The Role of Information and Opportunism in the Choice of Buyer-Supplier Relationships

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ABSTRACT

An important characteristic of any buyer-supplier relationship is the amount and type of information that is exchanged between the contracting parties. Buyer-supplier networks are characterized by greater information exchange than arm's-length transactions. This enhanced information exchange allows for greater production efficiency but increases the potential for information misappropriation. In this paper we characterize the set of innovations for which each of these forms of exchange relationships is efficient. We then explore the effect of an initial information linkage between the buyer and supplier. Such linkages increase the set of innovations for which networks are efficient. However, such linkages have a negative effect on the buyer's incentive to innovate and an ambiguous effect on the supplier's incentive to invest in flexible production techniques. Finally, we identify settings in which the buyer-supplier surplus is greater with such linkages.

1. Introduction and Literature Review

An important decision made by a potential buyer and supplier is the manner in which they choose to organize their exchange. As Williamson [1975; 1986] notes, different types of buyer-supplier relationships can be viewed as different points on a continuum between markets and hierarchies. As a result, there is no "bright line" clearly distinguishing one exchange relationship from another. However, there are certain characteristics that one relationship may have more of than another. For example, relative to an arm's-length relationship, firms that are part of a buyer-supplier network exchange more information (e.g., about product design, production process, and demand forecasts). Further, the information is often proprietary and tends to be exchanged earlier in the design and production phases. This information exchange enhances efficiency by allowing more innovations to be incorporated earlier into the product design and production process, thereby enabling the firms to more rapidly respond to market and technology changes. The auto manufacturers were among the first in the U.S. to emphasize the use of networks. Since then, the computer and electronics industries have become intensive users of buyer-supplier networks.[1] A more recent example is e-commerce firms, which, because of their perceived need to bring their products and services to the market quickly, often outsource their back-office, production, order-fulfillment and other activities to their network partners.[2]

While the greater and earlier sharing of information associated with network relationships enable enhanced speed-to-market and greater efficiency, an obvious cost is the additional cost of information transfer. But there is another, potentially more important, cost inherent in this information transfer, which though noted, has not been systematically studied—the firm providing the information is potentially putting itself at a disadvantage if the receiving firm can misappropriate the information. Clemons and Hitt [2000] notes that the potential for this information misappropriation "...is especially important for e-commerce businesses ... that must rely on outside service providers for many operational functions. While this cooperation is essential for rapid market entry by firms...this cooperation itself opens these firms up to exploitation as a result of the transfer of information" (p. 2–3). Further, Clemons and Hitt [2000] notes that with e-commerce businesses, the value to the information recipient from misappropriating the information can easily exceed the entire value of the contract with the information provider.

The objective of this paper is to better understand the productive efficiency/opportunism trade-off involved in choosing between organizing an exchange as an arm's-length relationship versus a network. As noted before,

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[1] An important part of Dell's and Cisco's manufacturing strategies is their use of buyer-supplier networks.

[2] See Clemons and Hitt [2000].

these two types of relationships differ in *degree* over many dimensions such as: information exchanged, level of explicit coordination, anticipated duration, etc. We restrict our attention to the dimension most often used to highlight the difference between these two relationships—the extent of information sharing (see Byrne [1993] and Templin and Cole [1994]). In arm's-length transactions, the contracting parties exchange minimal proprietary information whereas in networks, the contracting parties exchange a significant amount of proprietary information. Thus, at the risk of somewhat exaggerating the distinction, we will say that an arm's-length relationship exists if no information is exchanged and a network relationship exists if information is exchanged.

To conduct this analysis, we examine the choice of exchange relationship between an asymmetrically informed buyer and supplier in a noncooperative setting with incomplete contracting. We assume asymmetrically informed firms because the exchange of information is only meaningful when firms are differentially informed. We employ a noncooperative setting because firms do not give up their self-interested behavior merely as a result of entering into a network. Further, the opportunistic use of information only makes sense in such a setting. Finally, we assume a world of incomplete contracting. While this assumption is contrary in spirit to the usual contracting models analyzed in the accounting literature, our view, supported by survey studies (e.g., Clemons and Hitt [2000] and especially those which have examined the Japanese auto industry, e.g., Dyer [1997] and Taylor and Wiggins [1997]) and anecdotal evidence discussed later, is that contracting on the exchange of complicated, technical, and proprietary information (such as the results of R&D) or on its subsequent use by the recipient, is problematic. Such contracting would require that the important characteristics of the information and the potential ways in which it might be misappropriated be specified ahead of time and amenable to monitoring.[3] Further, our incomplete contracting assumption allows us to more clearly analyze the determinants of the productive efficiency/opportunism trade-off and highlight the determinants of the demand for mechanisms that might mitigate the threat of opportunism (such as those which make the set of contractible information larger).

