
The Impact of Information Technology on the Organization of Economic Activity: The “Move to the Middle” Hypothesis

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ABSTRACT: Investments to increase the level of explicit coordination with outside agents have generally resulted in increased risk to the firm; firms have traditionally avoided this increased risk by becoming vertically integrated or by underinvesting in coordination. This paper argues that information technology (IT) has the ability to lower coordination cost *without* increasing the associated transactions risk, leading to more outsourcing and less vertically integrated firms. Lower relationship-specificity of IT investments and a better monitoring capability imply that firms can more safely invest in information technology for interfirm coordination than in traditional investments for explicit coordination such as co-located facilities or specialized human resources; firms are therefore more likely to coordinate with suppliers without requiring ownership to reduce their risk. This enables them to benefit from production economies of large specialized suppliers. Moreover, rapid reduction in the cost of IT and reduction in the transactions risk of explicit coordination makes possible substantially more use of explicit coordination with suppliers. The resulting transaction economies of scale, learning curve effects, and other factors favor a move toward long-term relationships with a smaller set of suppliers. We call this combination—a move to more outsourcing, but from a reduced set of stable partnerships—the “move to the middle” hypothesis.

1. Introduction

EARLIER RESEARCH BY COASE [19], WILLIAMSON [49], AND KLEIN ET AL. [30] described the organization of economic activity in terms of the tradeoffs between the

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production cost advantages of outside procurement and the transaction cost advantages of internal production. This theory is enormously useful in explaining the evolution of industry and organizational structure through history, including the emergence of large, vertically integrated firms in the late 1800s [11] and the emergence of the multidivisional organizational form in the early 1900s [49].

Recent experience, however, is indicating that the historical tradeoffs that have guided the evolution of firms' strategies and structures are changing in some very fundamental ways. New organizational forms are emerging, including "strategic networks" [27] and "value-added partnerships" [28]. Increasingly, firms are finding that historical decisions concerning production or procurement are badly outdated, with serious effects on competitiveness. Roger Smith, shortly before he stepped down as chairman at General Motors, seemed bemused that GM's vertical integration, the most extensive in the industry, had ceased to be a "strategic advantage" and had become a "semi-disadvantage." What Smith termed a semi-disadvantage was in fact a per-car cost disadvantage sufficient to produce staggering losses, while leading to a nearly crippling loss of market share. A recent article in *Fortune* advances the same point; while the article lacks theoretical rigor, it certainly expresses its author's informed beliefs with conviction and without ambiguity. The initial paragraph describes how companies that make effective use of procurement outside their central core areas of competence, Dell Computer and Chrysler, for example, "are stealing customers from rigid, vertically integrated rivals like IBM and General Motors" [47, p. 106]. Lest this point be missed, the article designates as "corporate mastodons" companies that do not exhibit "smooth teamwork" with their suppliers, and concludes that this lack of teamwork is an "important reason why corporate mastodons . . . are losing so spectacularly in the evolutionary struggle" [47, p. 115].

These changes in the economics of procurement versus production and in the mechanisms for managing interfirm relationships have been so dramatic and have occurred so rapidly that they have outpaced progress in economic and management theories. The changes appear in many diverse industries, indicating that common processes are at work. This paper suggests that one important factor causing or enabling these fundamental changes in economic organization is *information technology* (IT). We argue that recent advances in computing and communications technology have affected the costs of coordination, and have had an even more dramatic impact on the risks historically associated with interfirm coordination. These effects have changed the historical balance between markets and hierarchies, contributing to the observed changes in the strategies and structures of individual firms and entire industries.

Although there no doubt are other factors that contribute to the major structural changes occurring in firms and industries, the importance of IT cannot be discounted. For example, in discussing the emergence of value-adding partnerships (VAPs), a concept very much related to cooperative long-term relationships, Johnston and Lawrence [28] highlight the importance of IT by listing technological tools that enable the formation of VAPs. These tools include data standards/bar codes that lower "transaction costs *between* organizations," information networking capability that "permits instantaneous sharing of information *between* organizations," and computer-

aided design that improves “coordination *between* organizations in design functions.” The cover story of a recent article in *BusinessWeek* [8] makes the case that new coordination technologies will increasingly facilitate major structural changes in the organization of economic activity.

1.1. Transactions Cost and IT

There is substantial literature in economics, manufacturing, strategy, and organizational design that attempts to provide answers to two important questions:

1. How much of a given product or service should the firm outsource? (Degree of outsourcing or boundary of the firm)
2. In what manner should the firm manage its relationships with outside suppliers? (Governance structure)

An important theoretical approach used to answer these two questions is *transactions cost economics* (TCE) (first suggested in Coase [19], popularized and expanded upon by Williamson [49, 50] and others, for example [25, 30]). The firm’s outsourcing decision is generally understood to depend upon the total cost, which is the sum of the *production cost* and the *transactions cost*, for producing or procuring a given component.¹ The structure of the firm naturally evolves to select the governance structure and degree of outsourcing that minimizes this total cost.

Traditionally (e.g., [49]), TCE has viewed the degree of outsourcing and choice of governance structure in terms of the dichotomy between *markets* and *hierarchies*. The market, consisting of independent suppliers, frequently can provide a required component of a higher technological quality and at a lower cost, since these market suppliers are assumed to enjoy economies of scale and specialization in the manufacture of that component. Using the market involves significant transactions costs, such as finding a reliable supplier, contracting with it, monitoring and enforcing the contract, and coordinating with the supplier for the duration of the contract. In situations of high uncertainty and significant investment in transaction-specific capital, these market transaction costs can be prohibitive, leading the firm to produce the component in house and manage the interaction through the organizational *hierarchy*. In-house production trades off production economies of the market for transaction cost savings within the hierarchy.

The simple markets versus hierarchies dichotomy has been expanded to include a more complete understanding of the wide variety of governance structures that are possible [e.g., 41]. The choice of governance structure can affect the level of transactions costs. Key dimensions of governance structure that have been identified in the literature include:

- *Ownership*. A governance structure can include complete ownership of the supplier at one extreme to no ownership at the other. There are many alternatives between these extremes, including part ownership of the supplier or buyer, setting up a jointly owned subsidiary, or shifting ownership of key pieces of transaction specific capital (e.g., [30, 33]).

- *Number of Suppliers.* The extent of a firm's search process has a strong impact on the ability of market competition to ensure efficiency; however, search is not costless. Decisions regarding the number of suppliers can have a significant impact on total costs (e.g., [45]).
- *Contracts.* The work of Coase and Williamson grew out of the recognition that, in some situations, complete and enforceable contracts were difficult to write. However, there are a great variety of contractual arrangements possible with different implications for transactions costs and total costs (e.g., [33, 49]). Key variables include the length of contract and the completeness of contracts.
- *Explicit Coordination.* Clemons and Row [17] observed that the degree to which operational decisions are integrated between two economic activities is an important dimension of governance structure quite distinct from ownership. They define explicit coordination as the extent to which decisions are coordinated through processes and information that are specific to the relationship.

The transactions cost framework has been important in evaluating IT's impact on the firm's operations. Ciborra [12] recognized that IT reduces transactions costs, thereby enabling the emergence of more efficiently organized markets and hierarchies. Since that early work by Ciborra there have been several important contributions from the IT community on this topic.

