

A RISK ANALYSIS FRAMEWORK FOR IT OUTSOURCING

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The outsourcing market for Information Technology (IT) services has been transformed over the past decade. Companies that once only considered outsourcing as a means of reducing cost, through economies of scale, scope and specialization, are now choosing to outsource important and even strategic IT functions. As the scope and size of the IT procurement market grows, special attention should be placed on understanding the opportunities for successful outsourcing. While previous literature has emphasized the importance of core competencies, contractual risks are now realized as a dominant factor in the outsourcing decision. This paper proposes a risk analysis framework for understanding the benefits and costs of utilizing a vendor's services in this domain. The fundamental drivers of risk are information asymmetries before contracting, inability to monitor partners' actions perfectly, and exogenous changes that allow one party to behave opportunistically. Reviewing the comprehensive contracting literature in economics and adapting it to the unique area of IT outsourcing provide the basis for prescriptions on efficient and effective contractual arrangements. These prescriptions are in the form of both governance structures that emphasize the importance of ownership of critical assets and contractual remedies to provide sufficient incentives to align parties' interests. The heterogeneity of the IT outsourcing market justifies examining different facets of this market. For each segment of this market, different relationships between client and vendor are suggested.

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I. Introduction

The outsourcing market for Information Technology (IT) services has been transformed over the past decade. Companies that once only considered outsourcing as a means of reducing cost, through economies of scale, scope and specialization, are now choosing to outsource important and even strategic IT functions. This comes through the realization that vendors often have advantages in providing these services, including competence in new technologies and access to better IT professionals (Caldwell, 1997; Saunders, Gebelt and Hu, 1997; Slaughter and Ang 1996). The immense growth in the market for IT services is evidence that many companies view outsourcing as their method of choice for obtaining IT services. Recent estimates place the market at \$630 billion by 2002, up from \$327 billion in 1997 (Violino and Caldwell, 1998). Most firms today utilize outsourcing vendors for at least part of their information technology expenditure, and several high-profile firms such as Kodak, General Dynamics, British Petroleum, and General Motors, have a large share of their IT services provided by independent, external contractors (McFarlan and Nolan, 1995). The range and complexity of IT outsourcing agreements are also continuing to expand, containing a continuum of activities from purchasing “shrink-wrapped” applications through complete divestiture of the entire IT function (Grover, Cheon and Teng, 1996). While in the past companies emphasized low cost as their main objective in outsourcing activities, today many companies are expanding the traditional role of outsourcing relationships to include improved services, improved financial performance, and even the development of new lines of business (DiRomualdo and Gurbaxani, 1998).

E-commerce is also expanding the use of outsourcing, with many companies choosing to outsource critical applications to gain access to new technologies and reduce time to market. Contracting for services is probably the most prevalent e-business model for Internet start-ups, and is not uncommon for other companies that want to pursue an online presence. The most recent National Association of Purchasing Management survey (2000) found that the major improvements in supply chain management will be in the form of e-commerce applications and strengthening the use of IT in supply chains. Companies are outsourcing all elements of the e-commerce value chain, including strategy, systems development and integration, payment processing, market design, advertising and customer management, as well as development of the physical network and web-hosting (Rosa, 2000; Gartner Group, 1999; Earl 1996). Those companies outsourcing such a large spectrum of activities,

which are usually serviced internally in the “bricks and mortar” side of the organization, have to look at the contractual risks of procurement (Gartner Group, 1998). For others, the online marketplace provides opportunities to contract for services at competitive prices.

A critical aspect of outsourcing is to define the terms of the relationship, a process that involves the governance structure of ownership and the *contract* for IT services. In an ideal world, a firm makes an informed assessment of the relevant costs, benefits and risks of outsourcing versus internal procurement (Coase, 1937). If there exists a profitable outsourcing opportunity, the client and the vendors enter into a contract with a full knowledge of the nature of the work for the client and the capabilities of the vendors. They create an explicit written agreement that covers all aspects of the services to be delivered and payments to be made, including contingency plans for unforeseen events. During and after the engagement, both parties are fully aware of whether the terms of the contract were met, and if not, appropriate remedies can be enforced by a third party, such as a court or arbitrator. In this ideal world, without contractual problems, clients can reap the benefits of using outside vendors, including economies of scale, scope or specialization in the form of improved quality, lower cost or faster time to market with IT-enabled products and services (Quinn and Hilmer, 1994).

Unfortunately, in reality, most contractual relationships for IT service cannot meet these conditions. IT differs fundamentally from the procurement of commodities, resembling more service provision. There is a vast spectrum of available services, each with different characteristics leading to unique tradeoffs in the outsourcing decision. Some contracted IT services are well-defined and commonplace, such as hardware maintenance, involving minimal procurement risk. At the other extreme, companies may outsource their entire IT infrastructure for a long period of time, requiring vendors to provide services that are yet undefined with unknown technologies. Standard contracts are hardly justified for ill-defined services. Intermediate procured IT services require individual attention to the governance structure and contractual mechanisms that minimize risk.

Even when compared to procuring other services, IT outsourcing has some unique difficulties. The inability to limit the use of information requires care on what counterparties know and understanding how they could use the information. The difficulties of objectively measuring quality in IT service procurement limit the viability of enforcement mechanisms. Inability to identify the direct value-added of IT further hinders incentive-based contracts. In many relationships, both the client and the vendor make critical investments to assure a project’s success. Simple contracts that provide

incentives to only one party may insufficiently motivate other members to undertake their investments. Finally, in many IT outsourcing contracts, vendors offer unique services and have better knowledge of the possible benefits from their service than the client. This leads to an increase in bargaining power for the vendor, as opposed to other procured activities. Conversely, IT contracting has a number of advantages. Most of the services contracted for have a large digital component, allowing extensive monitoring of otherwise unobservable actions and outcomes, thus increasing the viability of incentive contracts. The widespread acceptance of standards in the industry and commonality of platforms reduces the dangers of misspecification and miscommunication between parties. With the unique attributes of IT contracting and the heterogeneity between services, each contracting decision must be individually examined.

Lacking a systematic analytical approach to the outsourcing decision, firms may make arbitrary choices on the decision to outsource, based on historic norms, cashflow difficulties, political considerations or misperceptions of the benefit-risk tradeoff (Lacity and Hirschheim, 1993). The lengthy bidding and negotiation process has also led to contractual mistakes in procurement (Chaudhury, Nam and Rao, 1995). Agency issues may arise for a variety of reasons as discussed in this paper, leading to incentive misalignments between the client and vendor. Uncertainty about vendor quality may lead clients to overpay for services, receive inferior service, or unintentionally select unqualified or less qualified vendors who never deliver. Unforeseen contingencies can arise, leading one party to expropriate value from the other. Even the threat of unforeseen exploitation can sideline a potentially beneficial deal or raise the costs substantially due to investments in monitoring and other safeguards (Caldwell, 1998). There is a constant stream of reports of failed IT contracts, even for some of the most highly publicized agreements (Geoffrey, 1998; Saunders, Gebelt and Hu, 1997). Anecdotal evidence suggests that the field of IT contract litigation may be growing as fast or faster than the market for IT services. Some of the researchers who have most extensively studied IT contracting have argued strongly against outsourcing in most cases (see e.g., Lacity and Hirschheim, 1993; Strassmann, 1997) as a result of these problems.

If the outsourcing market is to remain robust in the long term, it is clear that a better understanding of contractual design is needed in theory and practice (Saunders, Gebelt and Hu, 1997; Lacity and Hirschheim, 1993). There exists a substantial body of work on IT contracting (and its successes and failures), as well as an even larger stream in the economics literature on the design of

contracts in a variety of settings. Our objective in this paper is to review, organize and discuss what is currently known about the economics of contracting, both in the IT and economics literatures, and how it applies specifically to the design of IT contracts. We will use this analysis to prescribe specific approaches that can be applied by practitioners to match contractual provisions to different types of outsourcing situations as well as to identify areas for future research.

In the next Section an analysis of the overall decision to outsource identifies the relevant factors that should be weighed. We then evaluate in detail these specific factors, including benefits, costs and risks. To begin the analysis, Section III provides an overview of the economics of contracting, discussing the various arrangements commonly included in the literature. Section IV expands on the benefits of procuring IT services from outside providers, elucidating the concepts of economies of scale, scope and specialization. Following this discussion, Section V enumerates the important costs of outsourcing, emphasizing the different risk factors raised in the literature and reviewing the standard contractual remedies for each one. These are broadly grouped into difficulties associated with differences in information regarding competencies, unobservable action, including misuse of information, and opportunism, all exacerbated by bounded rationality. The discussion in Section VI evaluates the opportunities for broader solutions to the outsourcing problem, including market-based solutions, contractual mechanisms and the advantages of different governance structures. Section VII concludes the paper.

II. Deciding What should be Outsourced

What should be outsourced? The make or buy decision is hinged on the ability to achieve superior results at lower cost. As part of maximizing profit, a company strives to find the most inexpensive means of producing goods and servicing its customers. Outside vendors have access to better technologies, at lower cost, that justify procuring a large spectrum of IT services. Taking advantage of outside opportunities leads to gains from trade, with customers willing to pay more than cost for various IT services. As the breadth of the IT service market expands, companies in need of IT enabled services can often find vendors to provide these services. With the inherent difficulties of purchasing IT services, the question remains how to minimize the expected cost of production and still maintain quality. The lower cost available from external procurement drives the recommendation of increased reliance on markets (Malon, Yates and Benjamin, 1987). On the other hand, there are

transactions costs associated with reliance on the market, including the explicit coordination cost and more complex contractual risks, that suggest internal production in hierarchies (Coase, 1937; Alchian and Demsetz, 1972; Williamson, 1975). The outsourcing decision trades off these opposing factors.

It is generally agreed in the popular business press that a *core competence* should not be outsourced (Earl, 1996; Prahalad and Hamal, 1990). Quinn and Hilmer (1994) suggest expanding the scope of activities that should be made, not bought, to include areas that are important to maintaining a competitive advantage in a company's core competencies. There often are adjacent activities that are risky to outsource. These vague concepts, however, provide little guidance in the outsourcing decision. To decide, we must first examine what it means for an activity not to be a core competence. Second, understanding the risks of losing one's competitive advantage from outsourcing adjacent activities requires a thorough evaluation of possible risks. It appears straightforward to determine if an activity is a *competence*. Areas of competence are those where the firm has a comparative advantage over competitors. Here, the firm can continue to produce internally, at lower cost or better quality, than available in the outside market. If an activity is not a competence of the firm, then it can be done more cheaply outside the firm, for the usual reasons of economies of scale, scope and specialization (see next section). By procuring the service, the firm can realize gains from trade. The gross benefit from outsourcing is the cost difference between external and internal production. As this difference grows, outsourcing becomes a viable alternative to internal manufacturing. It is this benefit that should be compared to the other costs, including transaction costs and contractual risks.

It may be less straightforward to determine what is and is not *core* (Quinn and Hilmer, 1994). Using generally accepted definitions, seldom clearly articulated by the managers who use them as the basis of their decisions, we may conclude that if an activity is a core activity, then it is directly part of the firm's mission. If the activity is not directly part of the mission of the firm, then using the "*stick to your knitting*" criterion that has become so popular, the activity is appropriate for outsourcing (Quinn and Himer, 1994;). This criterion, however, has historically been more than unreliable as the basis of sourcing decisions; it has occasionally been dangerous, as we can see by examining two outsourcing decisions in the operation of airlines.

Airlines' CRSs (computerized reservations systems) used by travel agents would not appear to be part of serving passengers or flying planes, and thus would not appear to be part of an airline's core activities. And yet, the major failures in the airline industry after deregulation were all from

among those airlines that chose not to develop these non-core systems and chose not to invest in these non-core development efforts. With industry-wide changes in fare structure and corporate travel reliance on travel agencies after deregulation, CRSs became a critical means of selling tickets and all airlines relied on their services. CRS vendors eventually repriced their reservations services, imposing fees on participating airlines that were extremely burdensome to the participating airlines and extremely profitable for the CRS operators. In the early 1980s, AMR's¹ SABRE and United Airlines' Apollo were more profitable for their owners than was the business of serving travelers by operating an airline. In contrast, Pan Am and Eastern, which did not operate their own CRSs, failed and were liquidated under Chapter 7. Likewise, TWA and Continental, which did not operate CRSs, have survived, but only after going into and out of Chapter 11. The major airlines that have survived now all participate as owners or partial owners of travel agent CRSs (Clemons, 1991; Flint, 1998).

Aircraft maintenance, in contrast, would *a-priori* appear to be a core activity, without which it would be unsafe to fly, and without which airlines would be denied certification, from their national regulators, to operate. And, yet, many airlines safely continue to outsource maintenance from other, larger carriers — Delta Airlines, Singapore Air and Swiss Airlines (Nelms, 1996).

Since the *stick-to-your-knitting* criterion appears unreliable, the economics literature has developed an alternative, *risk-based* criterion for separation of activities that should be candidates for outsourcing and those that should not (Coase, 1937; Alchian and Demsetz, 1972; Williamson, 1979; Hart and Moore, 1990; Clemons, Reddi and Row, 1993; Holmstrom and Milgrom, 1994). We will first examine the two airline examples just presented above:

As is now well-known, outsourcing a portion of the primary means of reaching customers is fraught with danger. CRS operators Apollo and Sabre initially made their services available to all competing airlines; after significant adoption by travel agents made participation in these CRSs essential for all airlines, the CRS operators instituted high service fees. At the peak of CRS profitability, American Airlines is reputed to have earned more money by providing reservations services for Delta's flights than Delta made by flying them, and operating a CRS was more profitable than operating an airline. CRS vendors were able to earn these high fees, even when airline profitability was low, because they could plausibly threaten to drop the flights of any single airline from their coverage within their system. The damage to the airline would be enormous, as expenses

¹ The parent company of American Airlines.

would not be dramatically reduced, but load factors and revenues would drop precipitously (Business Week, June, 22, 1987). Moreover, the impact on the CRS vendor would be only minor: American and United ticket revenues would not be affected by the actions of their CRS subsidiaries, and even CRS revenues would not change much, as passengers would simply shift their travel to other airlines, which would pay the fees that the dropped carrier would have paid instead. Indeed, when Braniff and Frontier were each dropped from a major CRS, both airlines ended in bankruptcy and liquidation² (Business Week, Aug. 6, 1984).

The risks of outsourcing maintenance service are, paradoxically, much less than the risks of outsourcing reservations service. In contrast with CRS services, hold-up is not plausible in the aircraft maintenance business. There are alternative providers of maintenance service, and an airline would switch service providers at contract renewal time if its service provider attempted to impose unfair charges. Moreover, since aircraft are by their very nature mobile, and are flown in for service, and standardized, able to be serviced at any service provider, there would be no additional cost to the airline for switching service providers. There would, however, appear to be a danger of substandard service: What if the maintenance service provider did a poor job on the customer's planes? Wouldn't a crash or two destroy the customer's reputation for safety and put the customer out of business? Well, yes. But the crash would also destroy the maintenance provider's reputation for safety and would most likely put it out of business as well, or lead to criminal charges - as SabreTech was indicted for murder and manslaughter for its role in the ValueJet crash on May 11, 1996 (Aviation Week & Space Technology, August 14, 2000). This, presumably, is why airlines obtain in-flight meal service from catering kitchens that need not be associated with an airline, while maintenance services are increasingly procured from the aircraft manufacturer or other airlines (Nelms, 1996). These parties have reputations that are as important, and are as much at risk from safety problems, as are those of their maintenance client airlines.

In the IT domain there is a large set of capabilities that have become standardized, and can be safely outsourced with minimal risk. "Off the shelf" software may be one of the most common examples of a near commodity that is commonly procured and not internally developed. Many users trust the software developer to improve the product continuously to enhance the level of service they

² In the outsourcing literature the imposition of unplanned, higher fees, backed up by the vendor's threats to discontinue service or by other unmanageable threats, is frequently termed *vendor hold-up* (Milgrom and

receive. If, for some reason, the vendor stops updating the software, users can often easily transfer to a competing brand. Other areas of the IT landscape that are becoming standardized include data center operations, communication, responsibility for PC procurement and maintenance, network support, data warehouses and data mining, ongoing maintenance of non-proprietary legacy software systems, and Internet application and web-hosting (McFarlan and Nolan, 1995). Empirical investigation into outsourcing candidates that are likely to succeed shows that contracts for systems operations and telecommunication management are more successful (Grover, Cheon and Teng, 1996).

These examples suggest that the traditional characterization of *core* is of little use in assessing what can be outsourced. Empirical studies on IT outsourcing support the notion that core activities can safely be outsourced. Saunders, Gebelt and Hu (1997) found that among companies that have outsourcing agreements satisfaction is higher for those that outsource core activities, provided that they have minimal risk from the relationship.

Transaction Cost Economics argues, instead, that the distinction between activities that are candidates for outsourcing and those that are not should be based on *risk*. The outsourcing decision is the comparison of gross benefits against other costs, including transaction costs and contractual risks. While some of these costs can be minimized and contractual risks can be mitigated, the residual transaction costs are often significant for IT outsourcing and should be evaluated in the make or buy decision. The risk mitigation possibilities are discussed further in Sections V and VI.