The extent to which information sharing takes place in an exchange relationship will depend upon how the asymmetrically informed players bargain over any efficiency gains from the sharing of the information. There are relatively few papers in the accounting literature that model bargaining under asymmetric information. Two papers that do so are Vaysman [1998] and Baldenius [2000]. Both of these papers exploit the fact that the negotiations are conducted by two divisions within the same firm in that the contracting parties simultaneously submit messages to a third party (corporate

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[3] As Tirole [1999, p. 741] points out, "Almost every economist would agree that actual contracts are or appear quite incomplete."

headquarters), which then implements a decision rule. Our model is different in that the negotiating parties are independent. Therefore, utilizing a third party to whom messages are transmitted and who implements an allocation rule is not realistic in our setting.

Our work is related to the subset of the information systems literature that studies the effect of information technology on the design of relationships.[4] Most closely related to our work is that of Clemons and Hitt [2000], who also study the misappropriation of information. Our work differs from the latter in that we study the effect of information transfer (and misappropriation) on the investment behavior of the parties involved and more formally model and analyze the parties' exchange relationship choice problem.

The question addressed here is similar to that addressed in the patent race literature.[5] In that literature, two firms compete to develop and bring to market a product (e.g., a drug). One of the firms is better informed and must decide whether to share its better information with the competitor and, if so, how to structure the contract so as to share in the benefit if the latter wins the race. Our model differs from the patent race literature in a number of ways. First, in that literature one party is usually exogenously assumed to be better informed, whereas in our model, the informed party's level of knowledge is a result of an earlier investment decision. Second, in the patent race, ignoring the effects of contracting, only the first party to develop and market the product makes any profit on the information. In our model, both parties can profitably use the information. Third, and most important, the models differ with respect to what is assumed to be contractible. In the patent race literature, the winning of the patent race and the benefit from winning the race are both contractible events. That is, its discoverer can patent the innovation and can preclude others from exploiting the idea. Further, the better-informed firm can design a contract that will allow him to extract some of the surplus created by sharing his information. In reality, patents are difficult and costly to defend and can often be circumvented. Therefore, in our model, we assume that the misappropriation of information by the recipient cannot be legally prevented and that his benefit from the misappropriation cannot be contracted on.

Finally, one of the issues addressed by our model is how much information the informed party should disclose to his uninformed partner in the network. Therefore, our model is related to the literature on voluntary disclosure in accounting.[6] However, that literature usually examines the indirect effects of disclosing information to the financial market, while we are concerned with the direct effects of disclosing information to a network

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[4] See, for example, Clemons, Reddi and Row [1993] and Banker, Kalvenes, and Patterson [1996].

[5] See, for example, Aghion and Tirole [1994], Bhattacharya, Glazer, and Sappington [1990], and D'Aspremont, Bhattacharya, and Gerard-Varet [2000].

[6] Theoretical papers in this body of work include Darrough and Stoughton [1990], Dye [1985], Verrecchia [1983], and Wagenhofer [1990].

partner. Further, the disclosure literature typically ignores the role of bargaining in influencing the disclosure decision, while our model explicitly studies the role of bargaining.

The paper is organized as follows. In section 2, we describe and motivate the basic model. We then examine the inefficiency introduced into the exchange relationship by incomplete contracting and asymmetric information. In section 3, we expand the model to allow for pre-existing information linkages between the buyer and supplier. In section 4, we allow for partial disclosure by the buyer. We conclude in section 5.

2. The Basic Model

2.1 GENERAL DESCRIPTION OF PROBLEM

In this subsection we describe the basic model in general and then motivate it with some examples. In the next subsection we describe the basic model in more detail.

