Strategic Dependence on the IT Resource: A Test of the Strategic Control Model

Detmar Straub*
Peter Weill**
Kathy Stewart Schwaig***

*J. Mack Robinson College of Business
Computer Information Systems Department
Georgia State University
Atlanta GA 30302-4015
(404) 651-3880
dstraub@GSU.EDU

**MIT Sloan School
Boston, MA

***Kennesaw State University
Atlanta, GA

Please address all correspondence to the first author.

March 30, 2006

Copyright © 2006 by Detmar Straub, Peter Weill, and Kathy Stewart Schwaig
All rights reserved.
Strategic Dependence on the IT Resource: A Test of the Strategic Control Model

ABSTRACT

Using resource dependency theory (RDT), this study analyzes how organizations control their information technology resources to improve organizational performance. According to RDT, organizations must manage their dependency on external organizations and limit external dependencies when resources are considered critical. The current study proposes and tests a Strategic Control Model positing that managers seek to control important, strategic resources in order to create value for the firm and to avoid dependency on external entities.

Utilizing a research design that captured extensive quantitative data on the control of IT functions and services, the research team gathered five years of data on 54 business units in 27 global companies located in seven countries. For data analysis purposes, the managers in these firms reported on several hundred different IT decisions. Firms with strategic investments in IT tend to locate control of their IT resources inside the firm. Locating the locus of control within the firm in cases where the firm depends on IT as a strategic resource proves to be a good explanation for effective decisions leading to higher performance. Viewing IT as a strategic resource alone does not lead to positive business unit outcomes, but the moderating influence of locus of control is found to establish the complex statistical relationship with business unit performance. For these reasons, it is critical that a theoretically-grounded firm-wide process for decisions on locating IT control is in place to capture business value.

Keywords: resource dependency theory; IT outsourcing decisions; strategic information systems; strategic IT resources; core competency; IT outsourcing; IT performance; firm performance; locus of control
1. INTRODUCTION

When managers decide to outsource IT, they should be outsourcing in order to create value for the firm. One means of creating business value is by achieving dramatic cost savings through outsourcing; another is through decisions that lead to strategic control of IT resources. In the former, IT outsourcing returns profits to the firm by taking advantage of economies in the marketplace. Theoretically, IT vendors/outsourcers drive down the costs of production and technical expertise by spreading these expenses over a large client base; accordingly, their customers are able to benefit indirectly from these *economies of scale* through attractive pricing of IT products and services by vendors.

*Strategic control* is a second avenue for value creation. Managers identify IT resources that are critical to its operations and its strategic direction are theoretically better able to manage those resources if the firm maintains control over them. By divesting themselves of activities that are not strategic, they can capitalize on superior design, marketing, production, inbound logistics, or distribution capabilities. Thus, organizations that outsource IT activities that are not strategic can concentrate energies on distinctive resources that are directly related to value creation for the firm. The notion of strategic control of the IT resource has strong theoretical underpinnings in resource dependency theory.

While both the cost savings and strategic control lines of reasoning have solid theoretical bases, nearly all of the research to date on IT sourcing has posited and/or tested economic and financial models, i.e., has stressed cost, rather than positing strategic control models. The current study seeks to fill this gap in the IT outsourcing research portfolio by proposing and testing a Strategic Control Model.

The notion of resource dependency is central to RDT and to the study. Specifically, a resource dependency is created any time a firm relies on an external entity for a resource needed by the firm. The more critical the resource is to the firm, the more serious is the dependency. This model posits, therefore, that, overall, when organizations depend on external entities for IT resources critical to their survival, they yield control and ultimately jeopardize the firm’s performance.

Utilizing a research design that captured quantitative data on the sourcing of IT functions and services, the research team gathered five years of data on 54 business units in 27 global companies located in seven countries. More than 560 data points were gathered for each participating organization, including detailed information on organizational outsourcing and
the related decision-making process. This data was collected for both the corporate and business-unit levels. Corporate-level executives (e.g., CEOs, COOs, Director of Strategy), CIOs, and business unit IT managers were among the interviewees and sources of data in the study. Archival data such as annual reports and strategic plans supplemented the overall data collection effort. This rich dataset provided the grist for testing the Strategic Control Model.

The results of this study offer insights for researchers and managerial guidelines regarding whether and how managers control the IT resource. When making such critical decisions, strategic control proves to be a good explanation for how the most effective managers outsource IT and how the firm reaps downstream benefits from their control decisions.

2. THEORETICAL AND CONCEPTUAL BACKGROUND

2.1 Resource Dependency Theory

Resource Dependency Theory (RDT) examines organizational decision making in light of the impact of the environment on the organization. RDT recognizes that the key to organizational survival is the ability to acquire and maintain resources (Pfeffer and Salancik, 1978). An organization must be open to its environment due to its dependence on that environment to obtain critical resources such as personnel, information, raw materials and technology. Resource acquisition may, in fact, be problematic and unpredictable. To guarantee the flow of resources, therefore, a firm will adapt to changes in its environment that impact the flow of resources to the firm. Adaptation is not passive, however, but rather a strategic choice to cope with pressure in the environment (De Wit and Verhoeven, 2000). Successful organizations, therefore, attempt to minimize their dependence on or increase their influence over organizations in their environment (Birkinshaw, Toulan, and Arnold, 2001).

Although organizations are constrained by their dependency on their environment, there are also opportunities to pursue organizational interest (Pfeffer and Salancik, 1978). Firms can negotiate their positions within these constraints. RDT recognizes that organizational strategy focuses not only on products and customers but also on the suppliers and other entities in the environment that impact the flow of resources to the firm. Organizations thereby interact dynamically as they act strategically to manage their resource dependency on other firms (Pfeffer and Salancik, 1978).

Given the preceding discussion of RDT, an important research question emerges:

To what extent do firms assess the degree of dependency that will result in outsourcing various
Their ultimate decision is based upon the degree of control desired for a given IT resource. According to RDT, firms will choose to own, nurture, and have exclusive access to, and thus control strategic resources that will lead to improved competitiveness. Conversely, it is not necessary for firms to own and control those assets that are not strategic and integral to their distinctive competence.

In the following sections we present our conceptual argument based up on RDT and we then derive the Strategic Control Model.

**2.2 Information Technology Outsourcing and RDT**

Prior studies indicate that outsourcing is a strategic arrangement for a firm (Lacity and Hirschheim, 1993; Insinga and Werle, 2000). At its core, RDT argues that no firm can exclusively rely on its own resources to survive. The effectiveness of a firm, therefore, is related to its ability to acquire needed resources from external vendors.

RDT argues that organizations will engage in a strategic decision making process when deciding whether or not to acquire critical resources from external entities (Pfeffer and Salancik, 1978). Important resources will be retained in-house while less important resources will be outsourced. Implicit in the outsourcing deal will be a dependent relationship that will have to be negotiated and constructed. According to Pfeffer and Salancik (1978) this dependence is determined by three resource dimensions: importance, discretion and substitutability for that resource. Important resources are those critical to the survival of the firm. Discretion is the ability of the firm to control resource availability. Finally, substitutability refers to the availability of alternative sources for obtaining the resource. By assessing all three factors with respect to a given IT resource, a firm can determine the degree of dependence associated with outsourcing a specific resource and make the decision according to the degree of control the firm is willing to relinquish.