This leads to the following formulation of the economically-rational outsourcing decision:

- A firm should keep an activity in-house if the size of the *expected* economic loss (transaction costs and contractual risks), given optimal contractual risk mitigation that can result from an outsourcing contract, exceeds the expected economic gains (difference in production costs).

As long as the risks associated with the outsourcing of any single activity do not have expected losses that exceed the expected gains, then, on average, the firm's portfolio of activities should be economically neutral.

While these decision mechanisms may appear non-controversial, and may even seem to be intuitive, applying them in practice is quite difficult.

Roberts, 1992).

Defining loss is relatively easy: We can define the expected potential loss from outsourcing an activity simply as the magnitude of the exposure times the probability of loss.³

Delimiting all the ways the possible risks can occur is seldom easy: Exposure includes misaligned incentives between vendor and client (Alchian and Demsetz, 1972; Grossman and Hart 1983; Harris and Raviv, 1979), insufficient investments (Grossman and Hart, 1986; Hart, 1989; Hart and Moore, 1990; Hart, 1995), inappropriate use of confidential client information (Clemons, and Row, 1992), vendor hold-up, expropriation and loss of bargaining power (Klein, Crawford and Alchain, 1978; Williamson, 1983; Joskow 1987), vendor private information about his ability (McAfee and McMillan, 1987b; Laffont and Tirole, 1987), market failures from private information Akerlof (1970), and ineffective bidding mechanisms (Milgrom, 1989; Thaler, 1992). Not all of these risks will materialize in every relationship, further complicating the calculation of expected loss.

For example, a major super-regional bank outsourced the service of its credit card accounts and, indeed, sold its credit card portfolio, while the new account servicing organization continued to use the original bank's logo on its cards and on its correspondence with customers. However, the best customers of the bank were frequently not profitable customers for the new servicing organization; consequently, the new servicing organization responded by raising the rates these customers were charged or reducing the quality of the service they received. While this served the interests of the credit card servicing organization, they were extremely damaging to the relationships that these customers had with their primary banking institution, which was blamed for the change in the quality of the credit card operation. The resulting damage to the bank's remaining businesses, while unanticipated, were so severe that the bank was ultimately driven to reacquire its credit card portfolio and redevelop the ability to serve its credit card customers internally.

Determining the probability of loss likewise is seldom easy, even for those losses that have been identified. Effective contracting can eliminate many potential sources of loss, as is discussed in the remainder of this paper. Other potential sources of loss can be rendered unlikely, but unanticipated environmental changes can create unanticipated opportunities for exploitation that were not protected against in the outsourcing contract (Simon, 1951; Simon 1979). The probability of the residual losses

³ To be precise, in place of *expected loss* the evaluations should use the smaller of the two quantities: 1) expected loss without any contractual attempt at mitigation of risk; and 2) expected loss after contractual

that remain after contracting is thus determined by the unknown probability of unforeseen events, which, if they had been foreseen, would likely have also been subject to contractual risk reduction (Earl, 1996). The probability of losses from these residual risks is also determined by the unknown probability that outsourcing partners will see and exploit these opportunities (Williamson, 1975; Klein, Crawford and Alchain, 1978; Clemons, 1991). Even when the potential for loss is well understood, loss realization often depends on other parties' actions.

The outsourcing decision hinges on the magnitude of the risks discussed in this paper. For each potential contract the various risks must be weighed against the outsourcing benefits. While the literature has advanced the various contractual risks, there is little comprehensive analysis to guide practitioners on the overall cost of outsourcing. Broadly categorized, these contractual difficulties can be grouped into a number of areas, involving precontractual information asymmetries of vendor quality, inability to observe counterparty action, and opportunistic behavior enabled by the bilateral relationship in an environment of great uncertainty and biases against comprehensive risk analysis.

Even before signing a contract, clients have difficulties in selecting competent vendors. Rarely do clients have comprehensive information regarding vendor qualifications before procuring IT services. These information asymmetries make it possible for vendors to misrepresent their capabilities strategically, increasing the risk of contracting for services (Williamson, 1975). Vendors may claim to have technologies that they do not possess or promise to deliver services that are beyond their abilities. For example, software developers may promise that they have experienced project managers and developers on their staff, but actually assign junior personnel to a project (Geoffrey, 1998).

The inability to monitor perfectly poses another risk that should be mitigated when contracting for IT services. In some procured IT services, such as software development, vendor effort is critical to the project's success, even though it is difficult to observe directly. During software development the project manager must staff the project according to its needs, provide incentives for developers to work on the project, and provide programmers with the means to complete the project (McConnell, 1996). While all of these are important, they do not lend themselves easily to contractual specification or ongoing monitoring. These non-contractible actions thus increase the risk of project failure.

risk reduction, less the real costs of the risk reduction mechanisms employed. We thank David Croson for this insight.

A closely related problem unique to outsourcing of IT enabled services is the non-rivalry of information. Often, as part of the outsourcing agreement, the client gives the vendor, directly or indirectly, critical information that should be used only to service the client's needs. Difficulties arise from the ease of copying such information and the inability to monitor how the information is used. For example, a bank may procure data processing services from another bank, thus providing the outsourcer with vital information regarding customer profitability. Part of the arrangement should specify that these data may only be used to service these accounts. Enforcing this clause is very difficult, because rarely can the client monitor all possible missuses of the data.

The third category of contractual risks comes from the bilateral relationship that arises between parties after a contract is in place. After contracting for IT services, the client may find herself⁴ relying on the vendor with no recourse. CRSs were able to reprice their services opportunistically because airlines were locked in to these systems to reach customers. The next-best alternative for the airlines was dropping out of the CRS, which led a number of airlines into bankruptcy. Realizing that external change and limited foresight may lead to over-reliance on IT vendors, allowing opportunistic behavior must be weighed when contracting for services.

Contractual risks are all exacerbated by bounded rationality. An individual's inability to specify all possibilities for loss limits the identification of some risks. Our overconfidence and "success oriented" management style blinds us from taking appropriate risk mitigation actions. The fast pace of technological change and great strategic uncertainty, from IT enabled transformations in markets, lead to insufficient analysis of adverse scenarios. With inherent biases against comprehensive evaluation of possible risks, many relationships are initiated before they are optimally mitigated, increasing the expected cost of outsourcing IT services.

II.A. Determinants of IT Outsourcing Risks

Certain project traits may be influential in the expected cost of contractual risks. Four important dimensions that impact the contractual risk in IT outsourcing are monitoring, uncertainty, competitive importance, and organizational interconnectedness. The Digital Age has produced a greater ability to

⁴ Following the convention in the economics literature, the client is referred to in the feminine throughout this paper.

monitor behavior and results in bilateral agreements. Service contracts can now specify a multitude of easily measured activities that vendors provide (Shachtman, 1998), allowing greater outsourcing and stronger incentives for partners (Holmstrom and Milgrom, 1991). Malone, Yates and Benjamin (1987) argue that IT reduces product complexity, facilitating improved monitoring. Clemons, Reddi and Row (1993) explicitly factor the ability to monitor IT-enabled services in their argument that IT reduces coordination cost. Gurbaxani and Whang (1991) extend this analysis to evaluate the impact of IT on firm size. They claim that IT improves monitoring of both internal and external providers, with ambiguous outcomes on firm size.⁵

In those situations where there exists a large degree of uncertainty with respect to various factors of provided services and the external environment, clients face greater dangers in signing long-term agreements when vendor behavior cannot be perfectly monitored (Quinn and Hilmer, 1994). The ever-changing technology of the Internet age, and the vast changes in the competitive environment make uncertainty itself a virtual certainty for those pondering IT-enabled strategies. Uncertainty is the only constant in IT-based processes, making outsourcing inherently difficult, due to the expectation that current “facts” will not be relevant soon after any relationship begins (Earl, 1996; McFarlan and Nolan, 1995).

The final two variables are those that truly impact the viability of procuring IT-services. Contractual risks are greatest for those projects that are critical to a company's competitive advantage. These systems often provide the client with unique benefits that cannot be achieved without the contracted services (Clemons, 1991). This trait increases the client's reliance on any outsourcing vendor, therefor increasing the possibility of vendor hold-up (Klein, Crawford and Alchain, 1978). Another artifact of systems that score high on competitive importance is that their environment is often turbulent. Many companies implement systems in anticipation of exogenous changes, with little data on the nature of change. Bounded rationality (Simon, 1951, Simon 1979) often impedes comprehensive contracting in these situations (Milgrom and Roberts, 1992), resulting in contracts with misaligned incentives or significant changes in bargaining power, allowing the vendor to appropriate rents from the client (Williamson, 1975; Clemons, 1991; Clemons, 1995). A final difficulty in outsourcing

⁵ While IT improves monitoring for a given level of complexity, complexity is not exogenous and is but one decision variable in the outsourcing decision. IT facilitates both improved monitoring and greater complexity, so the net effect is ambiguous. In some instances, increased outsourcing of more complex projects may result in less monitoring.

projects of competitive importance rests with vendor access to confidential data and processes. Such systems often require an outside vendor to have access to proprietary data and workflow processes that provide her with a competitive advantage (Quinn and Hilmer, 1994). By outsourcing projects, the client may be exposed to poaching by IT vendors and consultants. They may use data and methods learned from the client to sell services to competitors, weakening the client’s competitive advantage (Clemons and Row, 1992).

The fourth important dimension that impacts the cost of outsourcing risks is the interconnectedness of the project within the company. IT projects that require an outside vendor to learn tacit procedures from various sources in the client organization may be quite difficult to implement. While internal IT providers may be generally familiar with the operations of a firm, data collection and learning specific procedures throughout the company by an outside vendor are costly and reduce the overall benefits from outsourcing (Saarinen and Vepsalainen, 1994). Furthermore, when the system affects multiple stakeholders within the firm, it becomes difficult to specify completely desired requirements and functionality in a manner useful for an outside contractor. For example, the desktop personal computer has hardware components, standard software, user-specific software and networking capabilities. If responsibility for the desktop is outsourced component-wise, maintenance responsibilities become vague, especially when difficulties emerge because of incompatible systems. The impact of these coordination difficulties may be quite severe if there are multiple standards in use throughout the company and users have autonomy in choosing applications (Earl, 1996).

These two dimensions provide us with the following framework for evaluating the costs of contractual risks:

Table 1: Critical Dimensions of IT Outsourcing Risk

		Competitive Importance	
		Low	High
Organizational Interconnectedness	High		Contractual risks critical must be weighed against outsourcing benefits.
	Low	Production costs critical, contractual risks of minor importance.	

IT projects that exhibit both low organizational interconnectedness and are not of competitive importance are prime candidates for outsourcing (Malone and Laubacher, 1998). These include standard software application or hardware maintenance. These activities are easily outsourced because vendor behavior does not widely impact internal constituents, so substandard service is not disruptive (Saarinen and Vepsalainen, 1994). Similarly, because the strategic importance of the service is minimal, service level is never a critical problem. In procuring these services, clients search for low cost providers with reasonable competencies. Efficient markets that match client with vendors, such as Internet-enabled markets, can be attractive for these projects (Snir, 2000; Snir and Hitt, 2000).

At the other extreme with high strategic value and high interconnectedness, frictional cost and contractual risk argue strongly against outsourcing. Examples of these IT services include computer systems for e-commerce companies, where substandard service may paralyze the company and strategic issues dictate the need for internal competence (Strassmann, 1997; Quinn and Hilmer, 1994; Prahalad and Hamal, 1990). For exactly these reasons, leading e-commerce companies, such as Yahoo, E*TRADE, Amazon.com, and eBay.com, have decided to maintain their critical IT skills in-house to reduce the risks involved with outsourcing.

For the intermediate cases, either dimension may dominate the risk analysis of outsourcing IT services, and the decision involves a tradeoff between the benefits provided by the market and the contractual costs (Coase, 1937, Gurbaxani and Whang, 1991). For those projects where competitive issues dominate, clients should assess the implications of being strategically dependent on a contractual partner against the gains these partners offer (Grover and Teng, 1993). For those who decide to outsource strategic systems, certain safeguards should be put in place. One important attribute is the ability to in-source those activities that are currently purchased, or at least have a viable second-source to mitigate possible *hold-up* by the vendor (Lacity and Hirschheim, 1993). Studies show that contract in domains where client dependency on the vendor is high, success is less likely (Grover, Cheon and Teng, 1996; Lee and Kim, 1999). The success of the drug distribution and inventory management system Economost, McKesson's electronic supply system for pharmaceuticals to participating pharmacies, was due in a large part to the fact that its rival Bergen Brunswig could transform a customer's site to its system overnight (Clemons and Kleindorfer, 1992; Clemons and

Row, 1988). The lack of dependency brought on by adopting Economost was an important advantage to the multitude of small drug stores that use its services.

ERP systems are a prime example of IT services that weigh heavily on organizational interconnectedness, even when they are not of strategic importance. The recent bankruptcy of the large drug distributor FoxMeyer exemplifies the difficulties of turning these systems over to highly reputable vendors. When the company chose Andersen Consulting to implement SAP AG software at a cost of nearly \$30 million, the system generated erroneous orders and led to massive distribution failures. The ensuing paralysis affected the entire company and is one of the main precursors of the company's bankruptcy (Geoffrey, 1998).

One branch of the IT outsourcing literature investigates the traits of outsourcing companies to determine whether there are patterns among those that choose to utilize outside expertise. If the main justification for outsourcing is the economies available in the market for certain IT services there should be no apparent pattern among these companies. The research indicates, however, that outsourcing companies are more likely to be witnessing an increase in long-term debt and declining growth, indicating that financially troubled firms are more likely to outsource key IT functions to improve their cash flow and reduce cost (Smith, Mitra and Narasimhan, 1999). This led Strassmann to claim that "outsourcing is for losers" (Strassmann, 1995). When the motivation for procurement is alleviating current financial difficulties instead of capitalizing on the market opportunities, companies may err in their choices of outsourced services and may sign contracts lacking sufficient safeguards.

III. Economics of Contracting

As with most economic choices, the outsourcing decision ultimately breaks down into a cost benefit tradeoff, although one that is quite complex. The important benefits companies achieve when outsourcing include economies of scale, scope and specialization. To achieve these benefits, they incur costs such as vendor search, negotiations, and legal fees to establish these relationships. However, more important, these costs are often dwarfed by contractual *risks* associated with inefficient contracts, due to differences in information between the parties (asymmetric information), inability to observe actions comprehensively; and the inherent incompleteness of IT contracts. These risks are often driven by the large uncertainty surrounding IT investments, parties' inherent risk

aversion and bounded rationality.⁶ Each of these costs and benefits is more fully defined and explored in the following sections.

The basic economic problem faced by the client is to choose a *governance structure* for the procurement of IT services (Coase, 1937; Alchian and Demsetz, 1972; Goldberg, 1976; Williamson, 1979; Hart and Moore, 1990; Clemons, Reddi and Row, 1993; Holmstrom and Milgrom, 1994). This usually involves a combination of contractual rights and responsibilities, ownership structure, incentive systems, and information collecting processes, all intended to maximize the benefits received by the client. These features are represented as an outsourcing contract, an arm's length relationship between two parties whose conditions are dictated by an enforceable contract. "Contracts" can take a variety of forms ranging from a spot market contract where the terms are preestablished and immediately satisfied after entering the agreement (for example, to buy or sell a share of stock on an organized exchange), to a long-term relational contract which simply agrees on a set of rules for future conduct without being explicit about everything each party is to do in every contingency (see Goldberg, 1976 for a discussion of administered contracts, and Williamson, 1975 or Hart, 1995 for a taxonomy of contracts). The critical limitation of contract structure, whatever the form, is that contract terms need to be enforceable. This requires a higher threshold than being *observable* by some party. Contractual terms must also pass the stronger condition that they are *verifiable* to an outside party such as a court.

There are a number of factors that influence the choice of governance structure. The ability to observe, monitor and verify activity of both parties places restrictions on how detailed and effective an explicit contract can be (Goldberg, 1976). If all actions that affect the value of a relationship are fully observable and verifiable, contracting is simply a matter of writing down a set of requirements and the payments contingent on completing them -- once the contract is determined the interests of the individual parties for their own gain do not matter. Whenever this cannot be done completely, incentive payments are necessary to align interests between the client and vendor. Much of the

⁶ Bounded rationality can be casually defined as "not knowing everything you need to know". It can arise because some information is simply not available (such as events that will transpire in the future) or because humans are limited in their information processing capability and thus cannot act on all the information they have at their disposal. For a discussion of bounded rationality and its economic implications, see Simon (1957).

economics of contracting reduces to the study of different incentive systems and how they perform under different conditions.

A second and important economic issue that arises in contracting is risk sharing. Different parties may have different preferences for risk (random variability in value) which can generate opportunities for gains from contracting. If both parties are “risk neutral”, meaning that they only care about expected return but not the variance of return, very strong incentive contracts can be used (Harris and Raviv, 1979). However, as parties become increasingly risk averse, the cost of very strong incentive contracts can be expensive because of the high risk premium required (see e.g. Milgrom and Roberts, 1990).