We assume a one-period world in which there is a buyer and a supplier. The buyer sells units to the market, which it must first purchase from the supplier.[7] The price per unit at which the buyer can sell the units to the market depends upon their quality. The supplier can always produce and transfer to the buyer, and the buyer can always sell to the market, units of some minimum quality, referred to as the default quality. However, as a result of the buyer's R&D investment, with some probability the buyer will uncover an innovation. This innovation reveals a new technology which, if communicated to and incorporated by the supplier, will result in a higher quality unit being manufactured by the supplier and sold to the buyer.[8] The cost to the supplier of adjusting his production process to incorporate the innovation and to produce these higher-quality units depends upon an investment made by him earlier in the game. The buyer can sell these better-quality units to the market for a higher price per unit. However, if the buyer discovers an innovation and communicates it to the supplier, the latter can misappropriate the information and use it for himself, to the detriment of the buyer. Neither the supplier's act of misappropriating the information nor the benefit to him from such misappropriation is a contractible event.

The buyer, therefore, has two alternatives after observing an innovation: don't disclose it to the supplier and order units of the default quality,

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[7] We do not attempt to explain the outsourcing or firm boundary decision (see Coase [1937]). Rather, we exogenously assume that the product must be produced by the supplier and that the supplier is not as efficient as the buyer in marketing the finished good. Further, while allowing for a finitely repeated game might improve the efficiency of the buyer-supplier relationship, it would not eliminate the inefficiency which we are interested in studying.

[8] As noted by Fitzgerald [1998], one of the major goals of buyer-supplier networks is to provide an environment in which the buyer actively helps the supplier to improve product quality.
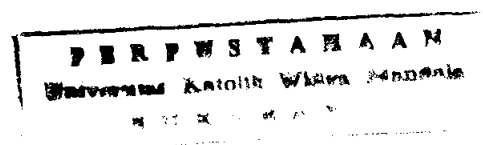
or disclose the information and possibly have the supplier misappropriate the innovation. We interpret the first alternative as the buyer deciding to engage in an arm's-length transaction with the supplier. We interpret the second alternative as the buyer deciding to disclose the information and form a network with the supplier. Our interest is in determining which innovations will be shared (or equivalently, for which innovations the buyer will choose an arm's-length relationship or a network relationship with the supplier); the distortions to the buyer's and supplier's investment decisions arising from the possibility of misappropriation; and the impact of pre-existing information linkages on these two issues.

Firms that design but outsource the production of key inputs of their product face the situation we model.[9] In our model, the buyer (the informed party) must convey information to the seller (the uninformed party) before the network or alliance can even be negotiated and established. Thus, the seller has the chance to misappropriate this information without first entering into the network relationship. For example, in a recent lawsuit, Endo Pharmaceuticals alleges that Watson Pharmaceuticals "... stole trade secrets [which were exchanged] *during failed negotiations over a possible alliance*" (Warner [2001], p. C1, emphasis our own). As another example, in a recent patent infringement suit filed by Abbott Laboratories against Children's Hospital of Boston and EntreMed, Abbott claims that a cancer-fighting discovery it made and communicated to Children's Hospital was subsequently patented by Children's Hospital and licensed to EntreMed (Arney [2000]). Of course, the information can be exchanged, the network established, and the party to whom the information is transmitted can subsequently misappropriate the exchanged information. For example, in 1982, Intel licensed its 8086 technology to AMD in order to outsource part of the production of that chip. AMD was able to use the knowledge gained from the licensed technology and this production experience to later design and build a clone of the 8086 and, still later, develop its own competing technology. These three examples arose because of the inability of the parties to contract on the information exchanged or on Watson's, Children's Hospital's, and AMD's subsequent use of the information.

There are several ways in which network partners currently deal with potential information misappropriation. The supplier may agree to not produce products that compete with the buyer's, although this reduces the

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[9] For example, Ericsson recently decided to outsource the production of its mobile phones to Flextronics, while still designing the phones inside. As stated by Kurt Hellstroem, Ericsson's chief executive, "It is important for us to have an influence over handsets ... We don't need to manufacture them, but it is important for us to continue to develop them." (Kapner [2001]). Flextronics will also manufacture the new Microsoft-designed X-box video game machine (Markoff [2001]). As a final example, much of the design work and marketing in the computer chip industry is done by one group of companies while the manufacturing is done by another (the so-called chip foundries).