Malone et al. [35] argue that IT reduces the unit cost of coordination and the transaction specificity of investment in interfirm interactions. They suggest that the increasing adoption of IT will lead to a greater degree of outsourcing and hence less vertically integrated firms. Moreover, since search costs are decreased, firms will rely more on search, leading to the emergence of *electronic markets*. However, Malone et al. also identified a phenomenon they termed *electronic hierarchies*, which were interfirm relationships characterized by *less* use of search and market competition and *more* use of tightly coupled operations with a few long-term partners. These arrangements seem to run counter to the basic "move to the market" hypothesis presented.

Gurbaxani and Whang [26] integrated the basic transactions cost argument with an investigation of internal agency costs. Their work highlighted the interactions between the economics of internal organizational structure and the economics of interfirm interactions, but also the difficulty in characterizing and explaining when IT would lead to more efficient markets or tightly coupled partnerships remained.

Clemons and Row [17] argue that the impact of IT on economic organization cannot be understood without explicitly considering risk. They suggest that transactions cost is composed of the cost of coordination and the transaction risk. Cooperation is viewed as an effort to increase resource utilization and value through higher *explicit coordination* of economic activities, that is, integration of operations. However, increasing explicit coordination can increase transaction risks: exposure to opportunistic behavior by the other party. This was particularly true historically, where increasing explicit coordination required investment in physical or human resources that could not readily be transferred to other relationships. Economics research [49] informs us that firms generally have avoided this risk by vertically integrating with their suppliers or

customers or by underinvesting in potentially value-creating transaction-specific capital. Clemons and Row show that IT can lower the cost of coordination without necessarily increasing the risk associated with a greater level of explicit coordination. They conclude therefore that we should see a greater degree of outsourcing due to production economies of scale and specialization available outside the firm; moreover, this will be accompanied by more cooperation than was the case before.

The form of supplier–buyer relationships has also been addressed by Bakos and Brynjolfsson [3, 4] who focus on different aspects of the problem. They argue that tightly coupled operations supported by IT require increased investments by suppliers in noncontractible resources, such as quality, innovation, and information sharing. However, the suppliers may not have sufficient bargaining power to guarantee a return on those investments. Reducing the number of suppliers can increase the bargaining power of the suppliers, giving them an incentive to make such noncontractible investments.

1.2. Goals

Our central hypothesis can be tersely stated: Industrial restructuring will increasingly be characterized by a “move to the middle.” Specifically,

1. A greater degree of outsourcing will take place (a move away from ownership and vertical integration).
2. But the firm will rely on fewer suppliers than before, with whom the firm will have close and long-term relationships and with whom the firm will cooperate and coordinate closely (a move away from the market to intermediate governance structures when outsourcing).

The argument that IT would support increased outsourcing and increased use of explicit coordination was first advanced by Clemons and Row [17]. We build here on that reasoning to demonstrate that the manner in which the increased outsourcing occurs is through the use of fewer suppliers with whom the firm has long-term cooperative relationships.

The “move to the middle” hypothesis is consistent with the Malone et al. prediction that IT would favor a greater degree of outsourcing [35] (also see Malone and Rockart [34]), although their reasoning considers only some of the costs and few of the risks analyzed here. Gurbaxani and Whang [26] consider the impact of IT on firm size using a combination of transactions cost theory and agency theory. They conclude that IT’s net impact depends on which of these two costs—agency or transaction—is more affected by IT. Gurbaxani and Whang, like Malone et al., do not discuss how the structure of outsourcing may be altered by the increased use of IT.

In the remainder of this paper we provide theoretical justification to support the “move to the middle” hypothesis and some preliminary evidence that the predicted trend is already well underway. The basic framework we adopt is described in section 2. The framework decomposes transactions cost into components that closely match the features of IT that have an impact on transactions cost. The theoretical justification

for the first part of the “move to the middle” hypothesis concerning increased outsourcing is presented in section 3. Theoretical support for the second part of the “move to the middle” hypothesis regarding the increased use of fewer, longer-term suppliers is presented in section 4. Supporting examples, making clear the critical role of information technology in supporting the move to the middle, are reviewed in section 5. We conclude in section 6 with some complicating factors, outside the more narrow theoretical framework. Paramount among these is the need to manage the human interaction associated with partnerships and long-term relationships: systems can be used to improve monitoring, and thus to detect conditions that may reflect a violation of trust, but systems alone do not create trust. The relationship aspects of partnerships must be carefully managed, especially when differing objectives lead partners to take actions that the other—wrongly—may view as willful violations of the partnership agreement.

2. The Framework

THE PAPER EXAMINES A DECISION PROBLEM CRITICAL TO EVERY FIRM: how to minimize the combined cost and risk in the production of its product. Risk clearly can be seen as another form of cost and in this paper it is treated as such. To minimize the total cost plus risk, the firm must decide whether to outsource the product—that is, procure it from an independent supplier—or to produce the product in house. If the firm chooses to outsource, it must also decide the manner in which to organize this procurement—that is, the governance structure to use to conduct the procurement. Transactions cost economists would write the total cost that is being minimized by the firm as follows:

$$\text{total cost} = \text{production cost} + \text{transactions cost}.$$

In our framework we decompose the transactions cost into three smaller, distinct components and examine separately the impact of IT on each of these three components of transactions cost. IT has different features, each of which has a specific effect on transactions cost:

- IT is able to reduce the cost of exchanging and processing information, thus reducing the costs of coordination.
- IT is able to increase information availability and processing capacity, thus facilitating monitoring the performance of other participants in the relationship.
- IT is increasingly standardized and interconnective, thus reducing the relationship-specificity of IT investments and its impact on the vulnerability of the firm making the IT investment.

The decomposition of transactions cost into three components that match the different features of IT allows us to examine the manner in which each is affected by IT, and indeed to highlight the conditions under which improvements in the use of information technology for interfirm coordination affects them differently from other, more traditional investments for such coordination.

2.1. Decomposition of Transactions Cost

We can decompose the transactions cost into three distinct components. The motivation for this decomposition of transactions cost is that the economics literature has generally focused on the risk of opportunism, that is, where a supplier (or customer) could renegotiate a contract after the buyer (or supplier) has made a “sunk” cost investment (for example, see [49]), while the IT community has instead generally focused on the cost of coordinating with suppliers (or customers), since this is a cost that is obviously influenced by the price/performance characteristics of IT (for example, see [35]). There is, however, a third important factor that is not captured explicitly either by coordination cost or by opportunism; this is “operations risk.”²

The present decomposition is:

$$\text{transactions cost} = \text{coordination cost} + \text{operations risk} + \text{opportunism risk}.$$

Coordination cost is the cost incurred by the firm in coordinating with units actually or potentially producing the product. The term “coordination cost” is interpreted in a broad sense to include the cost of exchanging information and incorporating that information into decision processes, as well the cost incurred by the firm due to delays in the communication channel. Coordination cost includes the cost of exchanging information on products (price, product characteristics, availability) and demand. The coordination cost includes the cost to share design changes rapidly with its supplier, to inform and to be informed of changes in delivery schedules of the product, and so on. In the production of the product, uncertainties regarding the delivery times of specified quantities of the product, the availability of the product, and the supplier’s ability to custom-make the product to meet specific demands on short notice are all important to the firm’s operations, and actions to reduce uncertainty or to mitigate its effects all increase the coordination cost to the firm.