Lacity and Hirschheim (1993) have suggested the importance of contractual safeguards for IT outsourcing. Empirical validation of the need for tight contracts is shown by Saunders, Gebelt and Hu (1997) in their survey of 34 outsourcing agreements in the early 1990s. Their results indicate that clients that had loose arrangements with IT vendors viewed the relationship as a failure, while clients with tight contracts were much happier with the service they received.

A third issue is whether a relationship is repeated or is one-time only. Many of the difficulties associated with contracting for IT services stem from the view that these contracts are single-shot relationships, without long-term effects. When parties interact repeatedly, there is an opportunity to resolve potential contractual problems through reputation effects or information collection. For example, in repeated exchange firms will build reputations that will serve to encourage appropriate actions (Kreps, 1986; Croson, 1994). This repeated interaction also reduces parties' incentives to behave opportunistically because of the possibility of severe repercussions in future exchanges. Alternatively, repeated interaction may help one firm learn more about the other, which enables more efficient contracting. For instance, an arrangement may be divided into multiple stages where future profits provide incentives for improved short term performance or enable contracts that screen out poorly suited vendors (Snir and Hitt, 1999; Blanning, Kleindorfer and Sankar, 1982).

In the following sections we systematically analyze the benefits, costs and risks of outsourcing. These are organized by various economic perspectives that examine each area and identify possible solutions, both contractual and governance, to the problems of contracting for services.

IV. Benefits

Outside parties can offer lower cost and higher quality services when they aggregate demand from multiple customers (economies of scale), provide similar services to different industries (economies of scope), or specialize in one activity (economies of specialization). This section evaluates the importance of these attributes on contracting for IT services. By procuring services from an outside vendor, customers can reap these savings or increase the profitability of their current operations. With multiple vendors vying to service the customer's needs, she can often find superior service from the best available supplier.

IV.A. Economies of Scale

Scale economies arise when, for any reason, average costs decline as production increases. The most common form of an economy of scale occurs when efficient production involves a large fixed cost, such as a capital investment, which can then be amortized over a larger quantity of goods or services. For example, a bank that has invested in high-volume check processing equipment may find it advantageous to become a vendor of these services for other banks.

There are numerous other sources of economies of scale, including dividing fixed development efforts over a large transactions base, pooling demand from an uncorrelated set of clients, which reduces production quantity variability and increases capacity utilization, and having dedicated facilities and longer run lengths and thus fewer line changes and reduced down-time resulting from switch-overs. Information inherently enjoys economies of scale (Arrow, 1971; Shapiro and Varian 1998). Since information is not consumed by use, it can be viewed as a fixed asset with an infinite life span, or at least infinite economies of scale. Thus, utilizing expertise in multiple venues requires incurring only marginal costs and the original cost incurred with generating information often enjoys economies of scale (Gurbaxani and Whang, 1991; Wilson, 1975).

These simple economies of scale apply to information technology investments and outsourcing contracts. For many IT applications, there are minimum efficient scales of utilization. Recovering the cost of software development is only justified if it used frequently. Similarly, mainframe capacity utilization is important to justify expenditure cost. These economies of scale have a large role in understanding IT outsourcing. For example, excess capacity on mainframe systems or other large

servers has often been an issue in IT contracts. When UK's Inland Revenue contracted for IT services, it assured itself a portion of any profit that would be received from selling excess capacity on its systems (DiRomualdo and Gurbaxani, 1998). Similarly, an important reason why Computer Sciences Corporation purchased General Dynamics' data centers as part of an outsourcing agreement was that they could use the additional capacity to serve other clients (McFarlan and Seger, 1993). Large vendors also have the scale to negotiate better acquisition terms for software and hardware. By purchasing in larger quantities to serve simultaneous users, outsourcers can lower per unit costs. Finally, software developed for a specific application can often be applied at virtually no incremental cost to other clients. This is a primary reason why many large third-party vendors appear in markets where a service is principally delivered through software (Saarinen and Vepsalainen, 1994). Examples include payroll processing and insurance and bank account administration. Even in some cases where the software is not identical, the experience and learning accrued by the development team can substantially decrease the cost of production of similar systems. It is not uncommon for a large consulting firm to develop an application or design approach in one industry and sell it widely in other industries.

While often important, economies of scale have their limits. Lacity and Hirschheim (1993) claim that economies of scale are only verified for the cost of CPU time, and that also holds only for certain ranges (Baron, 1992). Moreover, many types of IT costs probably do not exhibit returns to scale. Vendors can rarely achieve significant cost reductions in the cost of hardware or software from scale negotiations.⁷ Most vendors do not wield sufficient bargaining power over manufacturers and developers to reduce these costs greatly. At one time it was believed that significant savings could be achieved in software licensing costs -- the vendor would own one license for all their clients, saving multiple licensing fees. However, this was quickly realized by software vendors and much of this value has been reappropriated by licensing software not by machine, but by "concurrent users" or "seats" (Varian, 2000). In addition, these economies generally only apply to large machines such as mainframes, which represent a decreasing proportion of total IT hardware. Similarly, it was also believed that vendors enjoyed lower personnel costs or preferential access to IT talent. The recent

⁷ Lacity and Hirschheim (1993) cite one senior executive as saying: "Can an outsourcing vendor buy a machine for less than Enron? Sure it can. I'll give you numbers that aren't exactly accurate, but a large IBM 3090 probably in the \$15-million-dollar list range. An outsourcing vendor could probably get it for

high rates of turnover in IT personnel have equilibrated individual compensation with individual productivity, eliminating substantial gains from vendors simply renting personnel to clients. However, there is still a potential efficiency for having critical mass in highly specialized skills or achieving other types of economies (scope and specialization) through staffing choices (Slaughter and Ang, 1996; Caldwell, 1997; Violino and Caldwell, 1998).

An extreme case of economy of scale occurs when network externalities affect companies' decisions. A network externality is a situation in which a product or service becomes more valuable to all users, as its adoption grows. For example, the telephone system is of little use if only one person has a telephone, whereas it has an enormous value if you can call virtually anyone. Products, services or systems that exhibit network externalities tend to converge toward standards (Shapiro and Varian, 1998). Once a standard has attained critical mass, companies may realize that adhering to the standard is critical for survival (Clemons and Kleindorfer, 1992). The practice of banks issuing individual automated teller machine (ATM) cards that were not compatible with other banks' ATMs was one of the factors for the slow adoption of the new technology in the early 1980s. To increase adoption, banks in the Mid-Atlantic area found it in their best interest to have a single ATM technology that allowed customers to use any banks' card at any ATM machine (Clemons, 1990) -- this was accomplished by outsourcing network transaction processing to a competing bank while assuring that the system owner could not behave opportunistically. As more banks joined the network, non-adopters became extremely disadvantaged. Customers preferred the benefits of a single regional network, and would change banks for this service. Non-adopters realized that joining the consortium was a strategic necessity because of the associated externalities. Another form of network externality arises when products have complements that are separately produced. Examples include world-wide web browsers and browser-specific content, SAP⁸ and SAP consulting services, computerized reservations services and travel agents, and operating systems and application software. As more users adopt the primary product, the market for secondary services grows, which in turn increases the value of the product. Generally, in these cases the primary product is supplied by a single or very small number of

\$11 million. Enron or First City could probably get it for \$11.5 or \$12 million. Now over a five-year period, this is not a whole lot of money being saved.”

⁸ SAP is the vendor of the SAP R/3 system, which is the most widely used “enterprise resource planning” application – is essentially a piece of software that attempts to automate all operations of a manufacturing or service firm on a single software platform.

vendors (making outsourcing a likely solution). In many cases, the secondary product is also outsourced due to its highly specialized nature.

Economies of scale, and especially those arising from network externalities, represent a compelling source of value for outsourcing, although the existence of such economies is not guaranteed and must be analyzed on an individual basis (Liebowitz and Margolis, 1994).

IV.B. Economies of Scope

When the total costs of producing several related goods or services together are lower than the sum of the costs of producing them separately, economies of scope are evident. Economies of scope arise in many of the same ways as economies of scale -- shared fixed cost production equipment or pooling of demand from different activities that use a common core of services. For example, the strengths of the old AT&T Bell System resulted in part because the costs of switching local and long distance services within a single firm were lower than for separate firms attempting to coordinate standards, technologies, and co-located physical facilities. Universities have long enjoyed advantages over alternative forms of single course instruction, at least before distance learning technologies become prevalent. Similar advantages are often attributed to Microsoft as the developer of operating systems and applications packages that run under them.

A common source of economies of scope occurs when core technologies have applications across multiple industries. Rapid technological change, combined with the experience effects of working in different settings, often combine to give vendors the advantage in providing "leading edge" technology services. Highly specialized vendors (such as US Web) have formed around current technologies such as world-wide web application development. Other historical examples are IBM and Digital Equipment, building extensive consulting businesses around their core hardware business, and Oracle sells consulting and applications software in addition to its main product, a database engine.

Empirical analysis regarding economies of scope as a motivation to outsource IT is limited. A notable exception is found in Nelson, Richmond and Seidmann (1996). They analyzed the sourcing decision for 186 systems projects in 5 large companies, between the years 1967-1993, trying to understand simultaneously the decision to outsource vs. develop software in house, and the use of

packaged versus custom software. Among their findings is the result that systems that implemented new technologies, such as fourth-generation programming languages, or that required minicomputers, or multiple-computer networks, were more likely to be outsourced than built in-house. This provides some support for the hypothesis that economies of scope exist for new technologies that can be easily used to support heterogeneous needs, and these are more readily available for vendors.

IV.C. Economies of Specialization

Economies of specialization arise when the cost of performing only one activity is lower than the cost of performing that activity as a small part of a portfolio of activities. By focusing on a single activity, hiring, management structure, and incentive systems can be more focused than in a generalist firm (Drucker, 1989; McFarlan and Nolan, 1995). When Pacific Bell Telephone decided to improve business capabilities and introduce new products, it realized its customer billing system was inflexible and IT personnel were not capable of replacing the old systems. To alleviate internal deficiencies, Pacific Bell preferred to outsource its upgrading process to a software company with expertise in the required technologies (DiRomualdo and Gurbaxani, 1998).

Specialized firms often have an increased incentive to build and maintain expertise in their core area than generalist firms. Delaware Valley Financial Services (Clemons, 1991), a service company focusing on annuity administration for large insurance companies, is able to maintain a substantial lead on their clients in adapting systems to changes in the regulatory environment. This is because they can afford to have dedicated personnel to stay abreast of regulatory changes affecting the annuities business.

Utilization of both vendor and client skills can also be important in applying industry knowledge to new IT-based offerings. By establishing a jointly owned, independent unit, companies can realize economies of specialization without losing control. One example is BSO-Origin, the IT joint venture between N.V. Phillips, the electronic company, and BSO Beheer a Dutch software company, to provide IT services to Philips and other customers. Philips outsourced its application development capabilities to the new company and both companies provided personnel. After consolidating its communications and data centers with the new company, the joint venture employed more than 10,000 people and had annual revenue of \$1.5 billion by 1996 (DiRomualdo and Gurbaxani, 1998).

Some of the important benefits of specialization involve the ability to break organizational norms by outsourcing certain activities. At one extreme is the use of outsourcing as a means of reducing labor costs, especially for low-skilled workers. Government agencies and other large organizations that provide employees with generous benefit packages have found that outsourcing activities that require low-skilled labor often provide them with significant cost savings. At the other extreme, companies may wish to outsource activities that cause internal difficulties. IT, as an internal irritant, often has tensions with users and management. Top management sees growing IT budgets often without measurable increases in revenue. Users perceive centralized units as unresponsive to their needs and unwilling to try new technologies. For these companies performance can improve by extracting the IT unit while requiring more accountability for expenditures (McFarlan and Nolan, 1995).

Leading edge technologies or highly specialized services often are available from only a handful of providers. Without justification of replicating capabilities in multiple companies, those that specialize in these areas can effectively service the needs of many customers. Focusing on specific technologies, and staying abreast of the latest changes, is key to these companies' continued success (Grover and Teng, 1993). One high-tech firm needed mission critical services that they could not develop in-house. By outsourcing the service, they gained access to the specialized knowledge without costly replication (McFarlan and Nolan, 1995).

Others become successful through the consistent management of a single service. ADP, which began as a small payroll processing company in 1949, has grown to \$3 billion annual revenue by specializing in large volume, standardized transaction processing (McFarlan and Nolan, 1995). By managing only one service, and providing it cost-effectively and consistently at high quality, the company has maintained its competitive position while providing services to a wide range of users. Customers who prefer to service these needs in-house find that the use of a third party allows them to reduce cost and focus on more important activities.

V. Costs

While market-based transactions offer the potential for lowering cost or improving profitability, there are also costs associated with procuring services. The costs of outsourcing are composed of both the explicit cost of carrying out the transaction as well as hidden costs due to coordination difficulties and contractual risks. The explicit costs of contracting for services involve searching for a suitable

vendor, negotiating a fair price, writing the contract, monitoring performance, and enforcing the contract (Coase, 1937). Other costs include coordinating among the different organizations, bridging cultural gaps among participants, and risks inherent in contractual relations. Those weighing outsourcing as a means to realize benefits should weigh these against the costs of contracting for services.

Coordination with outside vendors is another facet of the relationship that should be evaluated as part of the outsourcing decision. Managing the ongoing relationships with multiple suppliers is important for the contract's success. The CIO, now in charge of administering contracts, may find his role quite different (Cole-Gomolski, 1998). Instead of heading an internal group his responsibilities now involve coordinating internal users with external providers, who may not comprehend all aspects of the business (Violino and Caldwell, 1998). If many providers are used simultaneously, internal staff must coordinate all of them, defining technological and procedural standards across organizations (Cross, 1995). The arm's length relationship between client and vendor also requires maintaining internal competence in those areas that are of strategic importance (Quinn and Hilmer, 1994). By procuring new systems, the organization may not be current with new technologies and may lose its technical edge (*The Economist*, Aug. 31, 1991; Grover and Teng, 1993). When deciding to outsource, companies should pay special attention to the need for coordinating vendors while maintaining sufficient internal skills to stay abreast of technological advances (Earl, 1996). When USAA, the large insurance company, began the first implementation of its \$10 million image processing integration project, it placed great importance on understanding new technologies and having internal expertise in the area (Sviokla and Elam, 1992).

Cultural differences may be another point of contention between internal users and IT providers. As the IT function transforms from a service center into a profit center, each organization has different goals (Lacity and Hirschheim, 1993) and may develop a different culture. Outsourcing vendors specialize in providing IT services for their clients, intending to profit from their services. Users are focussed on their profitability and rely on the IT unit for dependable service. Furthermore, IT vendors may install new platforms, change personnel, or serve the client from a different location (Earl, 1996). All these require users to undertake the cumbersome process of learning new procedures and systems, while developing a common language among different groups. Cultural differences coupled with different objectives of users and providers, could lead to strife between the groups.

Contractual risks pose another, probably the largest, transaction cost in procuring IT services. This section builds on the vast economics literature on contractual risks to understand their importance in the context of IT outsourcing and to evaluate possible remedies. Contractual risks stem from hidden action taken by both the client and the vendor after the contract is signed and information asymmetries between the parties before the engagement commences. When writing a contract, the client must be assured that she has chosen a competent vendor and has provided sufficient incentives for the vendor to further the client's objectives. By understanding the risks associated with procurement, better contract and optimal governance structures can be suggested (Williamson, 1979). These risks can be broadly categorized into those that relate to precontractual information asymmetries, limiting the client's ability to distinguish vendor quality, the inability to monitor counterparty action, and opportunistic behavior that is enabled by the bilateral relationship.

V.A. Hidden Information

Difficulties in contracting begin even before the parties sign the contract. Before the relationship begins, one or both parties may have *private information* concerning costs or productivity. While this may lead to small concerns about costs or productivity, private information may, in the long run, lead to concerns about a party's ability to deliver, that is, to concerns about whether the contract can succeed at all. With the difficulties in assessing competencies before contracting, clients rely on vendors to reveal their abilities honestly. This provides vendors with strong incentives to misrepresent their abilities to win lucrative contracts (Williamson, 1975). Moreover, asymmetric information limits the effective use of incentives to motivate desired actions. When a vendor's ability to serve has great impact on a project's outcome, it is important to provide incentives to assure that only qualified vendors agree to the contract. If, however, the client is unaware of the importance of vendor quality, or is unaware of the distribution of quality of different vendors, she may propose an inefficient contract. A number of examples of asymmetric information illustrate the implications this has for IT outsourcing.

Private Information Examples

- The client may have a better sense of his current costs of operation, which could provide a sound basis for pricing the contract. He may share this information if the vendor's bid is too high, but may withhold this information if the vendor's bid is too low. Sharing of information may be useful if the negotiations continue through multiple rounds, but any shared information must be credible if it is to influence the terms of the contract.
- The client may have a better sense than the vendor of the difficulty of a proposed software development effort, possibly through initial pilot projects or even previous implementation attempts. Vendors attempt to assess these factors, but in many cases rely on average costs of previous projects for pricing. The client may withhold the true difficulty of a project if the vendor's error is in his favor. Once again, sharing of information may be useful if the negotiations continue through multiple rounds, but any shared information must be credible if it is to influence the terms of the contract.
- The vendor may misrepresent the quality of his software applications development team, the availability of key personnel or the intended staffing plan for a project, leading the client to over-estimate the quality of the systems that will be delivered and to under-estimate the cost of maintenance and enhancements.