Importance of the IT resource is probably the most researched of the three factors affecting the firm’s dependence. IT resources are playing an increasingly critical role in organizations. Much has been written about the strategic role of the IT resource in organizations (Sethi and King, 1994; Clemons, and Row, 1991; Brynjolfsson and Hitt, 1996) and studies have found a relationship between IT and sustained competitive advantage (Clemons,
With respect to discretion, firms attempt to minimize dependency on external entities through negotiation and contracts. In addition, many IT resources in firms are idiosyncratic to the business and not easily duplicated. Hence, few or no substitutes exist for those IT resource that have a great deal of specificity to the firm. While discretion and substitutability are important factors, we have chosen to focus on and operationalize the importance factor.

Willcocks and Lacity (2001) analyzed hundreds of case studies and determined that the decision to outsource critical IT applications increased the firm’s dependency on the external entity. The resultant dependency is enough to deter the firm from transferring control via an outsourcing deal. Similarly, Kern and Willcocks (2002) analyzed several outsourcing relationships and concluded that too much dependence on vendor’s performance is risky.

Traditionally, core IT applications are recommended for in-house control (Lacity and Hirschheim, 1993). Research suggests that core competencies are what make an organization “unique” in its competitiveness (Quinn and Hilmer, 1994). It is the knowledge that the organization has gained of its own processes (Prahalad and Hamel, 1990) that allows it to compete with the best in the world (Quinn and Hilmer, 1994). An organization that possesses a core competency can integrate core technologies and governance processes, realizing price-performance ratios and customer service levels that exceed those of its competitors (Prahalad, 1993). Core technologies are a critical enabler of this capability (Prahalad, 1993). To compete globally, firms need to ask whether external control of a function will improve its ability to perform an activity at a level comparable with the best of breed (Drtina, 1994).

**2.3 CONTROLLING THE IT RESOURCE**

RDT explains how outsourcing can lead to a state of strategic vulnerability because the external environment has control over resources rather than the firm itself. With respect to the issue of outsourcing of firm resources, the logical deduction in taking a resource-dependency perspective is that a firm must make decisions that result in control over its core resources in order to retain its competitive edge. Noncore resources do not have to be owned or controlled and can, therefore, be contracted out (Ang, 1994).

In the domain of information technology, researchers have discussed these same concepts under the rubric of "selective outsourcing." According to researchers who have extensively developed the concept, Lacity and Willcocks (1998), selective outsourcing is the decision to source certain IT functions from external provider(s) while still retaining in-house
20-80% of the IT budget.\textsuperscript{1} The basic argument made by Lacity and Willcocks (1998) and DiRomualdo and Gurbaxani (1998) is that strategic analysis of the IT portfolio is key to successful outsourcing decisions. The underlying line of reasoning is that IT functions have "distinctiveness" (Lacity et al., 1996) and an ability to affect competitiveness that senior managers must not ignore. Based on their empirical findings from multiple case studies, Lacity, Willcocks and Feeny (1996) found that "companies that consistently succeed in selecting what can be outsourced to their advantage usually distinguish between the contribution that an IT activity makes to business operations and its impact on competitive positioning" (p. 14).

Confirming this reasoning is additional evidence that managers should focus on outsourcing business processes that are not essential to their distinctive competence. Willcocks and Fitzgerald (1993) found that most companies successful with IT outsourcing used a decision making process based on a selective approach to outsourcing. Focusing on core competencies through outsourcing non-core activities has become a primary means by which fast growing companies achieve success according to a Coopers and Lybrand survey of 248 US CEOs (Williams, 1997). Of sampled firms, 83% increased outsourcing in order to focus more on their core competencies. In a KPMG survey of Australian managers, a significant proportion of managers indicated that strategic objectives like focusing on core business objectives played a major role in their decision to outsource IT (Hurley and Rundell, 1997).

2.4 Combining Resource Importance and Control of the IT Resources

Although the issue of IT as a strategic resource has been discussed widely in IS studies, no previous research has empirically examined the effect of a resource-dependency perspective on sourcing decisions (Dibbern et al., 2004). While prior research using transaction cost analysis (Ang and Straub, 1998, Beier, 1989, Grover et al., 1996, Nam et al., 1996, Schary and Coakley, 1991) has studied the impact of asset specificity on external procurement, of these studies only Ang and Straub (1998) and Grover et al. (1996) were empirical and neither study made an attempt to measure or test the extent to which treating IT as a strategic asset or resource led to

\textsuperscript{1} The range in this definition was based on the empirical work of Fitzgerald and Willcocks (1993). Willcocks, and Feeny (1996) provide an alternate definition of selective sourcing: "The practice of outsourcing select IT applications to vendors while retaining other IT applications in-house, referred to as 'selective sourcing,' 'smart sourcing,' or 'right sourcing,' eschews the all-or-nothing approach in favor of more flexible, modular outsourcing" (p. 14).
control of the IT resource. Whereas case study evidence suggests that managers think value is created in the IT function through strategic focus on core competencies (Lacity et al., 1994), more quantitative evidence is needed to support this qualitative work in order to better understand the relationships between views about IT as a strategic resource and the control of IT functions.

Reasoning from transaction cost and agency theories, for example, Ang (1993) discusses the role of agents of the firm and agents of the outsourcing vendor and how the nature of the relationship leads to different kinds and different intensities of control. Part of this control is related to the contract that binds the organizations, but part is built into the management decision to give up control over assets.

The basic argument in Ang’s work is that the degree of outsourcing depends on which agent has control over the activity. When one agent is completely responsible for an activity, then her conceptualization argues that this would be a case of either “total outsourcing” to outsiders or “total insourcing” to insiders. In the former situation, the firm has lost nearly all control of the asset. In the latter, the firm retains total control. But monitoring by one of the agents of the firm would indicate a higher level of firm control decisions whereas providing information or other inputs to the outsourcer, without extensive monitoring, would represent less control.

Based on RDT and consistent with other researchers, we conceptualize the notion of control of the IT resource as a continuum. One end of the continuum occurs when the firm yields control of all of its IT resources resulting in the greatest dependency on the external environment. In this case the firm is engaged in “Total Outsourcing.” Conversely, the decision to control all IT resources may be said to be a “Total Insourcing” decision. The extent of control of the IT resource, therefore, represents a set of decisions regarding which resources are to be retained and which are not. We refer to this as the locus of control.

![Figure 1 Continuum of Control of the IT Resource](image.png)
2.5 Downstream Effects: IT Control and Performance

According to RDT, organizational effectiveness is the assessment of the organization’s output and activities by various groups or participants. Managers control the IT resource in ways that improve organizational effectiveness by creating value and increased organizational performance (McFarlan and Nolan, 1995, Barney, 1991). Several empirical studies have investigated aspects of this relationship. Grover et al. (1996) found strong relationships between the degree of IT outsourcing and particular aspects of performance, notably: (a) the ability to focus on core competencies; (b) the ability to utilize human and technological resources of the service provider; and (c) the ability to gain access to leading-edge IT and to avoid the risk of technological obsolescence. They did not examine financial or IT productivity issues. In addition, Grover, Teng and Cheon (1998) argued that rdt provides an appropriate theoretical lens for examining the impact of IS sourcing decision on organizational operating efficiency.