Operations risk is the risk that the other parties in the transaction willfully misrepresent or withhold information, or underperform—that is, “shirk”—their agreed-upon responsibilities (“shirking” is an aspect of the moral hazard problem and is discussed in [1]). Operations risk stems from differences in objectives among the parties and is supported by information asymmetries between the parties or by difficulties in enforcing agreements. For example, a supplier who has agreed to provide a component of a certain quality may actually provide one of an inferior quality if the supplier knows that it is difficult for the firm to measure the quality of the delivered product. Examples of such quality attributes are on-time delivery performance, customer support, and maintenance skills. Information asymmetries are a common source of operations risk, but need not be present for these risks to exist: differences in bargaining power or incomplete or unenforceable contracts can also lead to operations risk. To continue the example, both parties may be fully aware of the quality shirking, but the contract may not unambiguously cover that contingency, the damaged party may not be able to prove the violation to the satisfaction of a court, or the costs of litigation may be prohibitive. Furthermore, the damaged party may not have sufficient bargaining power to recover their losses in future transactions.

Opportunism risk includes the risks associated with a lack of bargaining power or the loss of bargaining power directly resulting from the execution of a relationship, that is, a difference between *ex ante* and *ex post* bargaining power. Two important sources of opportunism risk that have been examined extensively in the transactions cost literature ([30] is an excellent example of that literature) are *relationship-specificity* of the investment and *the number of potential suppliers for the product*. Another source of opportunism risk less considered in the economics literature, but widely recognized in the management literature, is what we call the risk of *loss of resource control*.

1. *Relationship-specific investments*: An investment is considered relationship-specific if its use is particular to one customer or supplier relationship and it has a smaller value outside that relationship. A firm making a relationship-specific investment to do business with a particular customer becomes vulnerable. The customer may demand lower prices or attempt to renegotiate its contract once the investment has been made by the supplier. The supplier may have no other recourse but to agree to its customer's demands because the investment made is largely "sunk." There is a significant amount of theoretical literature (for example, see [30]) suggesting that in cases where highly relationship-specific investments must be made, firms are better off producing the product in house. In fact there is also substantial empirical evidence that firms do indeed vertically integrate and produce the product in house if it required making relationship-specific investments (for example, see [29, 36]).

2. *Small numbers bargaining*: This denotes a situation where there are only a few potential suppliers for a product and hence a firm that decides to procure the product from outside is exposed to the risk of opportunistic behavior from the supplier. Since the supplier is aware that the buyer has few alternative sources of supply, it may attempt to exploit the buyer's dependence on it; indeed, this monopoly power is, in traditional industrial economics, the primary source of firm profits.

A situation of small numbers bargaining can also arise due to the firm doing business with only a few suppliers. After the suppliers or the firm make relationship-specific investments, it becomes difficult for the firm or the suppliers to find such business elsewhere, thereby locking both the suppliers and the firm in a small numbers bargaining situation. Williamson ([49, 50] and elsewhere) has popularized the issue regarding the manner in which relationship-specificity and small numbers bargaining raise transactions cost. Williamson argues that firms vertically integrate in order to reduce these costs. There is significant empirical evidence that this is indeed the case (for example, see [10, 32]).

3. *Loss of resource control*: Resources may be generated or transferred as the result of a relationship that is difficult to control after the fact. For example, a firm that outsources production of a proprietary chemical compound may find aspects of that technology turning up in competitors' products much sooner than expected. Over time, they may find that their contract supplier emerges as a new competitor. Information and expertise are resources that are particularly vulnerable: as Teece [44] points out, it is very difficult to control access to and use of these resources and legal enforcement mechanisms may be inadequate.

The decomposition of transactions cost into these three components—coordination costs, operations risk, and opportunism risk—then allows us to evaluate how specific attributes of IT influence the overall transactions cost associated with an operation.

2.2. The Changing Characteristics of IT

The arguments in the next section, where we provide theoretical support for the “move to the middle” hypothesis, are based on three significant changes in the attributes of IT.

1. *Decreasing average unit cost of IT*: The unit cost of computing and communications has fallen dramatically over the years. We now have tremendously greater computer processing, storage, and communication power being provided at a significantly lower cost.

However, “average unit cost of IT” masks a more significant change in the cost structure of IT: *increasing economies of scale*. Hardware may be increasingly seen as almost free, but software costs continue to escalate. And unlike hardware, software has few capacity limitations and additional uses do not reduce the value of the resource. For example, the costs of developing branch automation software for a bank are the same whether the software is used in one branch or one thousand: the marginal development cost for additional uses is very low.

Less measurable than software development costs, but possibly more important in the long run are informational economies of scale [51]. Knowledge and expertise that are embedded in data and models in IT can be more easily and cheaply transferred, accessed, and utilized. This is very different from organizational information processing based on human information processors.

2. *Increasing information availability and processing capacity*: Beyond the reduction in the cost of computing, advances in IT have enabled tremendous advances in the amount of information that can be accumulated, transmitted, and utilized in decision processes. Bar coding and scanners facilitate detailed data capture. High-speed public networks—9,600 baud or higher speeds over conventional telephone lines, and digital T1 (over 1.5 million bits per second) or even T3 (over 45 million bits per second) service when needed—are competitively available. Increasing use of detailed communications standards, such as industry-specific standards for EDI, facilitate sharing of information within and between organizations. Better query languages and database management systems, supporting larger and more complete and more integrated databases, allow more rapid access to and analysis of data needed for monitoring. These technologies permit remote access to partners’ databases in support of one’s own operations and scheduling; that is, a buyer can verify a supplier’s product availability before placing an order for a critical part, or a supplier can verify the customer’s demand forecasts and manufacturing scheduling before beginning a large production run. In concrete terms, this represents the difference between “the check is in the mail” and Federal Express’s “the letter is now between 30th Street and your office, and should arrive before 10 A.M.” or even, “Pat signed for it and it’s currently in your mailroom.”

3. *Increasing standardization and interconnection:* The trends toward common standards in EDI, communication using telephone lines, standardized hardware, as well as the major drive toward “open systems,” make investments in IT less specific to the transaction or relationship for which they were initially made. Platforms are increasingly more open, making it easier to port software written to work with one partner’s systems to that of another customer or supplier. Likewise, it is becoming easier to transfer data, even large amounts of historical data, to systems of potential new partners, reducing switching costs and the resulting vulnerability. It is clear that investments in IT made to improve coordination and cooperation will be increasingly flexible and portable, and that in many cases they are already far less relationship-specific than alternative investments in physical capital or human resources made for similar purposes.

3. A Move to More Outsourcing

THE THREE COMPONENTS OF TRANSACTION COST—coordination cost, operations risk, and opportunism risk—are all affected by the choice of governance structure. Firms select a degree of outsourcing and governance structure to balance the transactions costs with production economies. We argue in this section that IT reduces coordination costs and, more importantly, transaction risks, altering the balance in favor of a greater degree of outsourcing.

3.1. Explicit Coordination and Transaction Risk

Governance structures can be characterized by the extent to which they rely on competition to achieve coordination or the extent to which they rely on joint or bilateral negotiation and decision making.³ We refer to this dimension as the level of explicit coordination. Increasing the level of explicit coordination between economic activities can create efficiencies not possible otherwise. For example, suppliers who have access to their customer’s production plans can better plan their own manufacturing and distribution. With explicit coordination, uncertainty is reduced and asset utilization is improved. However, explicit coordination typically leads to an increase in operations risk and opportunism risk:

- *Increased operations risk.* Increased integration of operations increases the complexity of firm interactions. It is much more difficult to specify the rights and responsibilities of the parties clearly and contractually. The result is more scope for “shirking.”
- *Increased opportunism risk.* Increased explicit coordination historically required investment in transaction-specific capital. Physical and human resources had to be customized to the relationship. Moreover, increased integration of operations made it more difficult to control access to proprietary information and expertise, increasing the risk that these resources would be misappropriated.