V.B. Market Failure

Information asymmetries can be so severe that markets for certain goods can completely disappear or only low quality goods are available for purchase. Akerlof (1970) first described this problem of "adverse selection" in the used car market. In the classic example there is a distribution of car qualities, some of high quality and some "lemons". Each owner knows the true quality of his car, but has no credible means of assuring prospective buyers of the quality, i.e., there is no credible *signal* for high quality cars. All sellers claim their cars are high quality, so rational buyers cannot discern quality, and are willing to pay based on average car quality. Prospective buyers offer to buy cars, but are only willing to pay up to the value of an average quality car. Owners of high quality cars view this price as too low, and withdraw their cars from the market. The result is that only lemons are sold. The important outcome of this problem is that informational asymmetries inhibit buyers and

sellers of high quality cars to exchange. Only those who are willing to exchange low quality will find suitable markets for their wares.

The problems of adverse selection have been especially difficult in the insurance industry. Insurance attempts to spread the risks from uncorrelated events across an entire population (e.g., auto insurance). When individuals have critical private information regarding the probability of an event happening to them, only high-risk customers opt to buy insurance, and the risk is not spread across the population. For example, private maternity insurance (separate from health insurance) was once offered, but proved to be unprofitable. Families have private information regarding their family planning and opt to purchase such insurance only when they plan to have children. Since families that do not plan to have children do not purchase insurance, the cost can only be spread over those families that plan to do so. The outcome of such selection into the insurance pool is that the cost to each insured family must be the expected cost, and this is prohibitive for prospective families (Milgrom and Roberts, 1994).

Examples of Market Failure

- Similar phenomena may exist in markets for IS services. When the quality of software developers is difficult to ascertain in a market facilitated exchange, efficient developers, be they individuals or companies, cannot credibly signal their relative values. Since other developers can easily mimic almost any quality claim made by a potential developer, the free market for high quality developers may dissipate. Clients who are not willing to settle for low quality vendors have to develop effective screening mechanisms to identify developers' true values. One option is to vertically integrate with the vendor, and verify vendor quality through repeated exchanges. While this may solve the difficulty of ascertaining quality, it again eliminates the open market for these services. Other options include improved vendor monitoring and performance based pay, but each of these has its own set of conditions, as described earlier.
- Online markets for IT services have been able to circumvent the difficulties of adverse selection by providing service clients with comprehensive information regarding vendors. In many of these markets, vendors post information about their competencies and details of previous work and buyers choose to contract for services. It appears that for sufficiently standardized IT services these online markets are surprisingly liquid (Snir and Hitt, 2000). Inspection of trades

consummated on these sites indicates that clients are happy to procure services, even from vendors across the globe (Boston Globe, July 10, 2000).

V.C. Hidden Action

Many types of contractual problems arise when one party to a contract, often the vendor but sometimes the client, can take actions that influence the value of the contract but are not observable to the other party. A vendor can choose to assign his best staff to a project or use his most inexperienced teams -- without a thorough background check on every person placed on a project at every point in time. This is difficult to detect, but may manifest itself in decreased reliability, excessive cost or project delays (Rothfeder, 1988; Geoffrey, 1998). Given that IT projects have a number of inherent uncertainties, it would be difficult to pinpoint these difficulties when they arise on the particular action of the vendor. The formal apparatus for analyzing this type of situation arises in the solution of the so-called principal agent problem. In situations where both vendor and client have the opportunity to take hidden actions, they are referred to as the “double moral hazard” problem.

V.D. Principal Agent

One of the most extensively researched contracting topics in the economic literature is the problem of a principal (for example, a firm owner or manager) who wishes to employ an agent (for example, an employee or a contractor) whose actions cannot be fully observed and verified (see Hart and Holmstrom, 1987, or Holmstrom and Tirole, 1989, for a review of the literature). Contracting difficulties arise when the principal's and the agent's interests diverge. Generally, the principal is interested in the agent exerting some form of effort or incurring some type of expense that is personally costly to the agent. The agent, while interested in earning whatever fee or payment is due for providing the requested service to the principal, is also interested in minimizing these private costs. If the principal cannot explicitly verify that the agent has exerted the effort, the agent may have the opportunity to provide less effort than desirable and still claim full payment (this is commonly referred to as “shirking”). A "moral hazard" arises because parties' incentives are mis-aligned and the agent prefers to shirk rather than undertake the effort that the principal believes she is paying for. For

parties in an outsourcing relationship, shirking behavior can be very costly. These costs arise because less than optimal effort is employed, which reduces the benefits of the service enjoyed by the principal, and because the principal now needs to make additional costly investments in monitoring or supervision that would not have been necessary if shirking were not a problem.

Opportunities for shirking include substitution of lower quality goods (cod) for better and more expensive items that were specified in contract (plaice), requiring testing laboratories moving furniture in a group, or any group activity where individual effort and contribution is difficult to measure (Alchian and Demsetz, 1972) and allocation of personnel to joint research consortia where the output is owned jointly but the opportunity cost of assigning personnel to the project is borne by their primary organizations. Of most relevance to this study is shirking in outsourcing, where the level of effort and the quality of service are difficult to observe.

The economic literature identifies the need for incentive contracts based on a project's outcome to align the parties' interests. The underlying assumptions of these models are that outcomes are perfectly verifiable by all parties and thus payment can be contingent on outcome. Inherent uncertainty in the project and the environment leads to the outcome being an imperfect measure of the agent's effort, while higher outcome is indicative of greater effort - it can also be a result of luck. A common additional assumption is that the agent is risk-averse, while the principal is risk-neutral, although this is not essential and the same results apply with slight modification.⁹ It is in the principal's interest to maximize profits subject to the agent's Individual Rationality (IR) constraint and his Incentive Compatibility (IC) constraint. The first constraint assures the agent's participation, because his expected utility from accepting the contract is at least as high as his next-best alternative. The second constraint assures that the agent prefers to perform the action requested by the principal rather than some other action (Milgrom and Roberts, 1992).

Formal modeling of the principal-agent problem indicates that incentive contracts often lead to inefficiencies, and at times there may not be a reasonable contract that aligns the parties' incentives. However, in many cases an incentive contract can improve performance over an absence of

⁹ If the vendor is risk-neutral, then the efficient solution is to sell the entire business to him, and relieve the client of the burden of sharing risk.

incentives, provided the problem has some reasonable properties.¹⁰ A typical outcome of formal modeling is a contract that pays the agent a fixed fee plus an incentive component that is linear in a collection of measured outcomes (Harris and Raviv, 1979; Berhold, 1971; Holmstrom and Milgrom, 1987; Hart and Holmstrom, 1987). The incentive component of the contract compensates the agent not only for the effort he exerts in the client's interests, but also pays him a premium for undertaking risk. Stronger incentives mean that the agent's and principal's interest are better aligned. However, these same incentives also make the agent responsible for variation in measured outcome which may only partially be due to actions of the agent -- as such, the agent will demand higher levels of average pay to compensate for this variability. There is a classic tradeoff between risk and incentives. At one extreme, if the agent is insensitive to risk, it makes sense to have him bear all of the risk on outcomes that their actions affect. At the other extreme, it may not be possible to reach an agreement if the agent is very risk averse or uncertainty is very high because the required payments to the agent to warrant sufficient effort and risk bearing are too high and eliminate the value of the project.

The classic analysis of the principal-agent model has two assumptions that may not be applicable in some IT outsourcing relationships. First, it is assumed that the vendor (agent) is more risk-averse than the client (principal), and it is inefficient for the vendor to bear all the risk. Oftentimes, however, vendor risk aversion is not a problem, because of their diversified portfolio of projects. In these instances it is efficient for the vendor to bear all the risk. This is reflected in the actual practice of selling a firm's IT infrastructure to a vendor, who then bears all the responsibility and payoff of his management (McFarlan and Nolan, 1995).

A second concern pertains to the allocation of bargaining power before contracting. The classic assumption is that the client has all the bargaining power and makes a "take it or leave it" offer to the vendor. In IT contracting this may not always hold. The vendor may be providing unique services that

¹⁰ Grossman and Hart (1983) identify regularity conditions that assure a solution to the problem using the "first-order" approach. This method states that the agent's IC constraint can be reduced to the first-order condition for agent utility maximization. When such conditions do not exist, the principal-agent problem may not have a solution. Even in cases where these regularity conditions exist, the solution may not be well-behaved. For example, the optimal solution may require that agent compensation not be monotonic in effort, i.e., for some effort level the agent receives less if he works harder. To eliminate this difficulty, the distribution of outcomes must adhere to the monotonic likelihood ratio that assures that the relative likelihood of a high outcome as opposed to a low outcome is higher when greater effort is exerted. For analysis of the standard principal-agent problem, see Ross (1973); Stiglitz (1974); Mirrlees (1976); Holmstrom (1979); Jewett (1988); and Shavell (1979). Text-book analyses can be found in Kreps (1990) and Milgrom and Roberts (1992).

allow him to decide which clients to service. The general implication from different bargaining structures is that the client's payment for services will be higher, as her bargaining power deteriorates. Coupled with the proposed incentive structure, this reduces the attractiveness of outsourcing. Future research should evaluate the impact different bargaining power has on actual IT outsourcing agreements.

Outsourcing contracts are fraught with potential for deliberate under-performance by client, vendor, or both. Several common examples of moral hazard are discussed below to exemplify the potential costs of ineffective contracting.

Examples of Vendor Moral Hazard:

- Grover, Cheon and Teng (1996) find that quality of service is still a big concern among clients of IT services and that successful contracts are those with high levels of service. Their results indicate that vendors are not placing sufficient effort in servicing their outsourcing agreements.
- Software development contracts can specify the number of modules to be completed and their functional requirements. They can specify mean time to failure. But it is more difficult to specify software quality, in terms of ease of user acceptance, natural feel of the user interface, or ease of extension of the interface to new applications. Mean time to failure is less interesting than expected financial loss due to software error. Even these measures do not capture quality of documentation and clarity of code structure, which will profoundly alter the cost of maintenance and enhancements.
- Ongoing cost reduction is one overriding concern in outsourcing agreements. With annual reductions in hardware cost on the order of 10%, it is important for the client that the vendor has access to new, lower cost technologies, and lowers the client's cost of obtaining services. Outsourcers will reduce the cost of providing services as long as they profit from the cost reduction. Outsourcing contracts must align these opposing interests. If, for example, the contract is based on vendor cost plus a mark-up, vendors have no incentive to lower the operating cost. Conversely, in a fixed-price contract, the vendor has every incentive to lower the operating cost, but the client does not see the savings. The contractual terms should provide sufficient incentives to the vendor from lowering costs by including savings-sharing mechanisms.

- One common arrangement is splitting cost savings equally among participants. Croson (1996) argues that if vendors are reimbursed for only half the realized cost savings, they will not privately undertake some cost-reduction activities. The reasoning behind this is that there exist efficient investments where the cost savings is less than half the investment. Alternatively, savings should be divided *after* compensating the vendor for cost-reduction investment (Croson, 1996).
- Rewarding behavior is best suited when it is possible to observe and measure the desired results. Call center retention specialists are paid to deal with customers who call to cancel their credit cards, and to keep those that are profitable for the issuer. The most frequent reason for customers' canceling their cards is to take advantage of a lower rate offered by a competing card company. For each customer there is a break-even rate; below this APR, the customer would be unprofitable for the issuer. Retention specialists who are rewarded solely on the basis of customer calls serviced could maximize the number of calls taken and thus maximize their personal gains simply by telling all customers to destroy their cards and cancel their accounts. Retention specialists who are rewarded on the basis of profitable customers retained could quickly offer each customer his break-even APR. Properly designed contracts, however, would have the retention specialists rewarded on the basis of the expected annuity value of each account retained; that is, rewards could be based not only on success at retaining customers, but also on how high an APR each customer retains and thus on far above the break-even APR each retained customer.¹¹

Examples of Client Moral Hazard:

The buyer of services will inevitably have shifted at least some of the risks to the service provider. When the actions of the buyer are not fully observable by the service provider, this frequently alters the buyer's behavior in ways that may appear at least morally questionable, even if not strictly illegal (Alchian and Demsetz, 1972).

- An outsourcing client with a tight contract that specifies strict performance measures and stiff penalties for non-performance may then reduce her effort in assuring that the vendor can render the desired services by lowering staffing costs or appointing inexperienced account managers.

¹¹ Clearly, outsourcing retention specialist requires providing call center contractors with a high degree of extremely sensitive information on customer profitability. This may be interesting to competitors and thus may be unsafe to share with outside firms. For this reason, it may be uncommon to share this information, even though it does enable the design of contracts that provide the desired incentives.

- A driver of a rental car may drive through forbidden territories or over low quality roads; the damage to the car cannot be observed until long after its return, and the risks are borne by the rental car company and not the renter.
- A driver of a rental car may drive with less care if he has purchased full collision insurance, since, once again, the risks are borne by the rental car company. Conversely, if he has declined full insurance, he may drive more carefully, or select his parking location more carefully, since he himself is bearing the risks.
- The buyer of web hosting services may contract for certain uptime on her e-commerce site. She may fail to notify the Application Service Provider (ASP) of advertising campaigns and other promotions that would cause demand for bandwidth to increase, although this would enable the vendor to scale up services. Because of the risk to her own services, she should inform the hosting provider in advance of activities that would increase demand, so that the provider can scale accordingly. In contrast, she may fail to inform the ISP of actions that would cause demand for their services to decrease, such as site renovations or canceling promotions, since she views the service provider as a free option, with no cost if she chooses not to exercise the option. These actions are costless to the buyer of hosting services, but impose real bandwidth costs on the service provider.
- A client of outsourcing services may undertake hidden investments even before the contract is signed. Many outsourcing agreements are based on an initial benchmarking period where actual cost is measured, and the vendor is given a bonus for cost reduction. Croson (1996) argues that clients excessively invest in cost reduction before contract initiation in order to limit vendor bonuses from cost de-escalation clauses.

V.E. Multi-task Principal Agent

The classic principal agent problem involves contracting for a single type of outcome. However, most types of real-world contracts have multiple desirable outcomes -- for example, low cost and high quality -- which need to be simultaneously achieved in a contract (McFarlan and Nolan, 1995). This has been recently formalized by Holmstrom and Milgrom (1991, 1994), who have expanded the single-action principal-agent model to a more complex analysis of multiple actions by the agent that

provide the principal with benefits. A classic example of multi-dimensional moral hazards is manufacturers' interest that a worker increase productivity but also invest in machine maintenance. Providing incentives for easily measured outcomes, such as increased output, encourages the agent rationally to allocated his efforts to maximize compensation from the activities that are rewarded, rather than to the activities that create value for the principal, such as maintenance. Conversely, by not providing any incentives to the agent, the agent may take appropriate care while increasing output. Similarly, IT outsourcing contracts that are motivated by exploring new business initiatives should not reward vendors for cost minimization (DiRomualdo and Gurbaxani, 1998).

Identifying the optimal incentive scheme hinges on the agent's tradeoffs between the different actions and the correlation between outcomes. When actions are substitutes whereby investment in one action comes at the expense of another, providing incentives for easily measured outputs induces agents to maximize that output, reducing their investment in other activities. Complementary actions, however, where the marginal cost of one action decreases with investment in another action can be encouraged simultaneously by providing incentives solely for observed outcomes. For example, investments in software quality may also reduce software development costs from reduced rework, testing and debugging (Harter, Krishnan and Slaughter, 2000) -- in this case it is optimal to provide strong incentives for both quality and cost. Similarly, when outcomes are correlated both types of actions can be inferred, albeit imperfectly, from the realization of a single outcome. Thus, if quality and cost are correlated and quality is difficult to measure, cost-based incentives suffice, because low cost is indicative of high quality.

Examples of Multi-task Vendor Moral Hazard:

In situations where vendors have multiple actions, some of which are rewarded, vendors will learn to respond to surrogate measures that maximize their own expected benefits rather than those of the client:

- The behavior of software developers on fixed price contracts is very different from contracts based on time and materials. The preferred contract depends on the client's interests. If the developer's service is based on standard procedures, such as building an e-commerce site a fixed-price contract provides sufficient incentives. In other situations where services are not well defined, such as developing an Internet strategy, payment based on time and material may provide

adequate incentives to learn the client's idiosyncratic difficulties before proposing solutions. This, however, does not provide incentives to minimize the cost of providing service.

- Clients are interested in software that is developed on time, on budget and is easy to maintain. Often it is possible to improve on time and budget factors at the expense of maintainability. Moreover, software vendors will deliver systems that maximize the degree to which the client will be dependent upon them for future maintenance efforts. With maintenance cost comprising 70% of the total life cycle cost, special attention should be placed on future cost. In software development contracts, clients should provide incentives both for timely completion of the system, as well as for low maintenance cost throughout the project life cycle.