To date, empirical studies have not found positive relationships between IT outsourcing and firm performance (Loh and Venkatraman, 1992, Teng et al., 1995). Likewise, in a study of over 20 major US-based outsourcing decisions, Smith, Mitra, and Narasimhan (1998) found few significant relationships between extent of IT outsourcing and firm-level performance measures.3 Some evidence does indicated that selective outsourcing practices do have an impact on productivity. Lacity et al.'s (1998) analysis of transcribed interviews from 145 participants found that selective outsourcing decisions reduced costs more than total outsourcing, but they did not study the impact on other performance variables.

There are numerous explanations for why empirical studies have not consistently uncovered a strong relationship between IT outsourcing decisions and organizational performance. Many internal and external variables affect performance besides IT. For example, task productivity and personnel changes can have a dramatic effect (Lucas and Baroudi, 1994) and business

---

2 Thus, Grover et al. (1996) were testing the effect of outsourcing on the downstream ability of firms to achieve better focus on core competencies. But they did not examine strategic focus on core competencies as a predictor of degree of outsourcing.

3 Smith et al. (1987) used a wide variety of archival financial measures and ratios. Among the COMPSTAT metrics analyzed were: SGandA / Sales; Operating expense/ Sales; Sales / Employee; Asset Turnover; Return on Assets; Return on Equity; Operating Margin; Growth Rate; Dividend yield; Dividend / Sales; Market to book ratio; Cash and Equivalent / Sales; Total Liabilities / Sales; Long term debt / Sales; and Current Liabilities / Sales. This work is the subject of Smith’s dissertation at the Georgia Institute of Technology.
environment and pricing decisions are also critical. Nevertheless, there should be circumstances where the strategic decision to control the IT resource has large impact on firms. This study offers an opportunity to test this proposition.

2.6 Research Model

The Strategic Control Model (Figure 2) expresses causal relationships in the context of resource dependency. The model indicates that when firms depend on external entities for resources critical to their survival, they yield control. IT functions that are viewed as important and, thereby, strategic are more likely to be controlled internally. IT functions that are less strategic are more likely to be outsourced to some extent. Our contention is that the effects of IT as a strategic resource on performance will depend on where the resource is controlled. The more strategic the resource, the more the need to control that resource internally. The less strategic the resource, the less the need to control that resource internally. When a “match” exists between how strategic a resource is and where that resource is located, higher performance should ensue. Where such a match is not observed, lower levels of performance should be expected. The model indicates, therefore, that locus of control moderates the effect of strategic IT resources on performance (H1).

![Figure 2. The Strategic Control Model (SCM)](image)

When organizations depend on external entities for resources critical to their survival, they yield control. This yielding of control over resources the firm is highly dependent on leads to lower performance. Based on the Strategic Control Model, we test the main hypothesis that: Locus of control moderates the relationship between strategic dependence on IT resources and firm performance.

In summary and from a resource dependency perspective, management must direct the
acquisition and deployment of resources, and thereby, control resources to optimize performance and obtain organizational goals. RDT stresses the need for firms to capitalize on their unique assets and to develop management strategies to exploit the advantages from strategically positioned resources.

A full testing of the moderating effect calls for a comparison with the direct effect (H2) of strategic dependence on the IT resource on performance (Sharma et al., 1981; Chin et al. 2003). H2 is not expected to add significantly to the explained variance and is examined specifically to see if the posited moderation is the most powerful explanatory of performance. H2 is formally: 

A model linking locus of control X resource dependence to performance will have statistically higher explained variance than a model linking only resource dependence to performance.

3. RESEARCH METHODS

3.1. STUDY DESIGN AND SAMPLING

To assess the hypotheses, 54 business units (BUs) in 27 firms were investigated. See Appendix A for a list of firms. These firms were headquartered in seven countries (USA, Canada, Malaysia, Singapore, Australia, UK and Switzerland) in the financial, retail and manufacturing industries. These three industries are at the forefront of change in industry structure due to the combination of technological innovation and the accelerated pace of globalization (Bradley et al., 1993). They also provide a contrast in their strategic use of information and information technology (Cash et al., 1992, Porter and Millar, 1985). Data were collected both at the firm and business unit (BU) levels. The firm level provides insight into the strategic role of IT in the organization. The business unit level allows us to examine the outsourcing decision at the point closest to the outsourcing experience.

In order to focus on BU outsourcing of IT in complex and representative settings, the firms selected met the following criteria:

1. Comprised of at least two autonomously managed BUs with a distinct set of products or customers;
2. Were in the top five in their industry by market share in their region;
3. Recorded data on historical IT investment, IT outsourcing and performance which could be made available to the researchers; and
4. As a group of firms, offered a broadly based international perspective.
To implement the study internationally, a research team collected data from universities located in or near the country of the firm’s headquarters (see "Acknowledgments" for list of research partners). The researchers met to refine the concepts and methods for the study and then used the same data collection procedures.

3.2. DATA COLLECTION

To adequately address the issues raised in the current study requires a study design that collects data from multiple respondents, thereby achieving independence of sources and reducing the likelihood of systematic bias. Data were collected via interviews, the completion of response forms by participants, analysis of organizational documentation (e.g., memos, internal reports) and notes of presentations made by executive managers about recent strategy and technology developments.

In each firm there were a minimum of four participants, some interviewed on multiple occasions. The four participants were the Chief Information Officer (CIO), IS executives from at least two different business units, and a corporate executive (CE) who was able to provide a strategic perspective across the firm as a whole. This person was the CEO, the Chief Financial Officer, Chief Operating Officer, or the Director of Strategy. In each firm, the CIO was interviewed about IS arrangements and the decision-making process relating to both business and IT strategy and the extent of IT outsourcing. Four different response forms were distributed to participants. When these were completed and returned, interviews were held with each IT manager, including the CIO and the BU manager to explore the issues in more depth and to ensure that consistent definitions of constructs were used in the data collection. Excerpts from these interviews appear later in the paper.

To ensure independence of variables, data on IT investment was gathered through different sources. The subjective view of IT as a strategic resource was provided by the CIO while objective IT investment data and performance data were gathered primarily from the CE and his/her staff, the one exception being IT investment in competitive systems, as described below. IT managers from the respective business units provided data on the nature and degree of outsourcing in the BUs. As can be seen in Table 1, some of these measurements called for judgments whereas others were more oriented toward accounting-type data. Performance data was also gathered from two sources: the CE and the BU information technology managers and then checked for inter-rater reliability.
3.3 MEASURES

The measures employed for each construct are discussed below and summarized in Table 1. Relevant instrument items are in Appendix B.