efficiency of the supplier by reducing the supplier's economies of scale. The supplier may set up so-called "firewalls."[10]. The supplier may sign a nondisclosure agreement or the buyer may patent the proprietary information. Clearly, to the extent that property rights over information can be easily enforced or the supplier's use of the exchanged information can be directly monitored, the misappropriation of shared information would not be a problem. However, the examples quoted above illustrate that the ownership of complicated technical information shared between parties can be very difficult to establish and difficult to trace. Further, if the supplier can misappropriate just parts of the buyer's innovation, a setting that is entirely consistent with our model, enforcement of the buyer's ownership right to the information becomes even more difficult. The most basic way for the buyer to control the misappropriation of its information is to restrict what information it discloses to the supplier. That is, the buyer may forego the efficiency benefits of disclosing its proprietary information in order to avoid the cost arising from the supplier's opportunistic behavior. It is this trade-off that is the object of our analysis.

2.2 BASIC MODEL FORMULATION

In our model, the buyer invests in his R&D process (at cost $C(p_b)$), which determines the probability, p_b, of his uncovering some innovation. Conditional on an innovation occurring, the quality of the innovation (v_b) has a known and exogenously given continuous probability distribution ($F(v_b)$) and density ($f(v_b)$), which is independent of the amount invested. The support of v_b is the interval $[\underline{v}, \bar{v}]$. Again, recall that the innovation represents new technology that, if exploited, results in units being produced which are of higher quality than the default quality units. For reason of tractability we represent the results of this technology as a scalar, v_b. The buyer privately observes whether an innovation occurs and its value. If no innovation occurs (with probability $1 - p_b$), or if an innovation occurs (with probability p_b) and the buyer chooses not to share that knowledge with the supplier, the latter can only produce units of default quality v, referred to as the default quality, where $v < \underline{v}$.[11] The buyer can sell these units for a per-unit price of v. We assume that it is not profitable for the supplier to sell default quality units directly to the market.

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[10] Continuing our earlier example, Flextronics will soon manufacture the mobile handsets of both Motorola and Ericsson. As each customer's handset reflects its own technology and design, both Motorola and Ericsson are justifiably concerned about Flextronics opportunistically leaking this proprietary information to the other customer. To assuage these fears, Flextronics has promised to protect both Motorola and Ericsson by, for example, producing each customer's handsets in a different factory (see Markoff [2001]).

[11] We model the innovation process this way because in most R&D processes there is always a significant probability that nothing will be found. Further, even when a discovery is made, it is only those whose value is above a given threshold (i.e., $v_b > \underline{v}$) that make it out of the labs. Finally, with some additional assumptions, our main results continue to hold even if the choice of p_b affects both the probability of an innovation and the size of the innovation.

If an innovation of quality v_b occurs and the buyer shares that innovation with the supplier, the supplier can produce units of that quality for the buyer, which the latter can then sell to the market for a price per unit of v_b. Alternatively, the supplier can produce units of quality v for the buyer, which the latter can sell for v per unit. For simplicity, we assume that the buyer can market either v units or v_b units, but not both. The final alternative available to the supplier is to misappropriate this information by producing and selling units of quality v_b directly to the market at a price per unit of αv_b, where $\alpha < 1$.[12]

The value to the buyer of revealing the innovation to the supplier is that the supplier can adjust his production process to produce units that take advantage of the innovation. We assume that this value arises only if the supplier is able to *perfectly match* the production process to the innovation. If the buyer truthfully reveals the information and the supplier adjusts the production process, the buyer's revenue per unit exchanged is v_b. If the buyer lies and the supplier adjusts the production process based on the misinformation, the buyer's revenue per unit exchanged is zero. There is no value to the buyer from falsely revealing an innovation to the supplier—it would only result in incorrect products being produced. Therefore, the buyer's choice is to honestly reveal the innovation or claim that no innovation occurred.[13]

Because the realized innovation is privately observed, its realization is not contractible information. Further, because of the inherent complexity of the innovation, we assume that the innovations are ex ante not describable, and hence, messages about *potential* innovations are also not contractible.[14] Therefore, any agreement between the buyer and supplier to supply units of some quality v_b, other than the default quality, can only be negotiated *after* the buyer has privately observed the innovation and communicated it to the supplier.[15] Hence, whether the negotiations occur after the buyer has disclosed nothing or after the buyer has disclosed the innovation, in

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[12] Because the supplier is not in the business of selling the units to the buyer's customers, it is reasonable to assume that he will not be as efficient as the buyer in doing so, hence $\alpha < 1$. Another interpretation of α is that the supplier is producing a specialized part that the buyer will combine with other parts that the latter will manufacture. If the supplier sells this specialized part to someone other than the buyer, its value will naturally be less as reflected by α. Our model is also consistent with the supplier selling the revealed information to others, rather than producing units of v_b himself.