V.F. Double-sided Moral Hazard

Mutually unobservable behavior may lead to inter-firm problems associated with imperfect commitment. This frequently manifests itself through the problem of "double-sided moral hazard" of mutual shirking (Alchian and Demsetz, 1972). For example, a manufacturing company developing an entirely new product line may attempt to protect itself by shifting some of the sunk development costs, and hence some of the risks, to its suppliers of components. Critical suppliers may be asked to pay for the initial development of their components, and thus may be asked to absorb all the risks associated with development. To provide incentives, they may be assured of sole sourcing relationships for the product life-cycle if the new product line succeeds. However, if the product line fails, the suppliers will lose their full investment in development. If the supplier fears that the manufacturer may under-invest in marketing, sales, distribution, final assembly, or quality assurance, then the supplier will rationally attempt to limit his own risk by under-investing in the development of his components for the new product. If the manufacturer fears that the suppliers will under-invest, he, too, may under-invest until he sees what has been developed. If both parties shirk, fearing shirking by the other, then the product line will probably fail. Both parties will feel that events have justified their caution, even though, paradoxically, it is this mutual caution and inability to coordinate actions in a way that would have been mutually beneficial that led to the failure of the venture.

The economic literature has recently realized the importance of double-sided moral hazard in the contexts of franchising and warranties. In franchising relationships (see Bhattacharyya and Lafontaine,

1995; Lafontaine, 1992; Lutz, 1995; and Mathewson and Winter, 1994), the franchisor's investments include original product quality, national advertising and increasing brand recognition, while the franchisee's investments are needed to assure that product quality is maintained by proper hiring and training and competent managerial practices. In the area of warranties (Cooper and Ross, 1985; Emons, 1988; Mann and Wissink, 1988; Demski and Sappington 1991; Dybvig and Lutz, 1993; and Romano, 1994), manufacturers invest in original product quality, while consumers must take appropriate care in using the product to assure longevity. In both these instances, it is obvious that risk sharing reduces the incentives to shirk.

When contracting parties are risk-neutral, it can be shown that an optimal incentive contract is one where the agent's incentives are linear in output.¹² Thus, the agent's compensation should be a fixed fee, plus some reward that is linearly dependant on output. In theory, the reward structure should be closely linked to the agent's ability to affect the project's outcome. As the agent's relative importance increases, so should the degree of his incentives, and, in the extreme when the principal's actions have no impact on outcome, the agent should become the residual claimant, bearing all risks (Harris and Raviv, 1979).

Bhattacharyya and Lafontaine (1995) extend this result and show that the efficiency loss from non-optimal incentive schemes is quite small. While it may be optimal to set different incentives for different franchises, based on local factors that drive profit, in practice they find that incentives are constant among franchises. The importance of their finding for IT outsourcing relationships should be obvious. While it is important for the contract to stipulate some form of risk sharing that is related to each party's hidden actions, any reasonable incentive scheme can substantially reduce these risks from shirking.

Mutually Unobservable Behavior:

A number of examples in outsourcing relationships emphasize the difficulties associated with mutually unobserved behavior:

- Mutual shirking in a manufacturing setting may occur when the new product developer relies upon a software outsourcing vendor to provide the systems needed to integrate the various component

¹² Kim and Wang (1998) show that linear incentive schemes are not optimal when at least one of the parties is risk-averse.

vendors along the supply chain. The software vendor, like the component suppliers, may be asked to front the development costs in exchange for a share of the profits (royalties) over the lifetime of the product line. While this may create incentives to perform well as long as the venture appears to be succeeding, it may create incentives for the software vendor to shirk if he fears that the manufacturer will do so, and for the manufacturer to shirk if she fears that the software vendor will do so.

- Mutual shirking can occur in the provision of services. The developer of an innovative financial service may be responsible for advertising, for obtaining regulatory approval, for product design and systems development, and for final pricing decisions, while a contract telemarketing firm may be responsible for distribution and for investment in training and systems to enable that distribution. If the primary service provider doubts that the telemarketing firm has invested to handle his peak capacity, he may price to maximize profits under more limited service capacity. If the telemarketing firm doubts that the primary service provider will be ready, or that he will price to maximize profits under assumptions of adequate telemarketing capacity, he may under-invest in development, training, or staffing.
- Shirking can also occur in anticipation of opportunism, once again leading to imperfect commitment by both parties. A service provider who is dependent upon a third party for distribution may anticipate that his telemarketing supplier will raise prices after he has invested in system development, marketing, and advertising. As a consequence, the service provider may limit his risks by under-investing, or by canceling the venture entirely. This suggests that some activities may be tightly coupled and indeed co-specialized, and that the provision of co-specialized assets may require contractual management (Williamson, 1975; Klein, Crawford and Alchian, 1978; Hart, 1995).
- Joint ventures are one possible solution to the double moral hazard problem. Through joint ownership both parties have incentives to make private investments in the project through their share in the resulting profit stream (Calwell, 1998). Partnership relationships have also been found to be more successful in practice (Saunders, Gebelt and Hu, 1997) because they reduce tensions found in arm's-length contractual relationships.

- For those companies pursuing commercial exploitation of existing technologies or capabilities, a joint venture may be an optimal governance structure. When N.V. Phillips, the Dutch electronics manufacturer, wanted to create a new line of business based on its IT competencies, it formed a joint venture with a local software company, BSO Beheer. Phillips provided its applications development group to the new company, while the software company was to take charge of selling new IT services externally. After initial struggles, the new company was able to consolidate with Phillip's internal communications and data management division, allowing it to reach annual revenue of \$1.5 billion, with over 10,000 employees (DiRomualdo and Gurbaxani, 1998).

V.G. Poaching

Unique difficulties arise when the performance of a contract involves the development or transfer of specialized intellectual property or information between the contracting parties. Clemons and Row (1992) argue that *Poaching* occurs when contracting parties use valuable information gained as part of a relationship without authorization, possibly to the detriment of the party contributing the information, or sell the information to competitors. Opportunities for poaching arise any time it is necessary to grant a partner or participant in a relationship access to sensitive data or to provide specialized training to the partner to enable him effective operation (Quinn and Hilmer, 1994). Once information or expertise and training is transferred, it is impossible to reclaim it (Arrow, 1971, Shapiro and Varian, 1998). For example, if a service provider is given access to information that would enable easy targeting of the provider's best and most profitable customers, there is a risk that the service provider may misuse this information to pitch services directly to these accounts, in competition with its client. There is also a risk that the service provider may sell this information to one of its client's competitors or use this information to sell its own services to one of its client's competitors (Demski, Lewis, Yao and Yildirim, 1999).¹³ Any time a partner in a relationship is given specialized training, there is some danger that the service provider may itself begin to compete directly with the firm that provided its specialized training. While it may be possible to place limits on how this information can be used in direct competition with its original owner, it is difficult to

¹³ The competitive value of such information is demonstrated by Clemons, Croson, and Weber (1996).

anticipate all possible uses that would be competitively damaging, and it is difficult to detect and prevent even some uses that may be anticipated.

The economic implications of poaching are quite different from the moral hazard issues discussed previously. While incentives may reduce an agent's shirking, solving the poaching problem requires limiting the available options for misuse of information, or assessing penalties for misuse. The critical difficulty is often unambiguously verifying misuse. In those areas where intellectual property rights are very strong and easily enforceable, poaching may be resolved through the legal system. However, in many cases customer information or expertise is not considered a firm's legal property, and such information is at risk whenever disclosed to another party. Most traditional economic mechanisms for dealing with contractual problems are ineffective in dealing with poaching and can even be counter-productive (Clemons and Hitt, 2000). The contractual mechanisms that reduce poaching have not been sufficiently studied, and the economic literature has yet to realize the difficulties associated with the property rights of information transferred as part of contractual performance.

While, in theory, the economic loss to an outsourcer from poaching is easily identified, the social efficiency of poaching is not unambiguous. At times it may be socially efficient for a contracting partner to use information entrusted to him, at the expense of his partner (Clemons and Hitt, 2000). If the outsourcer has the ability to increase the overall profitability of this information either through complementarities with other inputs he owns or by the sale of the information to another party that may substantially increase its value, the overall benefits may outweigh the losses to the original owner of the information. In this case, it may be possible to provide incentives that compensate the original owner sufficiently as part of a contract. In other instances, poaching leads to a net economic loss, because the value gained from misuse does not outweigh the losses incurred by the original "owner" of the information or expertise. If, however, the value of this information is lost through competition, compensation may not be possible.

Contractual arrangements that dissuade poaching are difficult to implement and enforce because of weak intellectual property rights and the inability to conclude definitively that stolen information was at the heart of a competitor's success. In some instances, however, there are noisy signals that private know-how was abused (Anton and Yao, 1994; 1995). For example, if a client's web site developer implements software very similar to the client's site, it may be because the developer

misused the client's know-how, or it may have realized independently that this was a good solution. Since the client and courts cannot distinguish between these possibilities, the client cannot sue the developer for misusing his intellectual property. Contractual remedies, however, can resolve this type of problem. In the original contract, the client can specify that the developer will pay a fine if he implements a similar solution for another customer. The client will probably pay a premium for this restriction on the vendor's future actions, but it provides assurance against misuse of property rights.

Demski, Lewis, Yao and Yildirim (1999) argue that firm structure and internal compensation schemes are important attributes that limit employees' abilities to misuse information. In many information intermediaries employees have private incentives to abuse confidential information to lower their cost of serving other clients. To limit this behavior, firms can limit their clientele to reduce conflict of interest, provide strong incentives and harsh penalties for abusing confidential information, and place barriers on the internal information flows. These internal structures and mechanisms are needed to signal a firm's sincerity regarding safeguarding information.

Poaching Examples

There clearly exist examples when strategic sourcing agreements, or strategic partnerships more generally, have enabled one party to have access to information that was critically important to the success of the other. If this information is then misused in ways that were unintended, and that were not precluded by enforceable contract terms, considerable damage may result. Some of these examples include:

- A vendor of trading services for securities firms or stock exchanges may implement a system for one organization, then implement a similar system for a competitor, including in the new system critical trading enhancements developed by or for the first.
- A computer manufacturer may outsource much of its manufacturing to an off-shore firm, only to discover that its off-shore supplier has learned its technology well enough to compete with it effectively, perhaps indeed driving it from the market (Quinn and Hilmer, 1994).
- A contract service division of a financial services firm may provide telemarketing services for a competitor. This may enable it to identify the competitor's most profitable accounts and to gain vital information about the preferences of these accounts. This, in turn, would enable it to market

its own services directly to these accounts, an unauthorized use of the client's data that harms the client by competing with it.

- A travel agency or other service provider could begin to operate overseas with an international partner, until it learned enough about the local market conditions and developed a sufficient client base to compete directly with its former partner.

It would appear that these problems should never have occurred. Contracts should always be sufficiently detailed about what uses of information are permitted and what are prohibited, to preclude this sort of misuse by either party. However, it was difficult for either party to the travel agency partnership to anticipate that they might eventually compete. The London Stock Exchange did not anticipate that changes in its trading environments — especially regulatory change associated with the European Monetary Union — would create so many potential competitors on the continent. Cuisinart did not anticipate that its supplier — Robotcoupe — would become a competitor.

Unfortunately, information products are easy to poach - it is difficult to be forced to forget what you have learned. It is hard to restrict poaching because it is difficult to anticipate all the ways in which the environment may change, creating opportunities to use information for personal gain in ways that were not anticipated, or that cannot be directly observed. At times the only solution to potential poaching is not to divulge information. The threat of future misuse of information or expertise should be weighed against the benefits of an outsourcing relationship.

V.H. Opportunistic Renegotiation

Often in outsourcing relationships parties become reliant on their contractual partners for key components or competencies. When a client receives goods or services from a vendor for a lower price than it would pay commercially for that service, it becomes reliant on the vendor. Vendor reliance can be brought about when a vendor makes a relationship-specific investment to reduce cost for a supplier. Such reliance can lead to appropriable quasi-rent¹⁴ (Klein, Crawford and Alchain, 1978) that one party may attempt to renegotiate through not upholding its contractual obligations.

¹⁴ A rent is an economic term for a value earned above the competitive price for a product or service. A “quasi-rent” is a rent that arises because of a specific set of circumstances. For example, owning a large portion of the mines that produce a particular type of coal earns a firm rent; owning a single coal mine

Opportunistic renegotiation becomes possible when either party comes to enjoy an unanticipated increase in bargaining power. The party with power can exploit the strategic vulnerability of the other; for example, the client can decide to pay less, or the vendor can demand more. Such repricing occurs because the increase in strategic vulnerability, being unanticipated, is not adequately protected by terms of the contract, allowing the stronger party to make plausible threats if the new payment structure is not accepted. Plausible threats are driven by the parties' *next best* alternatives (Klein, Crawford and Alchain, 1978). When payment for a service is much lower than is commercially available, the vendor can threaten to charge up to the market price for the service. If the vendor's service is not available in the market, the vendor can charge the client up to the client's surplus from the project. Similarly, a vendor can be required to lower the price he charges by threatening to change suppliers.

Opportunistic renegotiation (opportunistic repricing) may occur whenever one party to a relationship has a high degree of *strategic vulnerability* relative to the other. That is, if the parties' levels of commitment are not equal, the party with weaker commitment (alternatively, less at risk) can act with a higher degree of freedom (Saarinen and Vepsalainen, 1994). For example, if the client is committed to a course of action and needs the vendor for support, and the client's vulnerability is much higher than the vendor's if the relationship is terminated, then the vendor is free to reprice while the client has only limited recourse. This justifies the empirical finding that reliance on a vendor and contract length are negatively correlated with successful outsourcing (Lee and Kim, 1999).

There are examples where the client's entire line of business, and the profits that it generates, are dependent upon one critical supplier or vendor. If, upon termination, the vendor loses only the value of the contract, while the client loses the full value of the line of business, it is reasonable to expect that the vendor could demand substantially higher prices. In the absence of a complete and enforceable contract, the client would have few options that were more attractive than paying the new fees. Vertical integration or long-term contracts can mitigate the possibility of opportunistic behavior.¹⁵ For firms that are inherently dependent on their partners, and expect to be strategically

located next to a coal-fired power plant earns a firm quasi-rent, even when other coal (with higher transport costs) could be bought on the open market.

¹⁵ An interesting example in this context is the attempt by GM and EDS to maintain independence for EDS after GM purchased the IT vendor. Within three years after GM bought EDS for \$2.55 billion and issued separate class E stock for EDS stockholders, GM decided to buy out EDS executives after disputes regarding pricing of EDS services to GM (Business Week, Sep. 18, 1989).

vulnerable, integration with a partner or long-term contracting can minimize opportunistic behavior for the duration of the contract¹⁶ (Williamson, 1979).

The situations where opportunistic renegotiation is prevalent are situations of small numbers bargaining. Whenever there are few suppliers of a particular service, suppliers will enjoy substantial power and pricing leverage. However, in market economies, these are generally clear and not likely to be unanticipated. More important economic problems arise when firms, through their actions, unwittingly create small numbers bargaining situations. Even when the *ex-ante* universe of suppliers is quite large, often after initiating a relationship, parties have few alternatives but to continue with the relationship. Some common examples of these situations are described in the literature on transactions cost economics (see Tirole, 1988, for a detailed discussion):

- **Switching costs** arise whenever it is more costly to use a new supplier than an existing one. The larger the cost of locating and commencing a relationship with a new supplier, the larger the opportunity for existing suppliers to appropriate rents, as discussed in the following.
- **Relationship-specific investment (asset specificity)** sunk investments, which are more valuable as part of relationship than if they were used in another relationship or sold on the open market, also create small numbers bargaining situations. A common example is *site specificity*. A co-located physical plant is difficult to move; if there is only one convenient customer, the customer whose location the plant is built to serve, it may be difficult and expensive to serve alternative markets. This gives the customer unintended bargaining power. Although the builder of the plant may have anticipated significant savings, perhaps as a result of reduced shipping costs and reduced need for inventory within a lengthy supply chain, the customer can arbitrarily reprice and command most of the savings for himself. If the customer offers any price higher than the plant operator's next best price available through serving more distant markets, the plant operator may have no better alternative than to accept. A similar problem arises if a supplier builds *dedicated assets*, machinery or operating processes that are unique to a particular customer or are on a scale that would not be useful to other potential buyers.
- **The problem of learning, training, and relationship-specific human capital:** If the client has significant investment in learning to work with the vendor's systems, or if locating and training to

¹⁶ Williamson (1979) provides an interesting mapping of governance mechanisms that mitigate opportunism,

work with an alternative supplier would be time-consuming and expensive, the client may experience switching costs that limit his bargaining power.

Joskow (1987) comprehensively evaluates the influence of relationship-specific investments in the coal industry on contract duration and contract quantity. In the coal industry relationship-specific investments are likely to manifest themselves in three important variables: (1) proximity of the coal mine to the power plant, especially mine-mouth plants; (2) quantity of contracted coal¹⁷; and (3) geographic location of the coal mine¹⁸. The study's results find strong support for the hypothesis that relationship-specific investments impact contract duration. As the physical proximity of a power plant to its contracted coal mine or other variables of mutual-reliance increases, contract duration increases. Thus, we find that mitigation of contractual risks that stem from relationship-specific investments is common, at least in the coal industry. While we hypothesize that similar behavior is probable in the IT area, we still lack empirical support for such assessments.