Dependence on IT as a Strategic Resource: Objective Measures

To capture the firm’s dependence on IT as a strategic resource, we chose first to use objective measures of the percentage of the IT budget that was considered strategic. To achieve consistency across the sample we provided respondents with a simple definition of strategic IT based on the work of Clemons (1991), Ives and Learmonth (1984), and Porter and Millar (1985). CIOs were asked to provide the percentage of the IT budget over the past 5 years that was invested to:

“...increase or protect your sales (or market share) by providing new (or improved) customer service or products. This type of investment generally positions the firm in the marketplace (e.g. creates competitive advantage by significantly reducing the delivery time of your services by placing order entry links in your customer’s offices).”

Besides RESOURCE1, data on actual firm actions included the calculation of both a five-year average and an average year-to-year percentage change in assessments of IT as a strategic resource (RESOURCE2).

Dependence on IT as a Strategic Resource: Subjective Measures

The goal of this set of measures (RESOURCE3 - RESOURCE6) was to capture the CIO’s belief of the extent to which managers (both senior managers and BU managers) saw IT as a strategic resource. We asked the CIO to consider his or her dealings with senior business managers and answer four items. The items measured factors such as whether BU managers considered IT when they formed business strategies or whether they viewed a flexible IT infrastructure as a competitive advantage. Scores from the four, five-point Likert scales were used to measure IT as a strategic resource, with higher scores indicating IT was a highly strategic resource. The measures tap into RBV arguments that a focus on IT to create inimitable, nonsubstitutable resources which will, in turn, lead to competitive advantage. The measures, positioned at a molar level of abstraction, are omnibus measures. See Appendix B for the relevant instrument items.
<table>
<thead>
<tr>
<th>Construct</th>
<th>Code</th>
<th>Description of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependence on IT as a Strategic Resource: Objective Measures</td>
<td>RESOURCE1</td>
<td>% of strategic IT investment in prior year</td>
</tr>
<tr>
<td></td>
<td>RESOURCE2</td>
<td>% of strategic IT investment - average % change over previous 5 years</td>
</tr>
<tr>
<td>Dependence on IT as a Strategic Resource: Subjective Measures</td>
<td>RESOURCE3</td>
<td>The extent that BU managers consider IT in their strategic decision-making</td>
</tr>
<tr>
<td></td>
<td>RESOURCE4</td>
<td>The extent that IT infrastructure has a role in BU decision-making</td>
</tr>
<tr>
<td></td>
<td>RESOURCE5</td>
<td>Senior managers see IT as providing competitive advantage</td>
</tr>
<tr>
<td></td>
<td>RESOURCE6</td>
<td>IT enables new business strategies</td>
</tr>
<tr>
<td>Locus of Control of IT Resource: Extent of Outsourcing</td>
<td>CONTROL1</td>
<td>Average of rankings of the extent to which IT is outsourced by the BUs in each of 15 functional areas</td>
</tr>
<tr>
<td>Performance: Business Units</td>
<td>CONTROL2</td>
<td>% of IT investment spent on services outside the firm--average % change over past 5 years</td>
</tr>
<tr>
<td></td>
<td>CONTROL3</td>
<td>% of IT investment spent on services outside the firm over last two years</td>
</tr>
<tr>
<td></td>
<td>PERF1-2</td>
<td>Profits per employee ($)</td>
</tr>
<tr>
<td></td>
<td>PERF3</td>
<td>Pricing against competitors (index)</td>
</tr>
<tr>
<td></td>
<td>PERF4</td>
<td>Return on assets</td>
</tr>
</tbody>
</table>

Table 1. Constructs and Measure

**Locus of Control of IT Resource: Subjective Measures**

To capture the extent to which managers decided to give up control of IT resources to outsourcers, we queried managers about fifteen typical IS activities (CONTROL1). The control perspective on IT outsourcing has been conceptualized by Ang (1994) and validated in Ang and Straub (1998). In psychometric tests in the latter study, the researchers found that measures of the control of IT as a resource (not necessarily a strategic resource) correlated highly with an applications-oriented perspective and an operations-oriented perspective. Since validation is always "egalitarian and symmetrical" (Campbell, 1960, p. 548), their cross-methods validation suggests that a control-oriented perspective captures the essence of the construct of IT outsourcing (Ang and Straub, 1998).

Using Ang’s theoretical perspectives (1994; 1993), the instrumentation measured the shift in control from internal to external service providers for each of fifteen IT resources. Participants filled in the matrix entitled "Management of IT Activities" in Appendix B. The list of IT activities on the research instrument was similar to that used in the validated Ang and
Straub field study (1998) and Smith et al. case study (1987); it also aligned well with activities identified in the IT services work of Weill and Broadbent (1998).

The four groups responsible for sourcing are indicated in Table 2 below, which presents an example of how a respondent may have filled out the form. Levels of control were denoted by the respondents as “R” if the group was responsible for an activity, “M” if the group monitored the activity, “I” if the group provided input, and “N” if there was no involvement.

The coding of these levels of control for each activity was a straightforward ordinal scaling, varying from 1 to 4. If the matrix data indicated that control was entirely internal, the IT activity was coded "1." In cases where the outsourcer was being monitored by the client firm, the decision was coded as "2." If control was shared with the external provider but only input was provided by the firms’ agents, then it was coded "3." If control was entirely in the hands of the outsourcer, then the coding was a "4."

<table>
<thead>
<tr>
<th>Corporate IS Group</th>
<th>Business IS Group</th>
<th>Line Manager</th>
<th>Organization external to the Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>I</td>
<td></td>
<td>R</td>
</tr>
</tbody>
</table>

R = Responsible for this activity  
I = Provide input for this activity  
M = Monitor this activity  
N = No involvement at all in this activity

Table 2. Coding Categories for Construct: Control of IT Functions/Services

An example might help to explain how this coding was performed. If the codes “M” or “R” was denoted for any of the inside agents (IS corporate, business unit, or line manager) and the outsider (“organization external to the firm”) role was coded “R” as being responsible for the activity, IT planning was coded as a 2. The reasonable assumption here is that the firm is attempting to control this activity by either monitoring it or sharing in the delivery of the service. If the outsider is responsible for the activity (coded as “R”) and one or more of the firm agents is providing input (coded as “I”), then the firm is exerting less influence over the delivery of the service, as in the sample response in Table 2. This lower level of control was classified as “3,” therefore.
Locus of Control of IT Resource:  
Objective Measures

An objective surrogate for control over the IT resource is the extent to which a firm outsources IT. Two objective measures were also used. The first, CONTROL2, was gathered at the corporate level. It is a financial measure where the outsourcing budget is expressed as a percentage of the firm's total IS budget for that year. Five years of data were collected allowing the calculation of both a five-year average (CONTROL2) and an average year-to-year percentage change in outsourcing (CONTROL3). Similar approaches were used in Loh and Venkatraman (1992) and Grover et al. (1996).

The second objective variable, CONTROL3, was the percentage of IT investment spent on services outside the firm. Averaged over the last five years, CONTROL3 measured the delta or change in percentage of IT investment outside the firm.