[13] In section 4, we analyze an extension of this model in which the buyer can make partial, yet valuable disclosures of innovations.

[14] The type of information with which we are concerned is complicated, multi-dimensional, and hard-to-describe ex ante, technical information. For example, it concerns innovations which affect the production possibility set. It is these characteristics which make it difficult to contract on and difficult to monitor the supplier's use of information (see Hart and Moore [1999]). However, for reasons of tractability, we are modeling the information as a scalar variable.

[15] This assumption with respect to information contractibility is standard in the property rights/incomplete contracting literature (see, for example, Hart [1995]).

both cases the negotiations will be between effectively symmetrically informed parties.[16] We therefore assume that the outcome of the negotiations conforms to the Nash bargaining rule.[17] Finally, the supplier's act of misappropriating the information is not contractible.

At the start of the game, the supplier's production process can only produce units of the default quality v. The variable cost of producing q units of the default quality is $\frac{1}{2}K_v q^2$. If the buyer observes innovation v_b, shares the information with the supplier, and the supplier decides to produce units of that quality, the latter has to incur a cost to adjust the production line to do so. The size of this fixed adjustment cost is given by $S(I, v_b)$ and is determined by an investment, I, made by the supplier at the start of the game. We assume that $S_I < 0$ and $S_{II} > 0$, where the subscripts represent partial derivatives. Once the fixed cost is incurred, the variable cost of producing q units of any quality v_b is given by $\frac{1}{2}K_x q^2$.[18] All investments are jointly observable but none are contractible.

2.3 ANALYSIS OF THE BASIC MODEL

We begin by analyzing the incentives of the buyer and supplier in this base model. To do so, we employ a backward induction approach, first analyzing the bargaining outcomes that would result in various contingencies. We then use these outcomes to derive the buyer's disclosure and relationship choice strategy and use that in turn to solve for the up-front investments by the buyer and supplier.

Consider the situation in which the buyer has generated an innovation, v_b, and is contemplating his options. He can either disclose the true innovation to the supplier and bargain over the relationship or disclose nothing to the supplier and form an arm's-length relationship. In the absence of any relationship agreement, both parties obtain nothing. With no disclosure but an agreement to form an arm's-length arrangement, they can produce and transfer the optimal no-innovation quantity, q^{no}, of default quality v, for sale by the buyer to the market. This quantity is given by:

$$\underset{q}{\text{Max}}\ vq - \frac{K_v}{2}q^2 \Rightarrow q^{no} = \frac{v}{K_v}.$$

The total surplus generated in this event is $\frac{v^2}{2K_v}$, and given the Nash bargaining solution, the buyer and seller each obtain half of this amount; i.e., the

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[16] If the buyer discloses nothing, his private information is irrelevant to the bargaining process and, therefore, the parties are effectively symmetrically informed.

[17] While the Nash bargaining solution is one of the standard bargaining models, it is not without loss of generality. For a discussion of the qualitative effects of using different bargaining models and the different representations of outside opportunities inherent in these alternative bargaining models, see Hart [1995] and De Meza and Lockwood [1998].

[18] The assumption of quadratic cost functions is made for tractability and allows us to identify an interior optimum for the output quantity. Alternatively, we could assume a linear cost function and a market price that declines in output to obtain similar results.

buyer's utility as a result of choosing an arm's-length transaction and not disclosing any information is $\frac{v_b^2}{4K_v}$.