Clemons and Kleindorfer (1992) formalize these concepts in their analysis of investments in an inter-organizational information system (IOS). In the development of CRSs or ATM networks, a single supplier provides the IT infrastructure to several participating buyers. The relationship specific investments made by the supplier and the individual buyers depend on their expected payoff from the IOS. When the system provides some advantage to participants, they enter into a relationship characterized by small-numbers bargaining. After the IOS is in place, participants will have to bargain over the surplus derived from their aggregate investment. When benefits from the IOS are enhanced by network externalities, we can expect the supplier to wield greater bargaining power and receive large transfers from other participants. On the other hand, when competing supplier-networks exist, buyers find that changing suppliers is inexpensive, thus reducing supplier power. A prime example of the latter occurs with ATM networks, where suppliers do not achieve supernormal profits (Clemons, 1990).

especially in the context of mutually dependent parties.

¹⁷ Since larger quantities are harder to sell or purchase on the spot market if a contract is breached, contracts for larger quantities increase parties' mutual reliance.

¹⁸ The variability in coal quality and mining technology and transportation change across geographical regions with Eastern US mines allowing for greater buyer flexibility than other regions.

Opportunistic Renegotiation in IT Outsourcing

- If the client is dependent upon the IT supplier for critical services, and it is difficult or impossible to arrange an alternative supplier, then the client faces a small numbers bargaining situation (Saarinen and Vepsalainen, 1994). He may be forced to pay a significant premium to preserve his business if the vendor threatens to withhold service. This could occur for if no other systems vendor were able to maintain software written by a vendor who delivered poorly structured and incompletely documented code.
- After a bank has undertaken the marketing and systems development investments for a new product launch, they may be totally dependent upon their systems vendor until they are able to locate an alternative vendor, and complete training and systems development to enable the new vendor to provide the essential service; this, once again, gives the service provider considerable ability to reprice.
- Clearly, while investments based on information technology are less sunk than are investments in traditional physical plants (as examined by Clemons, Reddi, and Row, 1993), they may still create the possibility of opportunistic renegotiation. A major travel agency may make a multi-million dollar investment in serving a major corporate client, and may expect to retain the benefits that accrue from cost savings. The client may note that this investment has limited use outside the relationship and that it is a sunk cost. Just as with co-located dedicated physical assets, the client may be able to demand most of the savings by explicitly appealing to the limited attractiveness of the vendor's next-best use.
- If either party has made a sunk and relationship specific investment, it may have counted upon setting high enough prices to enable recovery of this investment. The practice of making large one-time investments in servicing a customer appears to be commonplace in IT outsourcing. Often this takes the form of procuring the client's current infrastructure or learning about the customer's specific needs (McFarlan and Nolan, 1995). As such, these contracts place considerable risks on vendors, if customers have the possibility to lower future compensation.

Paradoxically, the very magnitude of the client's sunk investment in his own business, the limited usefulness of these sunk investments in other businesses, and the large exit barriers that make it

undesirable for the client to terminate his business, all combine to give significant power to the vendor if alternative vendors cannot readily be found.

- In most IT outsourcing agreements, vendor compensation is based on a baseline of services that are included in the original agreement, and additional payments for additional services. Poor measurement in the baseline period and rapid changes in client needs may lead to steep charges. Often clients have eliminated their internal IT capabilities and have little recourse other than to accept the vendor's request for additional compensation. Saunders, Gebelt and Hu (1997) document a case of one company that exceeded the contractual baseline by more than 20% within 6 months of initiating an agreement.
- These outsourcing contracts often have "change of character" clauses that require the customer to pay for services not included in the original agreement (Lacity and Hirschheim, 1993). Because of the lengthy duration of many outsourcing agreements new technologies are often implemented during the original term.¹⁹ When new technologies are implemented, vendors can claim that this involves a change of character from the original terms, and charge excessively for the new services.
- When CRS vendors began to impose high fees on airlines, airlines had few options other than to pay these fees or to fail and declare bankruptcy. This gave the CRS vendors enormous power; the airlines' next best use for their partially filled aircraft appeared far worse for most than simply paying the new CRS fees. This problem was created for the airlines largely because of bounded rationality and the limited ability to foresee the possibility for opportunism that success of the CRS distribution system would create.
- After outsourcing all operations and facilities management, a financial services firm may find that it cannot rapidly reclaim the operation of data processing facilities after outsourcing, with the associated "badge flipping" of employees to the vendor, the closing of dedicated data centers, and the dispersion of critical personnel to other locations within the vendor's organization. This can lead to the imposition of substantially higher fees in the later period of the contract, or after

¹⁹ This is especially true when these new technologies are intended to reduce overall cost of services in the agreement. Here the magnitude of savings may be underestimated by the vendor to improve the contract's profitability.

contract renegotiation, since the client has few options other than to pay the fees or cease operations until the effects of the outsourcing decision can be reversed.

- After outsourcing software development and maintenance for strategic value-adding applications, key applications development personnel will have left the firm. New applications may be incompletely documented and perhaps poorly structured. These factors make it extremely difficult to reverse the effects of outsourcing and to reclaim applications development or maintenance of existing applications, and thus suggest that the client will have little bargaining power when the terms of maintenance contracts need to be renegotiated in the future.
- In the process of software development there are often budget and time overruns. Some of these are caused by initial system misspecification, while others are the outcome of vendors' overselling their skills or not exerting sufficient effort. When cost overruns do appear, clients have little recourse but to complete the project with the original vendor and continue to pay for development beyond the original project scope. Vendors may even make significant profit on these late and expensive projects because of their ability to hold up the client (Geoffrey, 1998).

V.I. Bounded Rationality

The contractual difficulties associated with "hidden actions" and the motivation for incomplete contracts are further exacerbated by individuals' cognitive limitations. While contracting parties attempt to be rational and evaluate all possible outcomes, and the probability of each outcome occurring, cognitive limitations restrict the ability to evaluate all possible scenarios and decision making becomes "boundedly rational", taking into consideration only those outcomes that are foreseeable (Simon, 1951, Simon 1979). Insufficient monitoring or naïve contracting, such as missing incentives, may not be the result of cognitive limitations, but may be due to the high cost of identifying proper incentives and monitoring behavior (Williamson, 1975). Both difficulties, cognitive limitations and prohibitive contracting or monitoring costs, result in sub-optimal contracting that are often based on standards and norms (Cyert and March, 1963) rather than analysis of the issues on hand and parties' mutual benefits.

It is difficult to anticipate all possible environmental changes; that is, not only may it be impossible to assign probabilities to all possible future events, it may be impossible even to list those

that may influence the long-term behavior of parties to the contract (Williamson, 1975). Thus, it is difficult to anticipate actions that the firm itself may wish to take in response to these environmental changes. Moreover, it is difficult to anticipate the actions that the outsourcing partner may wish to take in response to these changes, perhaps to the detriment of the firm. Since it is difficult to anticipate how contracting partners may wish to act, it is difficult to anticipate what to observe and to anticipate what explicit restrictions should be placed upon their future behavior.

Therefore, bounded rationality implies limited ability to design an appropriate contract, based on the limited ability to foresee the actions of the firm and the actions of its contracting counter-parties (Williamson, 1975). Since not all eventualities can be anticipated, it is not possible to design a contract that covers all eventualities and specifies all future behavior of both parties. Hidden actions include not only an inherent inability to monitor all actions, but also those actions that could be monitored and are simply not foreseen.

Strategic uncertainty is probably the strongest force behind bounded rationality and an inability to design appropriate contracts (Clemons, 1991). A highly turbulent and rapidly changing environment exacerbates all of the problems addressed above. For example, most of the truly costly examples of opportunistic renegotiation deal with events that were enabled by unforeseen environmental changes (Williamson, 1975). The most common of these, changes in regulation of air travel, financial markets, telecommunications, and power generation, were unforeseen but not unforeseeable (Clemons, 1995). Strategic planning tools exist for dealing with strategic uncertainty (e.g., de Geus, 1988; Schwartz, 1991; Schoemaker, 1995; Clemons, 1995), but often these are not fully utilized. All too often contracts deal with the foreseeable and easily describable. Even when environmental uncertainty is expected, for example for technological developments, it is difficult to specify how the technology will change, and provisions for technological change are not contracted. Similarly, risk-management procedures, although well-known, are often weakly implemented because of lack of managerial attention.

Examples on the impact of Bounded Rationality

- It is difficult to anticipate all possible environmental changes, including those caused by the outsourcing arrangement itself. For example, the advent of travel agent CRS fundamentally altered the distribution channel for air travel, leading to increased market share for corporate travel and increased power for the CRS vendors. These effects were accelerated by deregulation of air

travel, increasing the complexity of fare structures and increasing corporate reliance upon travel agents. This unforeseen change in power enabled the opportunism of CRS vendors when renegotiating the terms of CRS service for airlines (Clemons and Row, 1991).

- Cognitive limitations are heightened when outsourcing is chosen as a means of staying competitive in a fast changing technological environment (Quinn and Hilmer, 1994). Companies that outsource key technological components to suppliers who hold cutting-edge technologies may find their foresight limited, exactly for the reasons they chose to outsource - technological developments may change the competitive environment in ways that are completely unforeseen. These contracts, while allowing a competitive advantage are also those that are coincidentally the most prone to contracting difficulties. Outsourcing processes that become critical for success are likely to lead to opportunism. Not realizing the implications from excessive reliance increases the risk from outsourcing.
- As mainframes' quality-adjusted cost decreases approximately 10% a year, firms that outsource hardware should be aware of the possibilities of significant savings. Contracts that do not account for these inherent price reductions are "giving away" money to their vendors (Lacity and Hirschheim, 1993).
- One advantage of outsourcing IT services is employees' promotion opportunities (Drucker, 1989). Companies that chose to outsource often fail to realize that these promotions are often in servicing other customers. The end result is that qualified personnel are assigned to sales or other accounts, while only junior staff remains servicing the original firm.

VI. Discussion

When weighing the costs and benefits of outsourcing, including possible risks, companies can choose from various market-based structures, contractual mechanisms and governance structures to reduce the risk associated with reliance on external providers. Market solutions are viable for reducing differences in endowed information and hidden action when these differences are limited to a single dimension or when intermediaries exist to disseminate credible information regarding counterparty behavior. Auctions allow procurement of IT services from a low cost provider by inducing vendors to disclose their privately known cost structures. When cost is the only important factor, the

an auction allows a buyer to procure services at competitive prices. On the other hand, reputations can provide market-based incentives to reduce contractual risks. The knowledge that future business in other relationships depends on performance in the current contract limits vendors' gains from misbehavior.

For some outsourcing risks, contractual mechanisms suffice to align both parties' incentives. When the client relies on the vendor to take costly, unobservable actions, profit sharing may be suitable. By giving the vendor a part in the output he produces the vendor has some incentive to make these unobservable investments. These types of profit sharing solutions are also applicable when vendors have private information regarding their own abilities, and the client is interested in contracting with the most efficient vendor. IT allows better monitoring of vendor performance, improving clients' abilities to compensate for the multi-dimensional performance they value. When designing incentive contracts, however, care is warranted to assure that all aspects of effort are duly encouraged. If the client is interested in both low cost and high quality, and one comes at the expense of the other, it is critical to find mechanisms that induce behavior on both of these dimensions.

Governance structures can range from vertical integration through ownership to spot market transactions (Williamson, 1979). Ownership is primarily suited for instances where the risks from outsourcing are high. For example, companies that constantly innovate to stay ahead of the competition should realize that outsourcing the IT function may lead to opportunistic renegotiation by vendors, which could cripple the company. Similarly, when the information itself is the basis for a company's competitive advantage, the threat of poaching could warrant vertical integration. At the other extreme, arm's length relationships are suitable for those parts of the IT spectrum that can be commoditized. Shrink-wrapped software has long been purchased off the shelf because of the scale economies in software development and the limited threat of opportunism. Data processing may be another prime candidate for procurement, when it is easy to change service providers and safeguards are in place to prevent poaching. The intermediate solutions of joint ventures and separated ownership of critical assets are appropriate to provide incentives for private investments by different parties.

IT outsourcing has seen innovative solutions to the risks posed by contractual relationships. The remainder of this section explores some solutions that are important to IT outsourcing. Competitive bidding is one solution for identifying low cost vendors. Implementing auctions for IT outsourcing requires attention to cost drivers, especially those that are correlated across providers. Vendor

reputation has long been gauged as an important attribute in vendor selection. While reputation is important in economic interaction, the informational requirements for success are quite stringent. Screening vendors by offering contracts that attract only high quality providers is one possibility for mitigating information asymmetry before contracting. Improved monitoring, enabled by IT, increases the viability of incentives. Repeated contracting is another mechanism that can alleviate the difficulties of outsourcing. By contracting with the same vendor over multiple projects clients can learn the vendor's competencies and award him for high performance with future contracts. Diffuse ownership is another mechanism that provides incentives. Since owners receive the private returns to their investments, even if these are unobservable, ownership can induce optimal action. Finally, contracting with multiple vendors for similar services can provide each supplier with sufficient incentives to make private investments, while limiting the possibility of opportunism.

VI.A. Auctions

At times, hidden information is limited to a single dimension, such as vendors' costs for maintaining IT facilities, or prospective clients' values for a unique application. In procurement of highly standardized products or services, with easily verifiable quality, it is efficient to auction procurement to the lowest bidder. Auctions are particularly effective when the quality of the final service is easily observable, as occurs with labor-intensive IT services such as payroll processing. In these instances, the client can identify the desired service, define verifiable and enforceable metrics to measure the service, and compensate the vendor based on his bid (Snir, 2000; Snir and Hitt, 2000).

The use of auction-like mechanisms for product and service procurement has been well studied in the economics and management literature. Auctions enable price discovery deeming them a desirable way to facilitate trade, especially for those goods and services without a standard market price (McAfee and McMillan, 1987a; Milgrom, 1989; Klemperer, 1999). Proper auction design enables sellers to minimize cost for standard products (Chaudhury, Nam, and Rao, 1995), encourage optimal investment in multistage procurement processes where a product must be designed before production (Rob 1986), and provide performance incentives to participants to maximize gains from trade (McAfee and McMillan, 1986; Laffont and Tirole, 1987; 1993).

A key goal in designing an auction is that vendors'²⁰ true cost of providing a service be revealed by their bid. The Revelation Principle (Myerson, 1982) allows us to limit ourselves to direct mechanisms that assure revelation. There may be indirect mechanisms where vendors do not reveal their true cost, but the client can infer the cost by the proposed bid. The Revelation Principle guarantees that any such mechanism has a corresponding direct mechanism where vendors bid their true cost. Identifying direct mechanisms simplifies the problem of constructing a mechanism that provides reliable cost information.

Truthful revelation is not easily assured in auctions. For example, the most popular type of auction, where the lowest bidder wins the contract, induces vendors to bid above their cost. Under a first-price auction all vendors can expect zero profit by bidding their true cost. Losing vendors are not awarded the contract and earn nothing, while the winning vendor's expected profit is also zero. By bidding above cost, the winning vendor's profit increases while other vendors still lose the contract. Thus, in a first-price auction bidding above cost is a dominant strategy.

One mechanism that provides truthful revelation of vendor cost is a second-price or Vickrey (1961) auction. This mechanism awards the contract to the vendor with the lowest bid, but compensation is based on the second-lowest bid. Since the winner's payment does not depend on his bid, truthfulness is in his best interest. All other bidders do not receive the contract, so they have no incentive to lie about their cost, either. An additional benefit of the second-price auction is that all bids are known *ex-post*. Where a service may be auctioned more than once, the client may prefer to know the distribution of costs to calibrate future expected expenditure better.

Other mechanisms used in selling items (rather than procuring services) include the English auction where the auctioneer raises the price until only one bidder remains, and the Dutch auction where the auctioneer lowers the price until someone bids for the good. Not all auctions provide incentives for truthful revelation and optimal auction design should take into account the different parties' interests (Bulow and Roberts, 1989). For a discussion of auction mechanisms, see also McAfee and McMillan (1987a), Milgrom (1989) and Klemperer (1999).

Applying these concepts to IT outsourcing for easily verified projects such as standardized information processing (e.g., payroll processing) or hardware maintenance, Chaudry, Nam and Rao

²⁰ This analysis is described in terms of private vendor information regarding cost of delivering a service, but

(1995) proposed a mixed integer program for awarding bidders a contract. They identify a scenario where 3 prospective bidders can provide IT solutions to a company. Vendor cost distribution is idiosyncratic and privately known, with the incumbent having a known cost advantage. The client is interested in truthful revelation of vendor cost, and so proposes a bidding mechanism that provides the winning bidder an incentive for a low bid. By paying the lowest bidder no less than his bid, and often more than he bid, the client can construct a mechanism that induces self-revelation. To identify this mechanism, the authors define a mixed integer program, with the client's objective of cost-minimization, subject to the vendors' participation (IR) and revelation (IC) constraints, and an integer constraint on awarding the contract. An important result in their analysis is that preferential treatment of new vendors (other than the incumbent) provides the incumbent with an incentive to reveal his true cost. Thus, when two vendors' bids are identical, the client should award the contract to a new vendor.