Business Unit Performance

The construct “Performance” is used extensively in organizational and information systems research. A broad range of quantitative performance measures are often employed by researchers, including measures of profit such as return on assets (ROA) (Floyd and Woolridge, 1990, Hitt and Brynjolfsson, 1996), return on net worth (Cron and Sobol, 1983), expenses as a ratio of income (Bender, 1986, Harris and Katz, 1991), and the ratio of operating profit to revenue (Markus and Soh, 1993). These measures of profitability are lagging measures (i.e., accounting end-of-period measures). Kaplan and Norton (1992) recommend a balance of leading (i.e., measures of performance that predict lagging measures) and lagging measures to capture performance. We chose 3 measures that provide a balance of leading and lagging measures that also relate well with the theoretical issues we are expostulating. They tap into: (1) labor productivity, (2) competitiveness, and (3) return on assets.

First, profit per employee (PERF1-2) was chosen as a measure of labor productivity (Weill, 1992) as it is likely to be sensitive to the level of outsourcing used. We specifically did not use revenue per employee as any degree of outsourcing should artificially increase this figure. The first of the measures included cost of goods sold (COGS) and all other expenses. The second was COGS alone. Two other firm-level measures were used, namely, an index of competitiveness of the firm compared to its industry (PERF3). This was assessed by the chief officer of the business unit. Finally, a standard return on assets (ROA) measure (PERF4). All of
these measures should reflect higher performance if the firm does not outsource more strategic assets than the SCM argues it should. See Appendix B for instrument items and elaboration.

3.4 INSTRUMENT VALIDATION

Many of the measures employed to test the SCM seem to be formative rather than reflective (Gerbing and Anderson, 1988) in that the types of measurement and the scales being employed were radically different for most measures and constructs. For example, the construct “firm performance” was measured by two profitability per employee figures and two archival items tapping into the performance of the business unit. While each of these very different measures “forms” the construct of firm performance, they may not “reflect” it (Campbell, 1960; Fornell and Larcker, 1981; Fornell and Bookstein, 1982; Cohen, 1990; Thompson, 1995; Chin, 1998; Diamantopoulos and Winklhofer, 2001) in the sense that our four questions with similar low to high semantic anchors do “reflect” the perception of the CIO on whether IT is viewed as a strategic resource.

One indication of whether statistical tests favor a formative or reflective handling is to examine their assumptions. Reliability tests such as Cronbach’s $\alpha$ make the assumption that scales are relatively similar in the meaning of the scale values; if not, the $\alpha$ statistic rapidly becomes meaningless. Thus, Cronbach’s $\alpha$ is a metric that allows one to test reflective construct measures. Constructs that rely on formative measures call for structural equation modeling (SEM) techniques such as Partial Least Squares (PLS) or LISREL, and PLS, in particular, can model the latent construct whether it is reflective or formative (Gefen, et al., 2000).

The other advantage of using PLS analysis is that the measurement error is being modeled, and it is, therefore, possible to use all measures even when their contribution is calculated as being small or modest.\(^4\)

Given the choice of measures in the present study, we engaged in two different forms of analysis to examine the psychometric properties of the instrument. Cronbach’s $\alpha$ assesses the reliability of the measures. PLS loadings assess the extent to which the nonperformance measures

\(^4\) Particularly because we had numerous formative latent constructs in the SCM, we adopted a holistic data analysis approach with measurement and structural models being run simultaneously. That is, no confirmatory factor analysis preceded the structural model to “cleanse” the scales. A holistic analysis grants high conceptual integrity in the latent constructs. Holistic analysis retains the meaning of each construct, which is drawn from both its measurement items and the other latent variables (Bagozzi, 1984).
(or indicators) are reflective of the construct to which they have been assigned. PLS weightings assess the extent to which performance measures (or indicators) are formative of the construct to which they have been assigned. The relevant PLS loadings/weightings are presented in Table 3.

The occasionally insignificant loading/weighting in Table 3 is not a surprise, given that some of the measures are formative (Edwards and Bagozzi, 2000). The reflective subjective measures (no. 2 in Table 3) should have loaded well, and, indeed, they all load significantly, at α protection level of .05, which reinforces the interpretation that the instrument has some convergent validity.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>PLS Loading or Weighting</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. IT as strategic resource (objective)</td>
<td>RESOURCE1</td>
<td>.9464</td>
<td>7.6849*</td>
</tr>
<tr>
<td></td>
<td>RESOURCE2</td>
<td>.6580</td>
<td>1.7191</td>
</tr>
<tr>
<td>2. IT as strategic resource (subjective)</td>
<td>RESOURCE5</td>
<td>.9194</td>
<td>1.9704*</td>
</tr>
<tr>
<td></td>
<td>RESOURCE6</td>
<td>.7558</td>
<td>1.9871*</td>
</tr>
<tr>
<td></td>
<td>RESOURCE4</td>
<td>.5280</td>
<td>2.7585*</td>
</tr>
<tr>
<td></td>
<td>RESOURCE3</td>
<td>.4837</td>
<td>3.1304*</td>
</tr>
<tr>
<td>3. Control over IT resource (selective outsourcing)</td>
<td>CONTROL1</td>
<td>.8760</td>
<td>9.6375*</td>
</tr>
<tr>
<td></td>
<td>CONTROL3</td>
<td>.7492</td>
<td>3.7150*</td>
</tr>
<tr>
<td></td>
<td>CONTROL2</td>
<td>.4129</td>
<td>1.3933</td>
</tr>
<tr>
<td>4. Performance</td>
<td>PERF1</td>
<td>.8758</td>
<td>13.5146*</td>
</tr>
<tr>
<td></td>
<td>PERF2</td>
<td>.7094</td>
<td>4.8963*</td>
</tr>
<tr>
<td></td>
<td>PERF4</td>
<td>.4613</td>
<td>2.7507*</td>
</tr>
<tr>
<td></td>
<td>PERF3</td>
<td>.3282</td>
<td>1.5997</td>
</tr>
</tbody>
</table>

Table 3. Loadings/Weightings from PLS Run

With regard to discriminant validity, Table 4 indicates that all AVE statistics bolded on the diagonal cells are larger than the cross-correlations in the same rows and columns (Gefen, et al., 2000). AVEs in excess of 0.500 are one commonly accepted standard (Fornell and Larcker, 1981) for convergent validity and all qualify by this rule of thumb. These provide evidence that measures in the constructs discriminate, i.e., are more closely aligned with themselves than with other constructs. For discriminant validity, constructs should be compared within stages of a model and not across stages (Straub et al., 2004), and so the DVs are not included in this table.
In addition to these tests, the Cronbach’s α for the subjective view of IT as a strategic resource was .920, which is acceptable by Nunnally’s rule of thumb (1994). Therefore, our interpretation of these loadings/weightings is that whereas the measures are not perfect, they are sufficiently valid for purposes of further testing. They are also acceptable because we are adopting a holistic analytical approach, which means that no attempts have been made to “cleanse” the constructs and reduce the a priori measurement error in the entire instrument (Bagozzi, 1984). Measurement error is accounted for in the statistical technique, but not removed. If we find significance under these harsher statistical conditions, then the findings may be interpreted to be even more robust than otherwise.

3.5 DESCRIPTIVE STATISTICS

As can be seen from Table 5, the variables demonstrate reasonable dispersion, none suffering from a floor or ceiling effect. This distribution suggests that the data is conducive for further statistical testing.