According to TCE, where the benefits of explicit coordination are significant, but the transactions risks are prohibitive, the firm will vertically integrate. There are two conditions that could lead to a reversal of this: increasing production economies or reduced transaction risks.

We have suggested that IT can increase economies of scale, particularly in the development of software and in information and expertise. This could lead to increased outsourcing of IT-intensive activities. However, this effect is likely to be specific to particular industries and activities, and is unable to explain the pervasiveness of the structural changes described earlier. In this paper we focus primarily on the risk component, which is likely to affect most industries to some degree.

We argue that outsourcing is the result of decreasing the costs and risks associated with a given level of explicit coordination.

3.2. IT Reduces Coordination Costs

Using IT reduces the unit cost of communicating and reacting to information, and greater use of IT should today produce significant reductions in the costs of explicit coordination. This is a generalization of Galbraith's early observation that firms can substitute information flows for excess capacity or slack in other resources [24]. Within the context of a single firm, Galbraith noted that safety stock inventory can be reduced by improving forecasting and reducing order cycles, and slack manufacturing capacity can be reduced if planning and scheduling are improved. We note here that these results are now equally applicable in an interfirm setting: reduced IT costs, and increased use between suppliers and customers, should have similar impacts on coordination costs and on the costs of inventory and slack capacity maintained as implicit alternatives to explicit coordination.

Hewlett-Packard [7, p. 133] found that "communication was the chief culprit in on-time delivery failures" and that by "installing electronic purchase orders that flow directly from HP's computers to the suppliers' open-order management systems," they made significant improvements in their performance. The growing success of electronic data interchange (EDI) [23], which allows the transmission of routine information, such as invoices, may be viewed as investments in IT to reduce the coordination cost. According to one study [43, p. 56] on the actual and potential benefits of EDI, manufacturers and distributors in the study listed the benefits to be "(1) reduced order lead time; (2) higher service levels; (3) fewer out-of-stock situations; (4) improved communication about deals, promotions, price changes, and product availability; (5) lower inventory costs; (6) better accuracy in ordering, shipping, and receiving; and (7) a reduction in labor costs." From these observations, and numerous other well-documented examples, we may conclude that greater use of IT reduces coordination cost.

3.3. IT Lowers Operations Risk

The increased information availability and processing capacity of IT enable operations risk to be reduced through improved monitoring and incentives. For example, com-

puters can be used to maintain records of the delivery performance of the supplier or information regarding complaints about the supplier. Systems may be linked to the production processes and schedules of the supplier to monitor the quality of the manufactured products. Examining the impact of EDI on the relationship between the participating firms, Stern and Kaufmann [43, p. 59] acknowledge that although "EDI systems heighten organizational interdependence and therefore increase the opportunity for conflict," they actually found in their study that "EDI generally has lessened rather than increased conflict."

IT's ability to reduce operations risk is demonstrated by the TRADE system offered by Barclays de Zoete Wedd (BZW).⁴ BZW is a major integrated securities firm, with headquarters in London, operating worldwide. As a member of the London Stock Exchange, it serves both as a market maker and as a broker. To increase its activities as a market maker, BZW instituted TRADE, an interactive order entry system linking the firm with retail brokers throughout the United Kingdom; these brokers are customers of BZW, which use the firm's market makers to execute trades for their own customers. Unlike U.S. stock exchanges, which usually have a single market maker in each stock, the London Stock Exchange has several competing market makers, sometimes over twenty; SEAQ (the Stock Exchange Automated Quotations system) displays the prices at which each market maker is willing to buy or sell shares. At any time, the best available buying and selling price (bid and offer) are readily observed. BZW trades in close to 1,800 shares, virtually all companies traded in the London Stock Exchange. At the time of TRADE's launch, no other U.K. firm that supports retail orders traded in even half that. The broker using TRADE to buy or sell shares for a customer keys in an order for virtually any stock, sees the price at which BZW is willing to deal, and in most instances automatically executes a trade. BZW assures TRADE customers that they will always receive the best price available through SEAQ, even if BZW itself is not currently offering that price to customers using SEAQ. Significantly, the broker is willing to use TRADE without examining other prices that might be available from other market makers. The broker thus saves considerable time and effort, and finds orders through TRADE faster and cheaper than by using other channels for fulfilling the customers' orders.

BZW's TRADE system would appear to place its customers in a position of vulnerability, were it not for the ability of information technology to provide rapid, inexpensive, and utterly reliable monitoring. That is, brokers' reliance upon TRADE for pricing as well as executing their customers' orders might appear initially to offer BZW an opportunity to shirk, to offer less than best performance. A few pence might be shaved off the price offered for the brokers' shares, a few pence added to the price charged. This does not happen. SEAQ records the best prices available in the London market at all times, and other systems time-stamp all trades. A market maker that dealt at prices inferior to the best in SEAQ would be caught, fined, and potentially punished with loss of market making privileges. The penalty for cheating is so high, and the risk of detection so certain, that TRADE customers are quite confident that they will always receive best prices. Brokers claim that this assurance of best price is essential, since they are required to assure it to their own customers, and that without it TRADE would

not have succeeded despite the advantages it offers to the brokers. Clearly, the necessary monitoring could not occur without automated systems for effective monitoring of prices in the market and of the cost of shares in each trade.

Increased information and information processing capacity also reduce operations risk by enabling more efficient incentive structures. For example, in the consumer packaged goods industry, promotions, such as temporary price reductions, coupons, and special displays, are used as an important competitive tactic. Manufacturers often implement these promotional programs through their retailer customers, usually offering them temporarily reduced product prices in return for their offering the promotion to the final consumer. However, the manufacturer has historically had no way of monitoring the retailers' promotional performance. The retailer has been able to "shirk" in several ways. The retailer may stock up on the product from the manufacturer at the reduced promotional price, and sell the product later at the higher, normal retail price, a process called forward buying. Or the retailer may re-sell the promoted product to other retailers in geographical regions where the manufacturer is not offering the promotion. In both cases, the return on the manufacturer's promotion dollar is reduced. IT increasingly enables manufacturers to monitor product flow. They are using this information to structure ways of paying for promotions that reduce the retailer's incentives for forward buying and diverting. For example, the manufacturer may pay the retailer for promotions based on products actually sold to consumers on promotion, as recorded and verified by checkout scanner systems.

3.4. IT Reduces Opportunism Risk

Investment in explicit coordination has generally been viewed as idiosyncratic, involving specialized physical and human resources, hence such investments were considered to increase the opportunism risk to which the party making the investment is exposed. This risk of opportunism led to *underinvestment* or to vertical integration [49]. Underinvestment causes the firm to forgo the benefits of coordination. Vertical integration avoids the risk of opportunism and thus preserves the benefits of coordination, but generally causes the firm to forgo the benefits of procuring from an outside supplier with significant cost advantages due to economies of scale or specialization. We argue here that investments in coordination are *not* necessarily idiosyncratic, and will be even less so in the future (see also [17, 35]).

