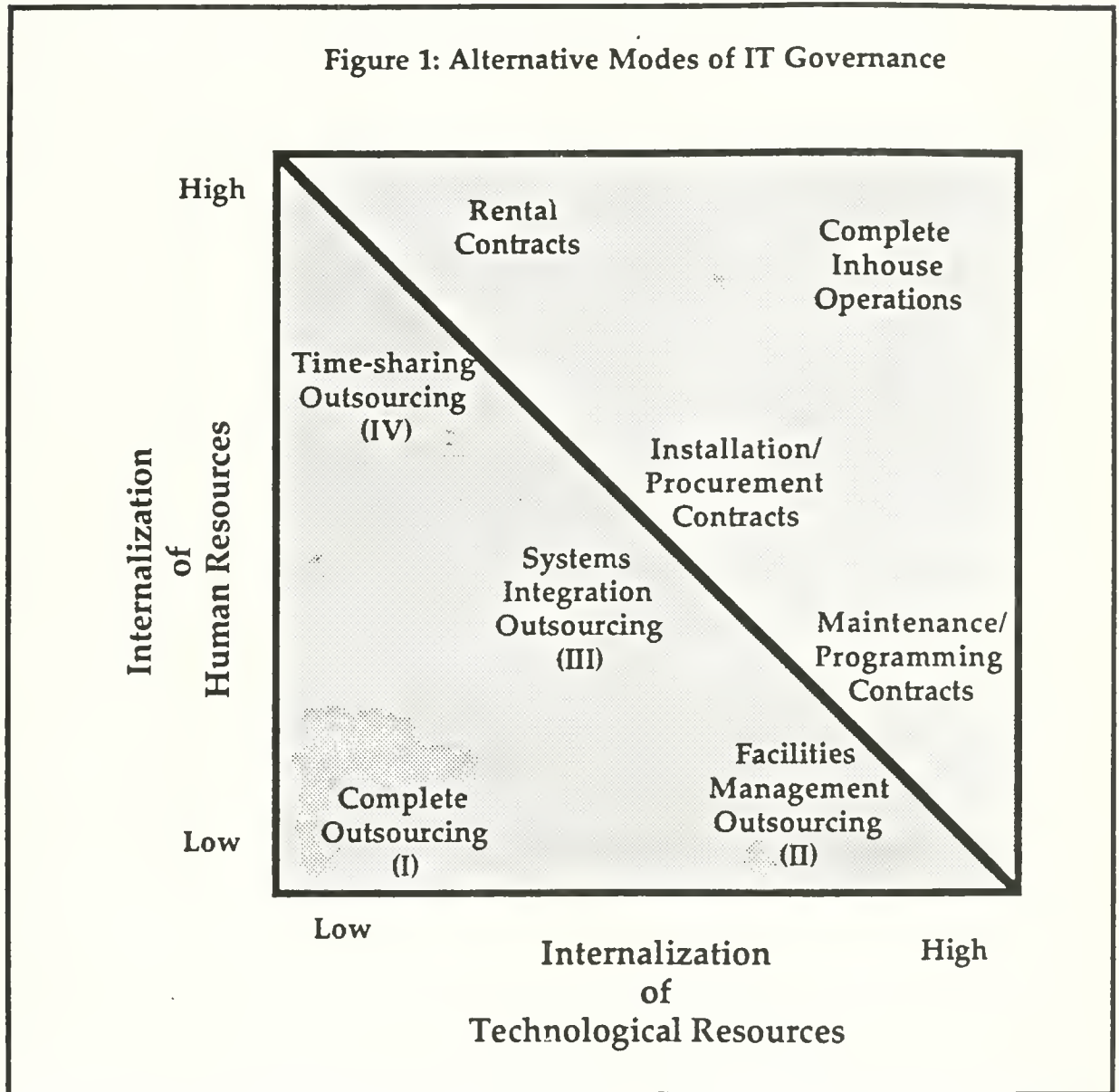
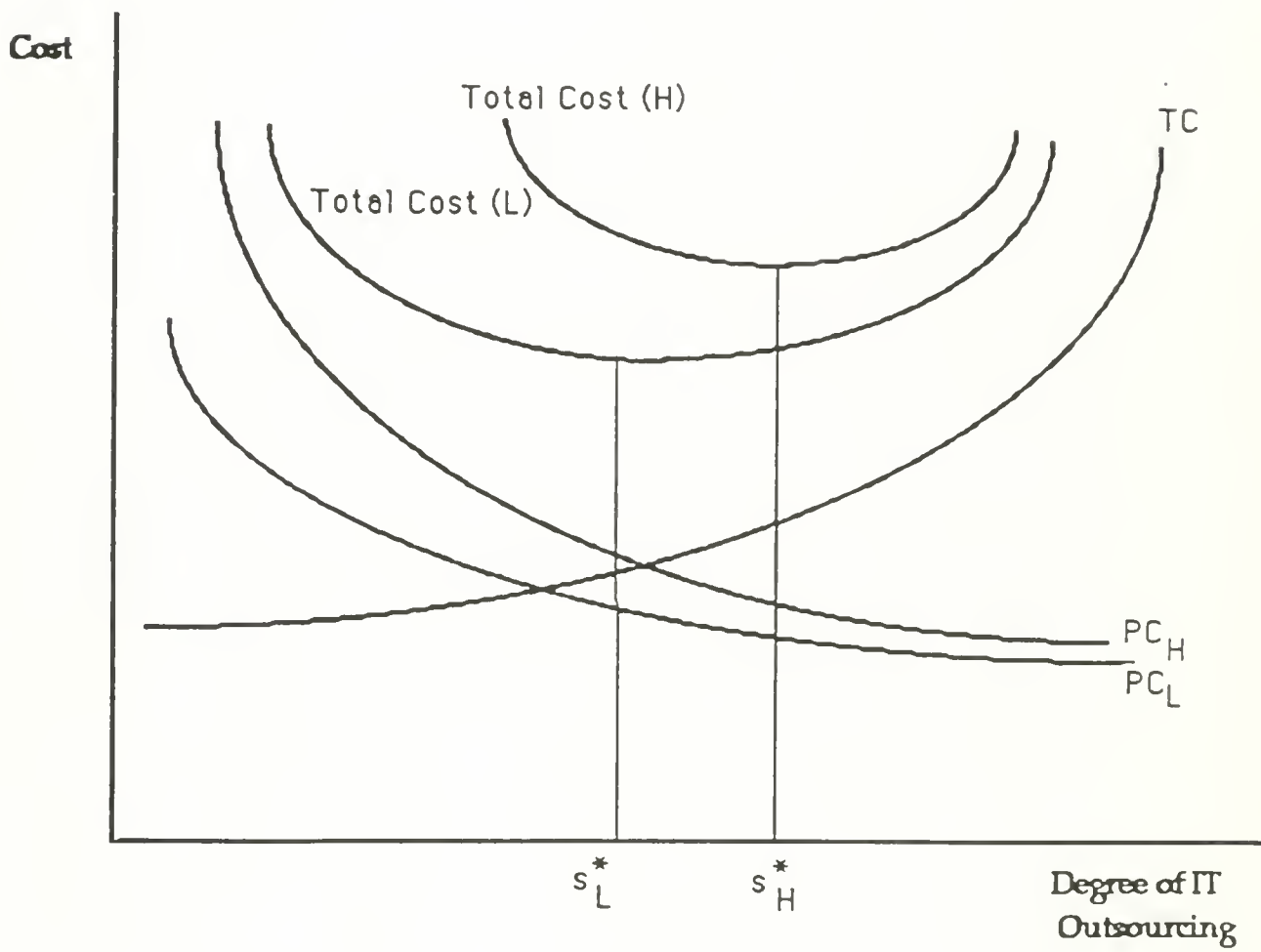


FIGURE 2
Effects of Cost Structure on IT Outsourcing



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