<table>
<thead>
<tr>
<th>Construct</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. IT as strategic resource (objective)</td>
<td>.815</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. IT as strategic resource (subjective)</td>
<td>.268</td>
<td>.694</td>
<td></td>
</tr>
<tr>
<td>3. Locus of control: extent of outsourcing</td>
<td>.169</td>
<td>.439</td>
<td>.706</td>
</tr>
</tbody>
</table>

Table 4. PLS Discriminant Validity Matrix

Diagonal entries are the average variance extracted (AVE), which is the square root of the variance shared between the constructs and their measures. Off diagonals are the correlations between constructs. The diagonals should be larger than any other corresponding row or column entry in order to support discriminant validity (Gefen et al., 2000). This is a less robust test than Fornell and Larcker (1981) who use the square root of the correlations. The analysis passes either test.
Firms varied in the level of their strategic IT investment from 0% to 70% of their portfolios, and the average deltas varied from a 100% decrease to 75% increase. Clearly, all firms were engaged in making decisions about which IT functions to outsource in that no firm or business unit in the study completely outsourced all of their IT activities. As a percentage of IT investment, the five year average of IT outsourcing varied from 0% to 50%, averaging 8.6%. The average delta increase over that time was 3.9%, moreover, which suggests that firms were gradually outsourcing more and more of their IT services over time.
The descriptive statistics on the subjective view of dependence on IT as a strategic asset are very interesting and not what we expected, \textit{a priori}. There was a distinct difference between the RESOURCE3 mean and the means of RESOURCE4 - RESOURCE6. RESOURCE3 stresses the BU view of IT as a strategic asset whereas RESOURCE4 - RESOURCE6 generally measure corporate-wide views. Apparently, CIOs in our sample did not believe that the business units sufficiently considered IT in their strategizing (mean = 2.85).

4. DATA ANALYSIS

The frequency distributions for CONTROL1 just reported indicate that the sample group did not have cases of total outsourcing. Fortunately, there is dispersion on the CONTROL variables, although it is equally clear that no firms were engaged in total outsourcing. This means that a straightforward PLS analysis can be performed on the CONTROL variables without transforming them to match the conceptualization of locus of control in Figure 2. In this case, higher levels of internal control should moderate IT as a strategic resource and this moderation should lead directly to higher performance.

PLS was used to analyze the variables and relationships posited for explaining the IT outsourcing environment. Table 6 is a snapshot of the overall results of hypothesis testing.\textsuperscript{6} Since the distinction between formative and reflective indicators is still ambiguous in the methodological literature (Diamantopoulos and Winklhofer, 2001), the models were run in two ways, first treating the moderation as formative and then treating it as reflective. Chin et al. (2003) point out that it may be desirable to handle formative moderators differently from reflective constructs.\textsuperscript{7} They recommend creating centralized and/or transformed composite scores via PLS weightings and then using these composites rather than product-item indicators (Chin et al., 2003).

Sample size was more than sufficient for PLS analysis (Gefen et al., 2000). The path coefficients, their T-statistics, and the explained variance for the models are shown in Figure 3. The model to test \( \text{H}_1 \) explains circa 48\% of the variance in the latent dependent variable.

\textsuperscript{6} Model\textsubscript{1} and Model\textsubscript{2} will be explained later in the discussion section.

\textsuperscript{7} This discussion is found in the online supplement to their article and not in the printed version. See: \url{http://www.informs.org/Pubs/Supplements/ISR/1526-5536-2003-02-SupplA.pdf}
**Table 6. Overall Results of Hypothesis Testing**

In the main test of the moderator in the strategic control model, the coefficient linking BU-level IT resources moderated by locus of control of those resources with performance was statistically significant, as demonstrated graphically in Figure 3. This result supports H1 (coefficient = -.702; p-value < .05; R² = .487). The finding suggests that firms that invest in IT as a strategic asset are less likely to outsource, and supports the proposition that strategic or core competencies should be retained within the organization and not be outsourced (Prahalad, 1993).

![Figure 3. Main Hypothesis Test](image)

4.1 COMPARATIVE MODEL ANALYSIS

To examine the moderation issue further, a PLS run was performed that linked only the importance of IT as a strategic resource with performance. In this way we are able to compare a model...
(Model₂) that links our resource dependence variable directly to performance with the moderation acting alone (Model₁).⁸ The test is a pseudo-F test, which in both the case of the formative and reflective interpretation are highly significant (p<.05). Effect sizes (f²) are calculated as \((R^2_{Model\ 1} - R^2_{Model\ 2})/(1 - R^2_{Model\ 2})\) (Mathieson et al., 2001; Chin et al., 2003). Multiplying f² by (n-k-1), where n is the sample size and k is the number of independent variables, yields a pseudo-F test for the change in \(R^2\) with 1 and n-k degrees of freedom (Mathieson et al., 2001). According to Cohen (1988), an effect size of .02 is small, .15 is medium, and .35 is large. In our case, the formative effect size is medium and the reflective effect size is large, indicating that in either case the models are markedly different in terms of their ability to explain the variance in the dependent variable. In short, the SCM is validated by this model comparison.

5. DISCUSSION, IMPLICATIONS, AND LIMITATIONS

The analysis uncovered numerous exciting findings about control over IT resources and the evolution of IT outsourcing. The strategic control thesis, a major contention of the research, was supported in H₁. Firms that invest at significant levels in strategic systems are sensitive to when they should retain control of core assets (Lacity, 1995).

Sustaining an IT-enabled competitive advantage requires continuous innovation, environmental scanning and a corporate mindset that understands the strategic use of IT. Such an environment is difficult to cultivate when control over a strategic asset is handed over to an integrator or service provider. Bendigo Bank, a regional Australian bank, decided recently to bring information technology back in house. Vicky Kelly, Bendigo Bank’s CIO, explains (Zampatakis, 1997):

---

⁸ Sharma et al. (1981) offer a procedure for determining whether the moderation takes the form of quasi- or pure moderation. Using the steps in their procedure, it appears that locus of control also has a significant direct effect on performance, indicating that we are in the presence of quasi-moderation. “In [such a] case, the moderation [still] influences the form of the relationship in the classic validation model” (p. 286).
In banking now, the lines between the business of banking and IT are becoming blurred. We need the IT knowledge within our organization so we can use it to help the business and we want immediate access so we can change direction at a moments notice. Outsourcing doesn’t provide that.

Whether a managers view IT as a strategic resource or not, the outsourcing decision is almost certainly not an indiscriminate one. There is evidence in the study that selective sourcing decisions lead to higher performance and that there are adverse consequences involved in ignoring the connection between viewing IT as a strategic resource and selectively outsourcing it. Higher levels of performance uncovered in this study include: (1) larger profits per employee and (2) higher ROA. PERF3, increased competitiveness or comparative pricing against competitors, did not load significantly (see Table 3), but the other performance measures did. These significant effects are last in a value chain that begins by arguing that strategic choices about sourcing IT eventually impact the firm’s bottom line.