An IT investment, unlike investments in capital goods such as manufacturing equipment or physical plant, is not necessarily relationship-specific and need not be considered as "sunk" or idiosyncratic. The hardware is typically standard and rarely needs to be customized for the transaction. Further, EDI protocols are (gradually) moving to industry standards (the retail industry is one such example, see [21]), thereby reducing their relationship-specificity. For a discussion of the evolution of software and hardware standards in the computer industry towards "open systems" or common standards, see [46]. Significant improvements in communications technologies have now made possible the use of ordinary telephone lines for exchanging

information; special communication channels constructed to the supplier's or the firm's site are seldom necessary.

McKesson Drug's Economost system⁵ to support retail drug stores is an example of a system that is superbly executed, provides considerable benefit both to its developer and to its customers, and yet provides no significant change in bargaining power for either party. McKesson's customers—drug stores and pharmacies—can scan their shelves with bar code readers to determine what needs to be ordered and then place their orders electronically. Orders arrive the next day, in each customer's standard order quantities, prepriced with each customer's prices, and boxed to conform to each customer's shelf plan. McKesson itself uses the information in the orders to optimize all aspects of its own operations, from inventory management, to order packing, to distribution, and is able to offer substantial discounts for orders placed electronically. Customers thus save, both directly, in terms of prices paid, and indirectly, in terms of transactions costs associated with placing the order and managing their own inventory. Not surprisingly, the vast majority of McKesson's orders arrive electronically.

And yet it is difficult to discern any increase in bargaining power for McKesson resulting from this system. Margins are no higher than industry average, market share grew only when McKesson began acquisition of smaller competitors, and stock price has consistently underperformed all market indices [22]. This is easy to understand. McKesson has effective competitors, most notably Bergen Brunswig, whose systems are largely equivalent to its own. McKesson's customers' investment is largely transferable to use with these competitors: the systems run on standard PCs and require similar modems and data entry devices, and little retraining of pharmacy staff is required to switch from one supplier to another. The only major expense—a few hours spent replacing store shelf labels and rekeying standard prices and order quantities—is borne by the new supplier. With no sunk cost from the retailer, and thus no cost to his switching suppliers, it is not surprising that these systems do not provide the wholesaler with new economic power.

The impact of IT on the risk of loss of resource control is more ambiguous. Increasing use of IT implies that more information and expertise are represented electronically. The cost of accessing and transferring this electronic information and expertise is greatly reduced, increasing the risk of misappropriation. However, the monitoring capability of IT may also facilitate the monitoring of access to and use of information and expertise, thereby reducing this component of opportunism risk.

3.5. Reduced Need for Ownership

The combination of reduced coordination costs and operations risk and reduced opportunism risk from IT investments leads to more outsourcing: it is possible to achieve a level of explicit coordination normally associated with in-house production without an offsetting increase in transactions risk, and firms are increasingly likely to seek both the benefits of explicit coordination and the benefits of economies of scale that come from outside procurement. We argue that both the effects on coordination costs and the effects on risk must be included in analysis of outsourcing.

Figure 1A presents the base case where at the appropriate boundary of the firm the production and transactions cost of internal manufacture and outside procurement are equal. Outside procurement has lower production costs, due to economies of scale and specialization, but higher transactions costs, due to the exposure to operations risk and opportunism risk.

Malone et al. [35] argue that the ability of IT to reduce coordination costs will lead to a greater degree of outsourcing. Reduction in coordination costs alone does not explain the increased reliance upon outsourcing. Reduction in coordination costs requires investment IT; were these investments relationship-specific, as were traditional investments in explicit coordination such as specialized plant, equipment, or human resources, then increased reliance upon IT would increase opportunism risk. In fact, increasing reliance on IT and explicit coordination in such cases might be so risky that these investments were not made. Alternatively, if IT investments increased transaction risk, and yet the benefits of explicit coordination were high enough to demand that these investments be made, we might well expect increased opportunities for coordination to produce increased vertical integration, that is, a move away from the market. This is shown in figure 1B. Indeed, this was the case for the major coordination technologies developed in the late 1800s and early 1900s. As Chandler points out [11], the development of railroads and telegraph contributed to the large, vertically integrated firms that characterized the industrial revolution.

Recent trends in IT, however, enable firms to reduce coordination costs through explicit coordination *without* increasing exposure to operations risk and opportunism risk. As figure 1C shows, this favors the production cost advantages of markets.

Note that the move to outsourcing does not require elimination of transaction risk. Indeed, as we will see in the next section, interfirm relationships with high levels of explicit coordination may still involve significant investment in transaction-specific capital. All that is required for the move to outsourcing is that transaction risk is lower than the potential production economies available from outside procurement.

4. IT and the Governance Structure of Outsourcing

IT AFFECTS THE MANNER IN WHICH THIS INCREASED OUTSOURCING, discussed in the previous section, is conducted. We argued that when IT was expensive, had only limited impact on monitoring the performance of outside units, and was highly relationship-specific, firms favored in-house production and used IT investments to reduce the transactions cost of in-house procurement. IT even a decade ago shared many similarities with other investments in explicit coordination, such as specialized production equipment; in Williamsonian fashion this caused firms to refrain from making significant IT investments to coordinate with outside suppliers.

In this section, we analyze the impact on the management of outsourcing resulting from IT that is inexpensive and scale-intensive, provides an effective monitoring capability, and is less relationship-specific.

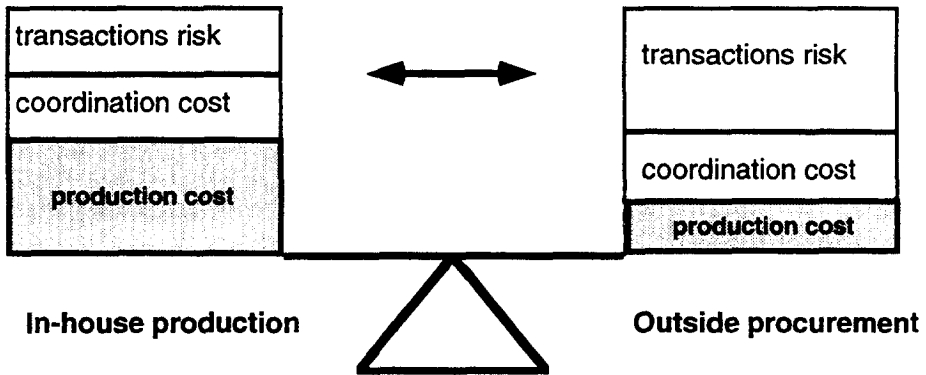


Figure 1A. The Balance between In-house Production and Outside Procurement

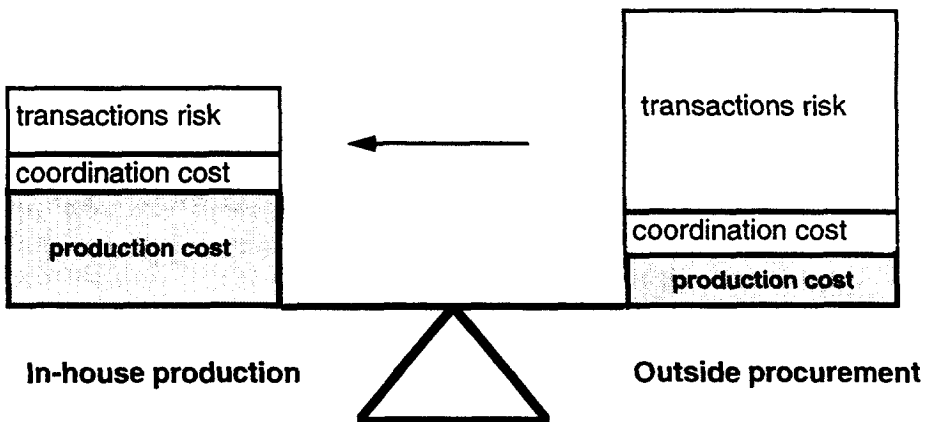


Figure 1B. Traditional Investments to Reduce Coordination Cost Increased Transactions Risk. Firms preferred to Make Such Investments In-house.