VI.B. Winner's Curse

The inefficiencies associated with first-price auctions are exacerbated when there is uncertainty regarding the true cost of a project. Often vendors have very similar cost structures and differences in bids are a result of different estimates of the cost of servicing a client. When vendors have identical cost structures and uncertainty regarding the actual cost of completion, the winner will be the vendor who underestimates the cost the most. This leads to the perverse result that the winner is assured to lose money from the contract, because his estimates for cost of completion were farthest from the true cost. This phenomenon, called winner's curse, makes first-price auctions sure losers for the winning vendor (Thaler, 1992; Milgrom, 1989).

In IT outsourcing these difficulties can come about in contracts with few cost advantages, such as standard hardware maintenance or provision of temporary staffing of IS professionals. In either case, the cost of providing the service is almost identical to all competing vendors, and the winner is likely to be the vendor who is most optimistic about his ability to reduce cost. At some point after winning the contract the vendor realizes that his costs are higher than his bid, and he will search for ways to earn some profit for his service.

has immediate parallels for other private vendor information and private client information.

While the results of Winner's Curse appear to be to the client's advantage, in the long run they destroy any potential benefit from the outsourcing relationship. When the vendor realizes that the contract is losing money, he can attempt to regain profitability by renegotiating the contract terms or shirking on his initial commitments. Even if these actions contradict explicit contract terms, the vendor prefers early termination of the contract, at the lowest possible cost. The client eventually loses from the original miscalculation either because she chooses to pay more than required by the contract or because of the early termination by the vendor.

VI.C. Reputation

With the great difficulties discussed previously of assessing vendor competence and assuring sufficient effort by outsourcing partners, clients often turn to alternative factors to choose a vendor. Two important factors that impact vendor choice are the vendor's reputation and "deep pockets". The former is used to assure that the client receives quality service, while the latter is an assurance that the vendor has the ability to correct any deficiencies should the service be inadequate, or compensate the client accordingly. While choosing vendors who have the financial ability to compensate for inferior service is intuitively appealing, there is the same difficulty of other incentive based contracts, namely outcomes must be observable and verifiable by third parties (usually courts). When output is difficult to measure, as often occurs in IT contracts, resorting to legal venues to gain restitution for inferior service may be infeasible.

The importance of reputation is more difficult to ascertain. As an asset that commands a premium in the marketplace, and one that is intangible and easily destroyed, companies have a real interest in maintaining their reputations. Kreps (1986) develops the importance of reputations in the market for bilateral exchange between asymmetric parties, where one party (in our case, the vendor) has some ability to dictate terms and exert effort (see also Charmichael, 1989 for a discussion of the importance of reputation in the labor market). Using a simple prisoner's dilemma problem in extensive form, where the vendor decides behavior after the client decides to trust the vendor, Kreps shows that under certain circumstances reputation can enhance efficiency in the market for vendor services. In a single exchange between parties, vendors have an incentive to renege on the client's trust. Knowing that the vendor will not uphold the trust bestowed upon him, the client decides not to trust the vendor. In an

economy with infinitely repeated exchanges between the parties, one equilibrium is for the vendor never to abuse the client's trust, for if he abuses this trust, the client will never trust the vendor again (a "grim trigger" strategy). Thus, with repeated exchanges between the parties, the client can trust the vendor in every period and the vendor will uphold this trust.²¹

Kreps (1986) realizes that the requirement that exchange be repeated between the same parties is overly restrictive, and he extends the analysis to the problem where the vendor is long-lived and provides services for various clients. When clients can observe the vendor's behavior in past exchanges, with different clients, reputation can again be an important tool in assuring vendor behavior. Since future engagements depend on upholding current trust, the vendor will always find it in his best interest to act in the client's best interest. In the context of IT outsourcing, these results indicate that when outcomes from bilateral exchanges are known to prospective customers, vendor reputation can be key in assuring appropriate behavior.

The requirement that other customers have perfect information regarding current exchanges can also be relaxed, with some loss of efficiency (Kreps, 1986). If observed outcomes are (imperfectly) correlated with vendor action, then Nash equilibria will often require punishing vendors for unsatisfactory outcomes. Clients without the ability to discern whether disappointing outcomes are caused by vendor misbehavior or by exogenous circumstances, will occasionally punish vendors even when they are upholding trust. Furthermore, clients do not have to observe the outcomes of previous arrangements, but may be able to observe certain behavior that corresponds to better outcomes. For example, vendors who use improved software development practices and score highly on the Software Engineering Institute's Capability Maturity Model (Harter, Krishnan and Slaughter, 2000) can be expected to provide better software services. A reputation for using advanced managerial tools in outsourcing relationships should increase a vendor's value in the market for these services.

When new outsourcers enter the market they are often interested in establishing their reputations. Often they provide superior service to initial customers to gain credibility in the marketplace. This allows large customers to utilize the new vendors' expertise, knowing that it, has important implications for the vendor's future success (McFarlan and Nolan, 1995).

²¹ See Kreps (1986) for the precise requirements for this equilibrium to hold, and the stability of other equilibria. If there is only one vendor in the economy, the vendor may choose a different equilibrium

It is important to note that there are some caveats for using reputation as a means of reducing vendor moral hazard. First and foremost, the vendor must be interested in maintaining his good reputation in the relevant industry. When the short-term payoff from providing low-quality service exceeds the value of maintaining an untarnished reputation, firms will opt to profit from shirking. Many “fly by night” firms exist, and some of these have the specific intent of profiting from low-quality service until the market realizes their (in)ability. Similarly, in services with an uncertain future, where vendors may not be offering these services again, the value of reputation is negligible and should not be used by the client to assure vendor behavior.

In those instances where vendors have a real desire to maintain their reputations, the market must develop a mechanism for recording vendor behavior (Croson, 1994). The IT industry has been very weak in building rating mechanisms for vendor services. Currently word of mouth and limited publication in the popular press are the only means of following vendors’ reputations. Lacity and Hirschheim (1993) argue that few companies publicly air their IT failures, and information regarding failed outsourced projects is not readily available. Without consistent and credible information concerning the fate of all, or a large majority, of outsourced projects, vendor reputation cannot be used effectively to reduce agency problems.

Experience rating does exist in other industries, often for information regarding consumers. The auto insurance industry uses driving records as a means of screening applicants and deciding on fees (Boyer and Dionne, 1989). To assure the credibility of the rating system, insurers base their decisions only on verifiable information that emphasizes the individual driver’s history. Similarly, credit card companies use consumers’ credit histories when deciding on granting credit and the terms of credit provided (Clemons and Thatcher, 1998). Similar experience rating in the market for IT vendors should greatly improve the value of reputation in vendor screening.

An important trait of common rating mechanisms is that they are based on verifiable information. In the current market for IT services, information regarding vendor competence and behavior is based on clients’ impressions of rendered services, and clients’ interests in making this information public. Clients may have strategic reasons for misrepresenting vendor behavior. In those instances when vendors attempt to offer their services to competitors, clients may desire to provide inaccurate

where he abuses trust occasionally. However, with competition among vendors, we can expect vendors never to abuse trust.

information regarding ability. If a certain vendor is deemed highly valuable, his client may prefer to tarnish the vendor's reputation to increase her own competitive position. For similar reasons poor behavior may also not receive sufficient publicity.

A final caveat in the use of reputation to enforce appropriate behavior is the limited ability to discern causality in failed outsourced projects. With a failure rate as high as 50% for software projects, faulting vendors for all failures is unreasonable. Without the ability to hold vendors accountable for project failure, even in the court of public opinion, the value of reputation is extremely limited. When the impact of vendor effort on success is uncertain, real efficiency losses would occur if the market places a high value on reputation (Kreps, 1986). Prospective clients would either severely punish any signal of vendor misbehavior or, more rationally, discount information from previous engagements because of the inability to evaluate causality of previous success and failures.

VI.D. Screening and Signaling

Often clients would like to have mechanisms to differentiate between high and low quality vendors. Identifying the vendor's private information about the quality of his output may be impossible to infer from available information, but other mechanisms may reveal information. Requiring a vendor to perform certain steps may provide insight into his privately known abilities (often referred to as "quality type"). The basic reasoning behind effective *screens* is that misrepresentation by a low quality vendor would be sufficiently costly so that he would not attempt to claim that he is of high quality. The use of Request For Proposal (RFP) when soliciting bids is an attempt to screen vendors. The vendor entails some cost by answering an RFP, and that cost is worthwhile only if the vendor believes he has a chance to win the contract. For very low-quality vendors, the cost of preparing an answer to an RFP is higher than their expected profit from the contract, and they opt out of the competition. Similarly a high quality vendor can offer to permit a client to test his product extensively, knowing that the product will pass all tests.

Similar to the use of incentives to reduce moral hazard, incentive-based contracts can be used to screen vendors. Offering potential vendors compensation that is strongly related to outcomes induces bidding by competent vendors. Other vendors with limited abilities and low probabilities of achieving high outcomes realize that their investment will not be compensated and opt not to bid (McAfee and

McMillan, 1987b; Laffont and Tirole, 1987; 1993). While these mechanisms are theoretically sound, their application to IT outsourcing is difficult because of non-verifiable outputs for many contracts.

A complementary literature has emphasized *signaling* models, where vendors make costly investments to reveal their quality type. Spence (1974) first discussed this idea in his evaluation of education as a signal of worker ability. In his model high-quality employees find investing in education less costly than low-quality employees. Knowing that it is relatively cheap for better employees to gain an education, employers offer these employees wages that induce their studying, while the low-quality opt not to study, given the expected wage.

In practice, one screening mechanism of vendor quality that is overused is aggregate reputation. Clients often believe that choosing a reputable vendor assures them of his quality. While reputation is an important factor for identifying quality, it is not without flaws. The difficulty of identifying causality of project failure and the large percentage of failed software applications does not, and should not, cause irreversible damage to a vendor's reputation. However, for reputation to be a viable screen, it is necessary that low quality vendors not be able to maintain their reputations. In an environment where causality is uncertain and vendors can easily shift responsibility for failed projects, reputation cannot be an effective screen of vendor quality (Croson, 1994).²²

IT contracting has seen very little progress in developing effective screening mechanisms for outsourcing arrangements. The idiosyncratic nature of outsourcing arrangements and the inherent difficulties of measuring output have limited the usefulness of screening mechanisms. This area deserves more research into patterns that can be used to screen potential vendors and that provide meaningful evidence of vendor private information. A notable exception is the use of pilot projects to identify vendor quality. The use of pilot projects can allow vendor screening when the outcome of the first-stage is highly correlated with the expected project outcome (Snir and Hitt, 1999).

VI.E. Improved Monitoring

While most mechanisms to reduce shirking require implicit incentives by the client, IT allows clients to expand the set of direct incentives by monitoring more vendor behaviors (Clemons and Row,

²² See the discussion below regarding the difficulty of using reputation to eliminate the moral hazard problem.

1992; Clemons, Reddi and Row, 1993). The automated nature of the service provided and the extremely low cost of gathering vast amounts of data make it feasible to monitor continuously every aspect of inputs used and of services provided. With increased use of metrics, explicit incentive contracts should be easier to formulate and implement (Violino and Caldwell, 1998). By following every aspect of the vendor's services, the client can reward every desirable behavior, compensating for those actions that actually increase the client's benefits.

Milgrom and Roberts (1992) analyze the theoretical underpinnings of improved monitoring and investment in monitoring technologies. The key effect of monitoring on the contract is that it reduces the variance in outcomes caused by exogenous factors. Often in IT projects a vendor's behavior is only loosely correlated with project outcome. Other factors, including those that are under the client's control (e.g., double moral hazard) and external market forces have a crippling effect on success. In such instances it is difficult to tie compensation to outcomes because vendors do not want to partake of the risks that are not under their control. In these cases, high-powered incentives do not promote vendor action, since his investments will often be wasted because of exogenous uncertainty.

When vendor impact on performance is weak, direct monitoring of actions allows for powerful incentives. By measuring actions rather than outcomes influenced by exogenous variance, moral-hazard by other parties is eliminated, and vendor compensation can be tied to controllable performance. This is especially true when production technology is well understood. Milgrom and Roberts (1992) find that costly monitoring of vendor actions is justified by increased contractual incentives. As monitoring increases, increasing client cost and reducing the variability of performance metrics, incentives should increase to induce the vendor to take desired actions and reducing vendor shirking. Furthermore, incentives and monitoring are complementary tools to reduce shirking. Additional monitoring (lower variance) induces effort, as well as justifying stronger incentives. With stronger incentives the vendor finds it in his best interest to invest more effort, complementing the effect of monitoring.

IT enables low cost monitoring of vendor actions, and should be used to compensate direct vendor actions. Recent developments in the market for IT services have expanded the scope of possible metrics that can effectively be used in monitoring vendor performance (Lacity and Hirschheim, 1993). Industry-wide benchmarking of a host of services allows customers to compare their services with "best-practice". The use of metrics in IT outsourcing has expanded to include target

levels for hardware down-time, completion targets, service levels, responsiveness, allocation of service hours, and maintenance costs (Shachtman, 1998). These can be used as independent measures to compensate vendors, or compared to “best-practices” and reward vendors for achieving performance levels benchmarked against industry-wide measures. These “hard-data” can be complemented with user surveys to verify that the vendor is delivering value, not simply adhering to the letter of the contract. Vendor incentives can vary based on the client’s interests. One option is to devise metrics for each desired factor and reward or punish, based on individual achievements. Comprehensive measurement of vendor services uses a “balanced scorecard” approach where the client explicitly identifies her multi-attribute utility function and compensates the vendor based on higher overall achievement (Cross, 1995; Shachtman, 1998).

The effectiveness of monitoring has one important caveat. While monitoring and stronger incentives can be useful tools in inducing desired behavior, it is important to note that it also skews unobservable investments towards those actions that are measured and rewarded. These efforts are often at the expense of other desired actions, which cannot be measured by the client, and thus are not rewarded. In contracts where non-contracted actions are extremely important, providing incentives for measurable actions reduces investments in other desired venues and may be detrimental to the overall success of the contract (Holmstrom, and Milgrom, 1991).

Examples of Benefits from Monitoring:

- Outsourcing financial services often involves risks that the vendor will provide inferior service or demand excessive charges for the provided services. Barclays de Zoete Wedd (BZW), a major British securities firm, developed an online securities purchasing system in the United Kingdom (TRADE) that enabled retail brokers to place their orders through BZW on the London Stock Exchange. At the time BZW was a dominant market-maker on the Exchange, and its automated service was unparalleled in the UK. While in theory these traits could allow BZW to quote its clients, retail brokerages, buying and selling prices that were inferior to those available on the Exchange, its clients benefited from the Exchange’s SEAQ (Stock Exchange Automated Quotations) system. SEAQ provided all customers with the best buying and selling prices available on the Exchange, and required all market-makers to quote these best prices to any of their clients. Market-makers that concluded trades for their clients at inferior prices were required

to pay stiff fines to compensate for their inferior service. With the knowledge that all trades entered through the TRADE system were guaranteed the best available price, retail brokers could use the system with confidence. IT-enabled, automated monitoring, of BZW's executions by the Exchange provided protection to BZW's customers and was critical in the system's success. Without continuous monitoring of executed trades, customers would be wary of BZW's quotes and other confidence-building initiatives would have to be implemented (Clemons and Weber, 1990).

VI.F. Renegotiation-proof Contracts

The contractual solutions discussed in the previous sections rarely evaluate the impact of contractual renegotiation at a later date. Specifically, in an agency relationship, the client or the vendor may want to change the terms of the contract after hidden investments have been made but before their outcome is evident. This is especially common when there is a long lag between contracting and final resolution of all uncertainty. Since uncertainty has not yet been resolved, opportunism is not a problem because the principal has imperfect information regarding actual investments and the outcome of these investments is unknown. The possibility of interim renegotiation, however, does impact the set of original contracts that can be signed. Foreseeing the possibility of renegotiation, parties would behave differently in agreeing to the initial contract and in making private investments. In the extreme, no initial contract may be possible (Tirole, 1999).

Research in this area has emphasized the possibility of contracts that will not be renegotiated throughout the contract's duration. Signing an agreement that is in both parties' interests to adhere to later assures the contract's robustness. This type of contract, however, may come at a cost to the client, to eliminate the agent's incentive to renegotiate. Fudenberg and Tirole (1990) investigate the impact of the inability to commit not to renegotiate and show that a renegotiation-proof contract induces less expected effort than if commitment were possible. Another important result is that to assure that the contract is not renegotiated, there is a positive probability that the vendor will exert very little effort.

Renegotiation can also be used to improve the set of possible contracts. While a contract between a risk-neutral principal and a risk-averse agent leaves the agent bearing some risk (Grossman and Hart, 1983), the renegotiation of the original contract can provide insurance to the agent (Hermalin

and Katz, 1991) if the principal receives a signal of the action taken. In this case renegotiation improves the efficiency of the contractual relationship because the agent bears less risk.