Grounded in the resource-based theory of the firm, the strategic control model expresses these relationships in a parsimonious fashion. In this study, the model received sufficient support to justify further research in this vein. In short, it appears that firms that selectively outsource IT and take advantage of these competitive opportunities will be justified in their investment decision. A significant business payoff awaits firms that can successfully manage selective outsourcing.

Managers and researchers alike need to consider the implications of these findings. For scholars, it is important to note that the strategic control hypothesis received support through the objective measures, but that the theoretical framework does needs further work in construct specification and testing of subjective measures and alternate measures of performance.

Of course, all research has limitations and there are some that need to be noted in the present study and addressed in future work. Whereas the quality of the data was generally excellent and 14 observations per business unit assessing the outsourcing activity (CONTROL1) added richness to our measures, further studies in differing settings and locales are always in order and part of the process of normal science.

Measurement issues lie at the heart of solid research and, although most of the measures in the instrument performed reasonably well, further work in this vein can refine and hone the approach. It would be useful, for example, to have accompanying subjective and objective measures for even more variables in the data set. This would help to rule out methods bias and
to conclude that the effects observed are not artifactual. Instrumentation of the attitudes toward IT as a strategic asset needs to be revisited.

Core IT assets need to be investigated vis-á-vis noncore assets. Asking whether an IT activity is strategic or core and then asking in the same instrument whether it was outsourced has a built-in methods bias. The results of this approach to instrumentation are predictable and likely to be artifactual. Researchers should seek out ways to measure these variables without collecting the data at the same time and from the same source.

Given that the present study represents a departure from the usual outsourcing theory bases of transaction cost and incomplete contracting (Ang and Straub, 1998; Lacity and Hirscheim, 1993; Richmond, et al., 1992a; Richmond, et al., 1992b), we feel that RBT has proven itself to be a useful lens for formulating theoretical propositions related to the outsourcing decision.

Practitioners should recognize that deciding which IT resources are strategic is a crucial phase in the overall systems integration process. Non-core assets can be taken over by outsourcers with no loss of strategic control. On the other hand, retaining IT assets that are strategic will enable the firm to remain competitive and better capable of responding to future technological uncertainty.

This study raises interesting questions about the worldwide trend of increasing IT outsourcing. For example, some governments (e.g. Federal Government of Australia) have mandated market testing for outsourcing all IT investments, often combining several departments in the outsourcing contract (e.g., Taxation and Health) to achieve a stronger bargaining position. In contrast to this approach, the results of this study strongly support a selective approach to outsourcing based on strategic control of key IT assets and the core competencies of the organization. Strategic control should be the ultimate purpose of outsourcing, rather than any arbitrary attribution of value to IT outsourcing in its own right. Managers in the position to influence key outsourcing decisions should think about the need to strategically control each IT activity and make their decisions accordingly.

Acknowledgments

We wish to acknowledge researchers who contributed to the collection of insights and data for this research:

♦ Marianne Broadbent, The Gartner Group
♦ Carey Butler, Monash University, Australia
♦ Tim O’Brien, formally of Melbourne Business School, University of Melbourne
♦ John Henderson and Christine Lentz, Boston University
♦ Jeff Sampler, London Business School
♦ Bob Tricker, John Whitman and Ali Farhoomand, Hong Kong University
♦ Peter Keen, Keen Education
♦ Jack Rockart, Jeanne Ross and Jim Short, Massachusetts Institute of Technology
♦ Judith Quillard, IBM
♦ Neo Boon Siong and Christina Soh, Nanyang Technological University, Singapore
<table>
<thead>
<tr>
<th>Participating Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANZ Banking Group</td>
</tr>
<tr>
<td>BP (Singapore and Australia)</td>
</tr>
<tr>
<td>Brash Holdings</td>
</tr>
<tr>
<td>Caltex</td>
</tr>
<tr>
<td>Carlton and United Breweries (Fosters Brewing Group)</td>
</tr>
<tr>
<td>Citibank, Asia Pacific</td>
</tr>
<tr>
<td>Coles Myer (Target, K-Mart, Department Stores)</td>
</tr>
<tr>
<td>Commonwealth Bank of Australia</td>
</tr>
<tr>
<td>Development Bank of Singapore</td>
</tr>
<tr>
<td>Development and Commercial Bank Malaysia</td>
</tr>
<tr>
<td>Hoffmann-LaRoche Switzerland</td>
</tr>
<tr>
<td>ICI Australia</td>
</tr>
<tr>
<td>Johnson and Johnson (USA and Australia)</td>
</tr>
<tr>
<td>Maybank Malaysia</td>
</tr>
<tr>
<td>Metway Bank</td>
</tr>
<tr>
<td>Monier/PGH</td>
</tr>
<tr>
<td>National Australia Bank</td>
</tr>
<tr>
<td>Royal Auto Club of Victoria</td>
</tr>
<tr>
<td>Ralston Purina</td>
</tr>
<tr>
<td>Southcorp Holdings</td>
</tr>
<tr>
<td>Sunlife of Canada</td>
</tr>
<tr>
<td>Times Publishing, Asia</td>
</tr>
<tr>
<td>Unum</td>
</tr>
<tr>
<td>S.G. Warburg, Europe</td>
</tr>
<tr>
<td>Woolworths (including Safeway)</td>
</tr>
</tbody>
</table>
Appendix B
Instrument Items

CONSTRUCT: DEPENDENCE ON IT AS A STRATEGIC RESOURCE: OBJECTIVE MEASURES (RESOURCE1 AND RESOURCE2)

Levels of Investment in I/T Infrastructure
The following questions relate to the level of investments in I/T in the corporate I/S function and the BUSINESS UNITs. Please be as accurate as you can. If you don't have the information, please provide your best estimation and mark the estimate with a star (*).

In completing these questions, please use the FIRM's or BUSINESS UNIT's reporting year. For example, if the last month of your reporting year is September, for Year 1 you would report for the year ended September Year.

Corporate I/T Investment

In answering the following questions, please consider I/T Infrastructure as:
the base foundation of I/T capability budgeted for and provided by the I/S function and shared across multiple BUSINESS UNITs. The I/T capability includes both the technical and managerial expertise required to provide reliable services.

1. Of the corporate I/T investment identified in Question 3, what percentage would you classify as I/T Infrastructure?

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
</tr>
</tbody>
</table>

2. Of the corporate I/T investment in Year 6 that is not infrastructure, estimate the percentage which was to:

   (i) Cut operating costs - e.g.: reduce costs of preparing and sending invoices

   ______% 

   (ii) Increase or protect your sales (or market share) by providing new (or ______% improved) customer service or products. This type of investment generally positions the firm in the marketplace

   (eg: Create competitive advantage by significantly reducing the delivery time of your services by placing order entry links in your customer's offices) [RESOURCE1]

   (iii) Provide information. This would include information for control, ______% communication, accounting, managing quality, EIS, MIS, etc.
3. Please estimate this breakdown in previous years.