4.1. IT Investments Will Be Made with Fewer Suppliers

Coordination costs incorporate the processes of both search and explicit coordination. If IT reduces the cost of coordination, we must ask whether firms will invest more in search, or in explicit coordination. There are several reasons why firms are more likely to use fewer suppliers:

- *Transactional economies of scale.* We have argued that investments in IT for explicit coordination are becoming less expensive, and less idiosyncratic. This would seem to argue that firms will use more suppliers, not fewer. However, reducing the

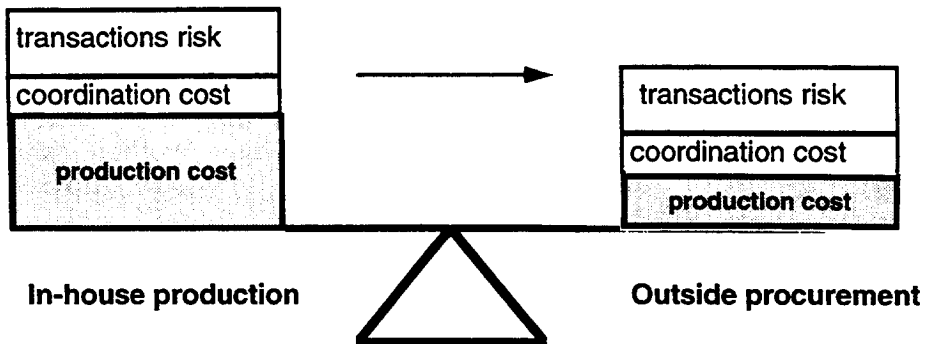


Figure 1C. Current Investments in Information Technology May Not Increase Transactions Risk. Firms Can Now Safely Outsource.

cost and the risk should lead to more explicit coordination. Indeed, there are still significant sunk costs in establishing highly integrated interorganizational relationships. Some of these fixed costs are IT-related, customizing databases and software to interact with a supplier or buyer. Perhaps more significant than IT costs are the organizational costs of establishing human relationships and business processes.

These fixed investments in the relationship create transactional economies of scale: the average cost of a transaction decreases with the volume of transactions. Thus, adding a new supplier has two effects. First, it requires a fixed investment to establish the new relationship. Second, it reduces the volume of transactions through each relationship. Both effects increase average costs and prolong the time taken for the investment in the relationship to pay off for the firm and the participating suppliers. Thus, increasing levels of explicit coordination argue for fewer suppliers on the basis of transactional economies of scale.

- *Incentives to suppliers.* Transaction-specific investment also has some incentive implications that also argue for fewer suppliers. Bakos and Brynjolfsson [3, 4] have argued that the incentive for suppliers to commit to noncontractible investments, such as quality, innovation, and information, may reduce as the number of suppliers who are entitled to share in the surplus increases. Dealing with fewer suppliers gives the suppliers an incentive to invest in such noncontractible resources since they benefit from a greater share of the surplus created by their investments.

- *Increased costs and reduced benefits of search.* Search processes reduce costs by using competition among suppliers to reduce operations risks. The idea is that the more firms search, the better the “fit” of the resulting purchase in terms of price, quality, and other key product attributes. However, search cannot reduce all operations risks. For example, it is not uncommon in many industries for contractors to “lowball” initial bids and attempt to recoup their losses through future change orders. Moreover, the efficiency of competition to reduce risk depends on comparability among suppliers—increasing differentiation of product offerings reduces this comparability, thus increasing the costs of search or reducing the benefits of search. Increasing explicit coordination can be viewed as increasing the level of differentiation of the product. Instead of being evaluated on simple price and physical product characteristics, a

supplier must be evaluated on lead time, flexibility, reliability, innovation, and value-added services. The increasing complexity of the relevant product/service characteristics inherent in increasing explicit coordination increases the cost of search. Most economic models of search are based on fixed product characteristics from which a buyer must select. The bundle of product and service characteristics inherent under explicit coordination is very different: more aspects of service become important characteristics in the selection of a supplier. These service characteristics are critical and yet more difficult to specify. For example, a company may adopt a new manufacturing process that requires components to be packed in a different way. The firm may search for a new supplier, incurring search costs, or may directly negotiate the change with existing suppliers, incurring some risk that the supplier overcharges; the latter may be less expensive, particularly for high levels of explicit coordination. The ability to customize important product or service characteristics inherent in explicit coordination decreases the benefits of search.

4.2. IT Investments Will Be Made with Long-term Suppliers

Another important dimension of interfirm governance structure that is affected by IT is the length of agreement. There are at least three reasons why IT-supported explicit coordination will be implemented with long-term suppliers rather than short-term ones.

- *Time to recoup investment.* Increasing the level of explicit coordination involves significant investment in relationship-specific capital. While IT investments are becoming less transaction-specific, they make the investment in human relationships and organizational processes more important. In order to recoup this investment the firm may wish to commit its suppliers to a long-term relationship. Similarly, to provide incentives to its suppliers to make the IT investment, the firm may agree to procure from those suppliers over an extended period of time. For example, in a study of the impact of adopting just-in-time (JIT) programs on the length of business relationships, O'Neal [39, p. 58] found that "approximately two-thirds of the respondents reported agreements of greater length (45 percent) or much greater length (20 percent). A moderate share (35 percent) reported no appreciable differences in length of agreement."

- *Learning curve effects.* There is a learning cost associated with the use of most IT systems for coordination, and indeed with all interfirm efforts at explicit coordination. Each supplier may have its own unique method of doing business incorporated into different procedures for different situations. The degree to which IT reduces the coordination cost and facilitates monitoring depends on the duration for which those systems have been used to coordinate the activities of the firm and the supplier. Long-term contracts with the same set of suppliers enables both partners to benefit from the learning curve. Switching between suppliers using short-term contracts would not allow the firm to realize the full benefit of cooperation.

- *Incentives.* Another variation of the Bakos and Brynjolfsson [3, 4] argument regarding creating incentives for suppliers to invest in noncontractible relationship-

specific resources is to provide these suppliers with long-term contracts. For example, discussing the risk of price escalation after suppliers have been selected, Treleven and Schweikhart [45, p. 100] find that “the long-term, partner relationship would motivate the vendor to charge a fair price and may even result in a price decrease.” Thomas T. Stallkamp, Chrysler’s vice president of purchasing, suggests that cooperating with suppliers is the quickest way to obtain better-quality, lower-cost parts [31].

4.3. Summary

IT can reduce coordination costs and reduce transaction risk. This runs counter to the historical implications of the organizational theory tradition; this combination of reduction of costs and risks is essential to understanding the impact of IT on the organization of economic activity. We have argued that these combined effects should lead to a greater degree of outsourcing. We have also presented some propositions about the governance structure of interfirm interactions. In particular, we predict an increase in the level of explicit coordination, which thus implies increased reliance on fewer, long-term cooperative suppliers.