VI.G. Repeated Contracting

Some companies have opted to outsource their IT needs to outside providers under long term contracts (e.g., Kodak, and General Dynamics McFarlan and Nolan, 1995). Partnerships are taking on a dominant role in the IT outsourcing landscape. The efficiency of such arrangements lies in the ability of making future vendor compensation dependent on current outcome (Blanning, Kleindorfer and Sankar, 1982; Richmond and Seidmann 1993). Contingent compensation may be directly linked to observable outcomes from the current contract, such as specified contractual metrics (see e.g., (Violino and Caldwell, 1998; Shachtman, 1998) where the client promises the vendor a bonus for achieving certain targets.

A more subtle approach to compensation is making future contracts with the same client contingent on current behavior. This allows the client to evaluate vendor behavior subjectively, and propose future contracts based on this evaluation. The reduced reliance on verifiable measures poses a tradeoff for the client. On the one hand, it allows the client to use subjective, non-verifiable metrics to evaluate the vendor, while it reduces the vendor's incentives to invest, because the client's future behavior may be based on irrelevant occurrences (such as the client's financial stability).

The implicit nature of this contract, where the precise terms of the contract are not spelled out, expands the client's scope of contracts that she can offer. The high transactions costs of specifying every possible contingency and desired behavior for each contingency (Coase, 1937; Williamson, 1975) are greatly reduced by the low-powered incentives of future contracts (Goldberg, 1976). With bounded rationality (Simon, 1951) limiting parties' abilities to contract on the future, implicit commitment by the client to compensate the vendor for current investment may provide incentives to invest.

In some contracts, especially with multifaceted service provision, the client may prefer subtle incentives to promote vendor behavior. Most vendors are interested in increasing the scale or scope of services sold to a customer. A client may utilize this as a means of rewarding desired vendor behavior. By changing of the quantity of service purchased, the client increases the vendor's overall

profit. Contingent changes in acquired services based on satisfaction with previous service may be a powerful incentive tool. These incentive mechanisms have the advantage that they do not require explicit contracting or verifiable outcomes to encourage vendor behavior. A client can often best utilize these forms of incentives when contracting for commodity services or if the client has multiple suppliers for the same service. In such instances, purchased quantity is solely at the client's discretion and promises to change future purchases are credible. In other instances, when the client does not have alternative sources for specific services, she must convince the vendor of her ability to change quantities, contingent on quality of past service rendered.

The view that vendors are partners instead of arm's length service providers exemplifies this practice. British Petroleum Exploration's (BPX) IT vendors have long term contracts with BP, while they compete for the client's future business (Cross, 1995). By implementing this type of arrangement BPX assures vendors of future business, but this compensation depends on past performance. Success of the USAA image processing project serviced by IBM was due, to a large part, to the partnerships forged between the different groups working on the project, including to intra- and inter-organizational workgroups (Lasher, Ives and Jarvenpaa, 1991).

Empirical studies indicate that partnership-type arrangements are more successful for IT outsourcing. Lee and Kim (1999) find that partnership quality is an important determinant for success. Grover, Cheon and Teng (1996) studied the success of Systems Operations contract and found that measures relating to partnership mediated success for these procured services. The conceptual view that fosters mutual trust as part of a long-term relationship, even if the contractual terms of resolving future contingencies are implicit, is an important ingredient for successful outsourcing contracts.

VI.H. Property Right and Incomplete Contracts

An inherent difficulty of IT outsourcing is the inability to construct a comprehensive contract. Identifying all possible contingencies and specifying appropriate actions in each contingency is beyond the scope of any reasonable contract. Furthermore, difficulties arise in contracting for IT services because of the inability to verify certain outputs. To write a comprehensive contract it is not sufficient that the outputs be observed by both parties, but also that they can be verified unambiguously by a third party. For outputs to be *observed*, it is sufficient that both parties understand the realized

output and its values. *Verification* of these outputs is a higher threshold to achieve, since it requires that these results be obvious enough so that a court could easily decide on their values and enforce the contract. Without verifiable, enforceable outputs, a comprehensive contract cannot be written.

Situations where contracts are incomplete make asset ownership an important factor in a contractual relationship. This is because decisions or rights not specified in a contract that regard the use of an asset are granted by law to the owner of the asset. In essence, this is the definition of asset ownership as the residual rights of control of an asset (see Grossman and Hart, 1986 or Hart, 1988). These residual rights of control convey bargaining power to the asset owners, which, in turn, affect the willingness of different parties to make relationship-specific investments. If a firm needs to make a non-contractible investment into a multiparty relationship that creates value, but believes that other parties will be effectively able to bargain for all of this gain, the firm is unlikely to make the investment even if all parties would be better off as a result. However, if the firm has an ownership right which conveys bargaining power, it is more likely to invest since it is able to obtain its fair share of the benefits by threatening to withhold essential assets that it may own.

Although this formal discussion is abstract, these difficulties are extremely important for IT outsourcing and have been studied extensively. The quality of a certain application or its maintainability is often difficult, if not impossible, to assess at completion of the contract. Similarly, the benefits sought from an outsourcing relationship may change over the course of the contract²³. Without definitive measures of success for an application, the contract cannot be enforced (by the court) and the original agreed upon terms become irrelevant (Hart and Moore, 1999). These inherent difficulties often lead to incomplete contracts where reactions to certain contingencies are not well specified. Contract incompleteness leads to post-contractual bargaining when, unforeseen contingencies arise. For example, if the client desires certain augmentation of the application, which she believes to be cost-effective, the vendor may attempt to renegotiate other aspects of the contract that he believes should be changed. Similarly, when one party becomes reliant on the other party for key services, it is susceptible to renegotiation attempts by the other party.

²³ DiRomualdo and Gurbaxani (1998) quote an IT executive as saying that “Initially our objectives for outsourcing were to do better those things that we were already doing, as well as to bring in new skills, tools, and competencies. As our business changed our objectives for outsourcing expanded to deliver bottom-line business benefits from IT in a way that was not done before.”

The post-contractual bargaining and renegotiation of contract terms is viewed as an important driver of investments that create value. Unlike opportunistic renegotiation, where unforeseen circumstances shift power and lead to expropriation of value, proper allocation of bargaining power at the beginning of a contract is crucial to ensuring that non-verifiable investments are made, as discussed by Hart and Moore (1999). The diffuse ownership structure forms the basis for *ex-post* bargaining, providing incentives for investments that cannot be contracted.

The nature of the inability to contract on output is critical in defining alternative contracting mechanisms and prescribing governance structure. Contracts may be incomplete because of unforeseen contingencies, the prohibitive cost of elucidating all possible contingencies, or costly enforcement mechanisms (e.g., courts) required to assure compliance to the contract and the renegotiation of contracts that ensue (Tirole, 1999). When unforeseen contingencies are the root problem, Maskin and Tirole (1999) offer a possible contractual alternative to the property rights solution of diffuse ownership proposed in the "incomplete contracts" framework. Under similar rationality assumptions and with the ability to commit to a contract, they show that it is sufficient that agents know the set of possible future payoffs, even if the states of nature are *ex-ante* indescribable. By introducing a third party to the bilateral exchange, buyers can eliminate the adverse selection problem. Using the intermediary to assure commitment to the process, parties write *ex-ante* contracts that allow efficient screening. Knowing the possible payoffs, the efficient vendor is chosen who transfers the completed project to the client after receiving payment. The intermediary assures that parties do not renege on their original promises by limiting their outside opportunities for exchange. This allows for contracting even when the quality of the project is non-verifiable due to indescribable traits.

The property right view of the firm (Grossman and Hart, 1986; Hart, 1989; Hart and Moore, 1990; Hart, 1995; Hart and Moore, 1999) identifies the firm with its ownership of physical assets. Through ownership, a firm has residual rights to decide on how to utilize assets in unforeseen contingencies. Specifically, an owner has "veto" power to withhold her assets from other parties that may have productive use of the assets. Using veto power, the owner can extract payment for services in instances that are not explicit in the contract. This residual right of control provides incentives for the asset's owner to invest in surplus increasing actions. For those who do not have direct access to an asset, the threat of expropriation reduces their incentive to invest in actions that increase the asset's value.

This framework has often been used to evaluate the efficiency of different organizational structures. The main advantage of a firm over market transactions is the assurance that the profit stream of any project is owned solely by the firm. Assurance that these potential profits will not be bargained away to others provides increased incentives for unobservable investments. As the number of partners to trade increases, the incentive for each partner decreases, if gains for trade can be appropriated (Hart and Moore, 1990). Hart (1989, 1995) views post contractual renegotiation as an important driver behind firms' integration. Often diffuse ownership does not warrant sufficient investment since the returns on this investment may be bargained away. Sole ownership can provide a solution.

Conversely, outsourcing IT projects may provide incentives to invest because of opportunities to share in the profits from unverifiable investments. Richmond, Seidmann and Whinston (1992) analyze the tradeoff between outsourcing a customized software development project and in-house development when both users and developers can make profitable investments. The user benefits from outsourcing a project because of her ability to specify the profit sharing mechanism to provide investment incentives. Their respective shares in the expected *ex-post* profits drive each party's investments. When user investment is of overriding concern, outsourcing should be avoided to assure sufficient investment. When developers have a critical role in future profitability, however, outsourcing is a viable alternative, and profit sharing mechanisms can ensure optimal investment. The results indicate that the outsourcing decision is idiosyncratic to a given context. The inherent tradeoffs require specific analysis of every opportunity, and few generalizations can be made.

While much of the analysis is based upon ownership of physical assets, Brynjolfsson (1994) expands the concept of asset ownership to include "information" as an asset. Identifying an agent's information as an asset that is crucial to creating surplus from physical assets allows analyzing the relative merits of centralization and integration and the impact IT will have on these. His results suggest that decentralization and contracting will become prevalent as (1) IT increases reliance on informed workers who require strong incentives (2) increased flexibility is achieved and (3) coordination between agents is improved, reducing the need for centralized coordination.

VI.1. Multiple Vendors

One of the main risks is that of vendor hold-up, or opportunism. After contracting with a certain vendor, the vendor may be able to take advantage of the client's inability to purchase services

elsewhere, and may raise prices or reduce the quality of service provided. The vendor's increased bargaining power, after the contract is signed, appears to be detrimental to the client. However, there is a positive result associated with this problem. With increased bargaining power, the vendor has incentives to invest to increase the client's benefits from the project (Grossman and Hart, 1986; Hart, 1989). The vendor's bargaining power is especially increased for non-contracted services. Knowing that client profits from services beyond those specified in the contract may be appropriated provides an incentive to invest in the ability to provide these services (Bakos and Brynjolfsson, 1993b).

When non-contractible investments are important to the client, there are additional benefits from outsourcing. At times, the client would like the vendor to provide specific expertise or improved development practices that are non-verifiable (by an objective third party) and thus cannot be part of the contracted terms. For example, in the outsourcing of data processing services, the vendor can invest in reduced down-time, fewer processing errors, and quicker data processing and analysis. The vendor can be expected to make these marginal investments, inasmuch as his marginal revenue, from *ex-post* negotiation with the client, covers these costs (Bakos and Brynjolfsson, 1993a). The bilateral partnership between client and vendor provides incentives for additional investments beyond the letter of the contract (Quinn and Hilmer, 1994).

While single sourcing increases the vendor's bargaining power in non-contracted investments, it also raises his bargaining power in unforeseen contingencies. If the client does not want to increase the vendor's bargaining power, she may contract with multiple vendors to deliver IT services. For commodity functions such as data processing and hardware maintenance, the loss in economies of scale may be offset by the increase in client bargaining power. With multiple vendors, each has little ability to hold-up the client in unforeseen contingencies, since the client may transfer services between vendors. Studies show that close relationships with a small number of vendors can offer the client the advantages of outsourcing without losing control of her production processes (*The Economist* Aug. 31, 1991).

Recent changes induced by developments in information technology make outsourcing to multiple vendors more attractive (Malone, Yates and Benjamin, 1987). Standardization in EDI processes and the massive influx of IT in purchasing systems (e.g., MRP) allow greater coordination across firm boundaries, increasing the ability to contract for complex services. Functions that were historically in-house because of complexity in describing the client's requirements can now be easily outsourced

with detailed requirements described in coded documents (Clemons, Reddi and Row, 1993). Furthermore, IT allows more comprehensive communication between client and vendor. With e-mail, video-conferencing and other communication media, multiple actors on each side can interact to assure delivery in accordance with the client's interests.

Clemons, Reddi and Row (1993) examine the impact these changes have on the risks associated with outsourcing and find that overall IT can reduce the transaction risk of outsourcing a project, allowing customers to gain the benefits of lower production costs available in the market. First and foremost, as discussed above, IT enables comprehensive monitoring, allowing for more complex contracts, including more contingencies. By reducing the bounded rationality inherent in outsourcing arrangements, IT allows clients to purchase services when vendor shirking may be problematic. Multiple metrics, such as down-time, number of failures or errors, time to repair failures, and cost per unit services can all be continuously monitored using computers, allowing parties to write more comprehensive contracts (Shachtman 1998) that provide stronger incentives for desired behavior.

Another important characteristic of recent IT initiatives is the commonality of hardware and standardization of procedures within industries. Contracting with multiple vendors, or having the ability to change vendors easily, reduces the relational-specific investments made by the client, reducing opportunistic renegotiation by the vendor (Clemons, Reddi and Row, 1993). In the not so distant past, investments made to commence one contract were often sunk, and could not service future contracts with other potential providers. With Extranets and other EDI protocols becoming standardized in many industries, common PC platforms for many inter-organizational systems and the Internet as the communication method of choice for most vendors, current investments made for one vendor are rarely sunk. Clients are not required to install proprietary or idiosyncratic infrastructure to support their outsourcing relationship, and can reuse most of the support technology when changing service providers. Commonality of infrastructure, often fixed, reduces the cost of switching vendors or of simultaneous contracts with multiple providers.

Croson and Jacobides (2000) suggest a different justification for the use of a small number of suppliers in the procurement of quality-intensive services. When quality is costly to provide yet important for the buyer's production, but difficult to contract, yardstick competition in repeated exchange justifies multiple vendors. To induce efficient investment in quality by a select group of "high quality" suppliers, the buyer should share the surplus generated by these investments with

suppliers while stipulating that future contracts and profits depend on current provision of quality. The repeated interaction and yardstick competition provides sufficient incentives for suppliers to invest repeatedly in quality.

Examples of Advantages from fewer vendors:

- British Petroleum Exploration in 1993 decided to outsource its IT department to three different service providers that would seamlessly service its needs while cutting cost and increasing flexibility. By contracting with multiple providers, the company was able to avoid vendor opportunism from reliance on a sole vendor. Having only three vendors proved optimal because it allowed close relationships with all partners, while maintaining some of the competitive pressure among them. With each subdivision responsible for its own contracts, it could negotiate with any or all of the select companies to receive the highest quality at the lowest price (Cross, 1995).
- Information sharing among a small set of partners can improve production timeliness and flexibility while reducing inventory cost and supporting innovation. Digital Equipment Corporation (DEC), the large computer manufacturer, shares with its suppliers detailed information regarding projection of product demand and production know-how. This information is used throughout the supply chain to synchronize production and assure improved inventory management to meet actual demand. While in other relationships this type of information could be used to the detriment of contracting parties, the partnership nature of the relationship and the long term mutual reliance assure that all companies make a fair return on their hidden investments (Bakos and Brynjolfsson, 1993a).

VII. Conclusion

IT outsourcing encompasses a wide spectrum of activities, each with its own characteristics regarding the advantages offered by external providers and the costs of contracting for these services. This paper reviews the current literature on IT outsourcing from an economic perspective. The heterogeneity in outsourced services does not allow for a single recommendation regarding the viability of outsourcing, but rather a framework is suggested to support this decision. Reviewing the economic literature, it becomes evident that the important tradeoff is between the economies of scale,

scope and specialization found in procurement, against the transaction costs of contractual relations. The key driver of these costs is contractual risks associated with IT outsourcing. This framework is more applicable to IT outsourcing than the core competencies notion advanced in parts of the managerial literature.

To evaluate the idiosyncratic risks of IT outsourcing, it is important to understand how IT differs from other procured goods and services. Four differentiating dimensions are monitoring, uncertainty, competitive importance and organizational interconnectedness. When compared to other procured services, IT services appear contractible because of the greater ability to monitor a vendor's actions, and compensate directly for desired performance. Conversely, technological uncertainty is often quite high in this realm and it impedes on efficient contracting. When technological changes are unforeseen, stipulated contractual terms may become obsolete within the duration of the contract. Renegotiation of the original terms may be undesirable when the client has little recourse but to continue using the vendor's services. These inherent uncertainties in IT procurement and other contractual risks are exacerbated in domains where the service has important competitive impacts or is highly interconnected within the client organization. Each of these factors increases the client's dependence on the vendor, limiting opportunities to replace the service provider. By understanding the potential risks of entering into a contract with a vendor, clients can begin to impose contractual mechanisms or governance structures to minimize those risks.

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