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Cut Costs</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
</tr>
<tr>
<td>(ii) Gain Sales [RESOURCE2]</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
</tr>
<tr>
<td>(iii) Provide Information</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
</tr>
</tbody>
</table>

**CONSTRUCT: DEPENDENCE ON IT AS A STRATEGIC RESOURCE: SUBJECTIVE MEASURES (RESOURCE3 THROUGH RESOURCE6)**

Decisions about I/T Infrastructure Investments
I/T Infrastructure refers to the base foundation of I/T capability budgeted for and provided by the I/S function and shared across multiple BUSINESS UNITS. The I/T capability includes both the technical and managerial expertise required to provide reliable services.

The following questions relate to the way decisions are made about I/T Infrastructure investments. Please CIRCLE the number that best describes your FIRM.

**RESOURCE3.** In forming business strategies, the BUSINESS UNIT (BU) considers the capabilities of the I/T Infrastructure

1. Never
2. Sometimes in Some BUs
3. Sometimes in All BUs
4. Often in Most BUs
5. Always in All BUs

**RESOURCE4.** In justifying Infrastructure investments, the flexibility to quickly meet future, but as yet unspecified, BUSINESS UNIT strategies is valued

1. Never
2. Rarely
3. Sometimes
4. Usually
5. Always

**RESOURCE5.** Senior managers of the FIRM perceive a flexible I/T Infrastructure as providing a competitive advantage

1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree
CONSTRUCT: LOCUS OF CONTROL OF THE IT RESOURCE (CONTROL1, CONTROL2, and CONTROL3)

Management of IT Activities
This question seeks to identify various types of responsibility and input for different I/T related activities throughout the FIRM. There are four groups indicated: the Corporate I/S group, the Business I/S group, Business Unit Line Managers and any organizations external to the firm. For each of the activities listed (Items 1-15), please indicate the level of management responsibility and input for each of the four groups using the following symbols:

- **R** = Responsible for this activity
- **M** = Monitor this activity
- **I** = Provide Input for this activity
- **N** = No involvement at all in this activity

Each box should have one of the letters (R,I,M,N) entered into it. For a particular activity there may be dual responsibility (or perhaps input). Thus a letter can be used more than once for an activity.

<table>
<thead>
<tr>
<th></th>
<th>Corporate IS Group</th>
<th>Business IS Group</th>
<th>Line Manager</th>
<th>Organization external to the Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. IT Planning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Systems Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Systems Maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Overall Architecture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Establishing technological standards for the organization in order to ensure compatibility (eg: only UNIX). Within the architecture who has the responsibility for:
6. Data
7. Hardware
8. Applications
9. Communications
10. Security
11. Infrastructure
12. Technology Transfer  
   (Introducing existing technologies into the FIRM)
   for IS group
14. Training in the use of IT
15. Research and Development  
   (Developing new technology)

**CONTROL1.** This measure was a mean rank of the codings of each of the 15 IT activities in the above scale.

**CONTROL2.** Of the business unit IT investment identified earlier in Question 3, what percentage is spent on services provided outside the firm?

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
</tr>
</tbody>
</table>

**CONTROL3.** Average of last two years of the data collected in CONTROL2.

**CONSTRUCT: PERFORMANCE (PERF1 – PERF4)**

**BUSINESS UNIT Financial Performance**
The following questions refer to the financial performance of this BUSINESS UNIT.
PERF1&2. Please report this BU's revenue for the past five years. If a bank, please define revenues as NET INTEREST INCOME (after INTEREST PAID) plus OTHER OPERATING INCOME

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M_____</td>
<td>$M_____</td>
<td>$M_____</td>
<td>$M_____</td>
<td>$M_____</td>
</tr>
</tbody>
</table>

PERF1. Please report this BU's expenses (including cost of goods sold) for the past five years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M_____</td>
<td>$M_____</td>
<td>$M_____</td>
<td>$M_____</td>
<td>$M_____</td>
</tr>
</tbody>
</table>

PERF2. Please report this BU's cost of goods sold for the past five years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M_____</td>
<td>$M_____</td>
<td>$M_____</td>
<td>$M_____</td>
<td>$M_____</td>
</tr>
</tbody>
</table>

PERF3. For each year, please indicate how your pricing of products compared to your three largest competitors. For example, if this BU's prices averaged 10% above those of the three largest competitors, then 110% is reported for each year.

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
<td>______%</td>
</tr>
</tbody>
</table>

PERF4. Please report your Return on Assets (ROA) for the past four years. ROA is calculated by dividing (i.e.: profit) before interest and tax (EBIT) by total assets.

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>______</td>
<td>______</td>
<td>______</td>
<td>______</td>
</tr>
</tbody>
</table>
## Appendix of Codings

<table>
<thead>
<tr>
<th>Construct</th>
<th>Code</th>
<th>Original</th>
<th>Description of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IT as Strategic Resource:</strong> Objective Measures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RESOURCE1</td>
<td>A_7B_93</td>
<td>% strategic IT investment prior year</td>
</tr>
<tr>
<td></td>
<td>RESOURCE2</td>
<td>A_7BDAV</td>
<td>% strategic IT investment average deltas over previous 5 years.</td>
</tr>
<tr>
<td><strong>IT as Strategic Resource:</strong> Subjective Measures</td>
<td>RESOURCE3</td>
<td>B_H3</td>
<td>BUS consider IT in their strategizing</td>
</tr>
<tr>
<td></td>
<td>RESOURCE4</td>
<td>B_H6</td>
<td>IT infrastructure has a role in BU strategies</td>
</tr>
<tr>
<td></td>
<td>RESOURCE5</td>
<td>B_H9</td>
<td>Senior managers see IT as giving competitive advantage</td>
</tr>
<tr>
<td></td>
<td>RESOURCE6</td>
<td>B_H10C</td>
<td>IT enables new business strategies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Construct</th>
<th>Code</th>
<th>Original</th>
<th>Description of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Selective Sourcing</strong></td>
<td>CONTROL2</td>
<td>C_I9_DAV</td>
<td>% of IT investment spent on services outside the firm average deltas over past 5 years</td>
</tr>
<tr>
<td></td>
<td>CONTROL3</td>
<td>C_I9AV23</td>
<td>% of IT investment spent on services outside the firm over last two years</td>
</tr>
<tr>
<td></td>
<td>CONTROL1</td>
<td>C_MEAN</td>
<td>Mean of 15 functional area assessments of the extent to which IT is outsourced at the corporate-level</td>
</tr>
<tr>
<td><strong>Business Unit Performance</strong></td>
<td>PERF1</td>
<td>F_EXPEM</td>
<td>Profits per employee ($) [Revenues-expenses]</td>
</tr>
<tr>
<td></td>
<td>PERF2</td>
<td>F_COGSEM</td>
<td>Profits per employee ($) [Revenues-COGS]</td>
</tr>
<tr>
<td></td>
<td>PERF3</td>
<td>F_COMP</td>
<td>Pricing against competitors (index)</td>
</tr>
<tr>
<td></td>
<td>PERF4</td>
<td>F_ROA</td>
<td>Return on assets</td>
</tr>
</tbody>
</table>
References


Lacity, Mary, Rudy Hirschheim and Leslie Willcocks, "Realizing Outsourcing Expectations," *Information


Wernerfelt, Birger, "A Resource-Based View of the Firm," *Strategic Management Journal*, September-