5. Support for a Move to the Middle, and the Role of IT

THERE ARE NUMEROUS EXAMPLES IN THE LITERATURE regarding the increased adoption of interorganizational systems by various companies during this decade (for example, see [5, 9, 38, 40]). There is also strong evidence that EDI is fast becoming almost a prerequisite for doing business in some industries.

A limited set of supporting anecdotes clearly will not constitute statistically compelling support of our hypothesis. Of course, no amount of statistical data can ever prove the null hypothesis, but can serve only to increase our confidence in it. Similarly, while the following qualitative data do not prove our move to the middle hypothesis, they are strongly supportive both of the presence of this move, and of the critical role information technology plays in enabling it.

This work was motivated by our recent experience in diverse industries, including travel, financial services, consumer packaged goods manufacture and distribution, and manufacture of consumer durables. Firms procure more; that is, there has been a contraction in the boundary of the firm. However, this contraction has not occurred in the traditional manner, that is, through market outsourcing, as had been predicted by Malone and others. Rather, firms in many industries seem to be reducing the number of their suppliers; they are procuring from a small set of fixed value-adding partners, replacing vertical integration through ownership with virtual integration through partnership.

As reported to us by a corporate strategic planning officer at GM, General Motors, Ford, and especially Chrysler have substantially reduced the number of suppliers from whom they purchase components, while simultaneously dramatically increasing the value of parts they procure. Within GM, this change is most evident when the older North American Operations unit is compared with the newer Saturn division. Bertodo [6]

presents data on outsourcing trends in the European automotive industry between 1980 and 1990. A large number of assemblies and systems that were being manufactured in house in 1980 were being completely outsourced in 1990. The author writes (p. 43) that “the share of purchased content rose from around 50–55 to 60 percent or more in the decade. Established trends suggest an even higher level in the future.” In a study of U.S. and Japanese automobile firms in 1990, Cusumano and Takeishi [20] find that the U.S. firms were moving toward many of the practices typically associated with Japanese firms, including a longer-term business relationship with a reduced set of suppliers. Bertodo [6] gives an example of an auto company that reduced its supplier base from over 1,500 in the 1970s to about 300–350 in the 1990s. He believes that this is indicative of the trend of a rationalization of the supplier base in the auto industry.

The automobile manufacturers were among the first to adopt interorganizational information systems. Initially, the big three auto companies had their own unique standards for data interchange, requiring their suppliers to invest in these different standards in order to do business with these companies. These standards were gradually made common to encourage the widespread acceptance and use of electronic data interchange (EDI) by their suppliers. Though it would be impossible to establish that the increased outsourcing described earlier was caused by the increasing use of IT to coordinate with suppliers, these two trends clearly have a strong correlation in the auto industry.

Boeing automated the routine aspects of its purchasing activity by implementing a system called PCOS (Purchase Control On-Line System) which essentially provided order processing, accounts payable, improved visibility of supplier prices, and so on [42]. The next phase of the IT project was to link up PCOS with EDI to coordinate directly with Boeing’s primary suppliers. According to Riggins, the management at Boeing “hoped that Boeing could use the networking concept to form stronger long term relationships with key suppliers and actually reduce the number of suppliers. The term ‘trading partner’ was used to designate those long term suppliers and was defined as a customer or supplier with whom Boeing had established a ‘long term business relationship, and had both agreed to conduct business transactions and communications electronically’ ” [42, p. 12].

We explore two detailed situations that support our analysis and highlight IT’s role in causing firms to “move to the middle.”

5.1. A Move to Cooperation in ATM Networks

The development of ATM networks is driven by economies of scale in software development and by participation externalities in shared networks: the more banks that join a network, the more complete the network’s coverage, the more attractive the network becomes to banking customers, and hence the more attractive the network becomes to unaffiliated banks. Ultimately, networks may achieve a monopoly position as the only provider of ATM service in a state or larger region. Scme, like Philadelphia’s MAC, do so despite the fact that they are owned by a single bank, which thus enjoys a position as a monopoly provider of essential services to

competitors. The MAC⁶ experience can only be understood in light of the use of information technology:

- Since the data are entered by customers in electronic form and shared with the ATM processor through standard interfaces, the cost of coordination among banks is low.
- Since interfaces used to communicate with MAC are standard, and are common among all participating banks, the cost to major banks to switch and share data directly among themselves would be minimal. Major banks in fact made contingency arrangements for this when MAC achieved its monopoly status. Thus, the technology also reduces the risk of opportunistic renegotiation of prices, even in a monopoly setting.
- Banks are able to monitor MAC's availability for themselves and for MAC's owner, Philadelphia National Bank / Core States Financial. This prevents differential performance or operations risk; in fact, MAC assures its banks that if the network is unavailable to their customers, it will be unavailable to its owner's customers as well.
- Banks are able to control carefully and completely, through the design of ATM hardware and interfaces, the information on their customers that is shared with MAC. Thus, while MAC must necessarily be able to access and to modify customers' banking balances at the time of ATM transactions, the design of electronic interaction with customers prevents their learning customers' names or other personal identifying information. This effectively precludes poaching: MAC does not have enough information to solicit business from competitors' best and most profitable customers, even though it is well able to identify at least some of them by card number and account.

This clearly represents coordinated outsourcing and virtual integration. Numerous banks exist in Pennsylvania and continue their separate retail banking operations; however, all ATM operations have consolidated into a single ATM network. ATM operations also illustrate a stable partnership, rather than a series of one-off transactions buying ATM network services; even when there were competing ATM operations in Philadelphia, there were no instances of banks switching their ATM network affiliations.

5.2. A Move to the Middle at Rosenbluth International

Rosenbluth Travel⁷ is a century-old agency, which has grown from a regional player with \$10 million in annual sales in 1980 to a multibillion dollar international mega-agency. With almost 500 offices in the United States, and an even larger network of offices abroad, Rosenbluth is positioning itself to compete with established worldwide mega-agencies like American Express and Thomas Cook. Rosenbluth clients get the same service anywhere in the world: the local agent has access to the customer's full itinerary so that a traveler who originated in Philadelphia and flew to London, but now needs to delay his departure from London to Los Angeles, will find that when he

changes his departure from London his hotel and rental car reservations are updated as well. Moreover, the London agent has access to detailed information on the individual traveler's preferences for carriers, seating, and meals, and access to his company's travel policy concerning class of service. Rosenbluth's U.S. offices are able to provide comparable service for travelers originating in Paris, Rio, or Tokyo. Agents are located in over forty countries. Information is additionally consolidated globally for corporate expense management and reconciliation, and for rate negotiations with airlines and hotels. Quality of service and interoffice integration appear seamless.

Surprisingly, this is accomplished through a network of cooperating independent offices, the Rosenbluth International Alliance (RIA). Rosenbluth Travel in the United States provides the necessary software to all members of the Alliance and has supervised the necessary revisions to airlines' reservations systems software. However, members of the alliance are fully independent, often leading agencies in their home markets, and are neither owned nor franchised by Rosenbluth Travel.

There are considerable risks associated with this strategy for achieving globalization. Although interregional travel accounts for about a third of an agency's activity, it represents more than half of billings. Moreover, it also represents client organizations' most senior personnel; thus, inferior service through international affiliates could jeopardize not only international business but the entire account. A well-chosen foreign affiliate, with significant market share and considerable local expertise and bargaining power, is well positioned to provide quality service. However, without systems for integration and monitoring, this strategy would have been impossible.

It is clear that this represents an extreme form of outsourcing. Members rely upon others for the entirety of the nondomestic service for some of their key clients. It is also clear that the necessary systems investments would not be made for all potential service providers; moreover, the critical nature of the service requires that a limited number of partners be selected and that relationships and trust be nurtured. Consequently, the RIA has only one member in each country. We call this extreme form of partnership the "electronic global virtual corporation" [14].

5.3. Future Empirical Research

In this paper we have attempted to provide theoretical argument, accompanied by some qualitative evidence, to support the "move to the middle" hypothesis. The hypothesis is sufficiently important to justify a rigorous empirical examination to test its validity.

To examine empirically the validity of the "move to the middle" hypothesis, we need to identify the conditions under which we can expect to observe the predicted effect. Since the primary argument presented in support of the hypothesis involves the ability of IT to lower coordination costs without an offsetting increase in risk, we need to identify situations in which the coordination cost and the operations risk are

significant. The following factors are known to have a demonstrable impact on transactions cost:

- Specification complexity of the product (e.g., [36])
- Demand uncertainty of the product (e.g., [48])
- Measurement difficulties associated with the product (e.g., [2]).

As argued in [15], these characteristics of the product and its environment increase the coordination cost and the operations risk associated with transacting for the product. Not surprisingly, there is significant empirical evidence to suggest that firms are likely to produce complex products with uncertain environments in house rather than by outsourcing (for example, [2, 29, 36, 37, 48]).

Given that environmental uncertainty and some product attributes increase transactions cost, the ability of IT to reduce transactions cost will be more readily observed in situations where these are significant. Since it is generally believed that these transactions cost are higher for outsourcing than for in-house production [49], we should observe a larger “move to the middle” effect for complex products in highly uncertain environments. We have developed specific hypotheses based on this reasoning to provide a framework in which to test the move to the middle hypothesis [15].

We are currently testing the “move to the middle” hypothesis using a questionnaire consisting of different scenarios. Scenarios differ in one or more of the important factors such as the sophistication of the IT in use and the complexity of the product. The respondent answers questions at the end of each scenario regarding the manner in which the respondent’s firm would procure the product in the situation described in that scenario. The variation in the answers provided for different scenarios will allow us to examine whether the predicted effect of IT is accurate. The respondents are the purchasing managers in large manufacturing organizations.

Scenario analysis was selected due to the difficulty of obtaining reliable historical data on the procurement practices of firms ten to fifteen years ago and the business context in which those procurement practices were adopted. The scenario approach enables us to control the business context, highlighting the effects of the key variables of interest. The scenario analysis will be accompanied by follow-up interviews with the purchasing managers to assess the significance of any changes in the procurement practices and whether these changes may be expected to continue in the predicted direction.

6. Conclusions and Unresolved Issues

OUR ANALYSIS CAN BE RESTATED IN SLIGHTLY DIFFERENT FORM, as follows:

- Explicit coordination has traditionally led to significant transaction risks. Information and information processing capacity was not available for monitoring the additional operations risks created through increased integration and interdependence of operations. Moreover, explicit coordination was typically accomplished through physical and human resources that were relationship-specific, increasing the threat of opportunistic renegotiation [30]. These factors have led to substantial Williamsonian

underinvestment in explicit coordination [49], and to increased reliance on vertical integration when explicit coordination has been necessary [19, 49].

- IT can reduce the costs of explicit coordination. More importantly, it can reduce the transaction risk by improving monitoring and reducing the relationship specificity of investment in explicit coordination. This should lead to more outsourcing as firms are able to realize the production economies of outside suppliers and the efficiencies of explicit coordination without incurring prohibitive transaction risks.

- IT should lead to increased attractiveness of explicit coordination over search in managing interfirm relationships, leading to lasting value-adding partnerships with a reduced set of preferred suppliers. We argue that this effect will be strongest for outsourcing those activities where the imperative for explicit coordination has already been established by organizational evolution. But we also expect the effect in many situations where the interaction is already governed by market mechanisms.

The following research issues remain:

- What are the implications for productivity?
- What are the factors complicating a strategic partnership?

6.1. Implications for Productivity

The use of outside suppliers, enjoying economies of scale and specialization, should result in reduced cost and improved quality of components. Transactions costs, particularly the transaction risk of opportunistic renegotiation and operations risk, have historically limited this. Increased outsourcing from a preferred set of suppliers should improve productivity; this should be a major motivator of increased outsourcing. An investigation of industries in which this trend is occurring, especially the automobile and electronics industry, may provide empirical support. Anecdotal support of strong improvements is appearing in the popular press [47].

6.2. Complicating Factors

It would be wrong to assume that global cooperation and coordination will proceed smoothly, simply because there are good economic reasons to rely upon cooperative efforts and because information technology makes such cooperative efforts more effective and less risky. The following complicating factors will remain critical, and will need to be managed:

Human factors: Ultimately, cooperation among organizations is determined by people, not technology. While technology can facilitate coordination, monitoring, and control in partnerships, and can reduce the risk of strategic reliance upon relationships, it is ultimately the trust among partners that determines the success or failure of partnerships. Successful cooperation requires careful selection of partners with similar culture and similar objectives for the partnership. It requires that each party have unique resources of critical importance to the success of the joint operations, so that each

party will need the other; partnerships motivated solely by access to capital are unlikely to prove stable. Most importantly, success requires that actions be taken regularly to develop and retain confidence among the personnel of cooperating organizations.

Different objectives, different performance measures, and incentive structures: Different objectives for their own organizations are likely to result in different expectations for the partnership, which can in turn place intolerable strain upon cooperation. This can be exacerbated by national differences. One party may intend to develop market share, leading to improved operating expense and long-term profitability; another party may need to show investors an immediate payoff from the cooperative venture. Such differences are likely to result in different performance measures and incentives for employees of the two organizations, and thus to actions by each party that the other views as counterproductive at best, and as betrayal of the partnership at worst. Without actions to improve and maintain personal contact and trust, this is likely to place intolerable strain upon the partnership.

Different traditions: It is likely that both partner organizations will have pride in their traditions, culture, and corporate history. Cooperation, and acknowledgment of the different objectives of partners, will on occasion require that the traditions of one organization be subordinated to those of the other. Again, without actions to improve and maintain personal contact and trust, this is likely to place intolerable strain upon the partnership.

NOTES

1. The term "component" here refers to both a physical component of a product as well as a component of a service activity.

2. This is slightly different from the decomposition of transactions costs presented by Clemons and Row [17]. That earlier work uses the following decomposition:

$$\begin{aligned} \text{Transactions cost} &= \text{coordination cost} + \text{transactions risk} \\ \text{Transactions risk} &= \text{transaction specific capital} + \text{information asymmetry} + \text{loss} \\ &\quad \text{of resource control.} \end{aligned}$$

Transaction-specific capital and loss of resource control are subsets of "opportunism risk"—the other portion of opportunism risk is from small numbers bargaining. Information asymmetry can lead to "shirking," which is the operations risk here. But operations risk can arise even without the existence of information asymmetry and hence this may be treated as a subset of operations risk.

3. We do not use the standard terms, markets and hierarchies, here, since they denote ownership structure. The characteristic of governance structure to which we refer here applies equally to inter- and intrafirm interactions.

4. The material for the argument here is based on information provided in Clemons and Weber [18].

5. The material for the argument here is based on information provided in Clemons and Row [16].

6. The material for the argument here is based on information provided in Clemons [13].

7. The material for the argument here is based on information provided in Clemons et al. [14].

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