On the other hand, suppose that the buyer honestly reveals the innovation v_b to the supplier in anticipation of forming a network with the latter and incorporating the innovation into the product exchanged between them. In this case, the buyer's status quo subsequent to disclosure (i.e., his no-agreement utility) is again zero.[19] The supplier, however, can *unilaterally* misappropriate the revealed technology to supply the external market on his own. His optimal (misappropriation) quantity choice, q^{alt} is given by:

$$\underset{q}{\text{Max}}\, \alpha v_b q - \frac{K_x}{2}q^2 - S(I, v_b) \Rightarrow q^{alt} = \frac{\alpha v_b}{K_x}.$$

This implies a status-quo (i.e., no-agreement) profit to the supplier of $\frac{\alpha^2 v_b^2}{2K_x} - S(I, v_b)$.[20] By reaching agreement and entering into a network relationship, the buyer and supplier can instead produce the optimal quantity, $q^*(v_b) = \frac{v_b}{K_x}$, leading to a joint surplus of $[\frac{v_b^2}{2K_x} - S(I, v_b)]$.[21] The Nash bargaining solution implies that the buyer's utility from disclosing and entering into a network relationship is his no-agreement profit plus one-half of the additional surplus created by reaching an agreement and entering into a network relationship, or,

$$0 + \frac{1}{2}\left[\frac{v_b^2}{2K_x} - S(I, v_b) - \left(\frac{\alpha^2 v_b^2}{2K_x} - S(I, v_b)\right)\right] = \frac{v_b^2(1 - \alpha^2)}{4K_x}.$$

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[19] The specification of the buyer's no-agreement utility as zero is without loss of generality. Our results depend on the fact that the buyer's no-agreement utility is the same whether he discloses information or not, not that this utility is assumed to be zero. This no-agreement utility is the buyer's threat point for the Nash bargaining game that he will play with the supplier. As Binmore, Rubinstein and Wolinsky [1986] notes, the "precise meaning of s^0 [the disagreement point] in Nash's model is somewhat vague." (p. 177). We interpret the threat point as what the buyer can do unilaterally, that is, without an agreement.

[20] We will assume that $\frac{\alpha^2 v_b^2}{2K_x} - S(I, v_b) > 0$ so that the misappropriation of the information is a viable strategy for the supplier. Recall that the supplier's no-agreement or threat point is based on what the supplier can do *unilaterally*. Therefore, the threat point cannot involve producing for the buyer.

[21] Recall that the buyer cannot market both v units and v_b units. If the buyer generates an innovation and shares it with the supplier, the latter has four alternative courses of action: (1) produce v_b for the buyer and v for himself and sell the latter to the market on his own; (2) produce v for the buyer and produce v_b for himself and sell the latter on the market for αv_b; (3) produce v_b for the buyer and himself; and (4) just produce v_b for the buyer. Alternative (1) is ruled out by our earlier assumptions that it is not profitable for the supplier to sell the default quality product on his own. Further, if the innovation v_b is such that the supplier would choose the second alternative, the buyer has no incentive to reveal the innovation to him. Hence, for those v_b realizations for which the supplier would choose alternative (2), the buyer will not reveal the innovation. Finally, alternative (3), which is predicated on the buyer and supplier coming to an agreement, would not be profitable because the buyer can always generate more revenue per v_b unit than can the supplier. Therefore, the joint surplus from the buyer disclosing the innovation and the parties coming to an agreement is computed only for those innovations for which alternative (4) holds.

The supplier's utility is

$$\frac{\alpha^2 v_b^2}{2K_x} - S(I, v_b) + \frac{1}{2}\left[\frac{v_b^2}{2K_x} - S(I, v_b) - \left(\frac{\alpha^2 v_b^2}{2K_x} - S(I, v_b)\right)\right]$$

$$= \frac{v_b^2(1 + \alpha^2)}{4K_x} - S(I, v_b).^{22}$$

The supplier's bargaining weight depends upon his no-agreement profit, $\frac{\alpha^2 v_b^2}{2K_x} - S(I, v_b)$, which, in turn, depends on α. The larger α, the larger is the supplier's share of the surplus created by forming a network.

A comparison of the buyer's utility with and without disclosure immediately yields the following result:

PROPOSITION 1.   *The optimal strategy for the buyer is to disclose the innovation for all innovations $v_b \geq v^*$, where $v^* = v\sqrt{\frac{K_x}{K_v(1-\alpha^2)}}$.*

We will assume throughout that the cutoff level v^* is in the interior, so that the buyer's disclosure strategy partitions the range of innovations in a non-trivial manner. Thus, for innovations $v_b < v^*$, the buyer will choose an arm's-length relationship, disclose no information, and order the default good. For innovations $v_b \geq v^*$, the buyer rationally reveals the innovation to the supplier, correctly anticipating that the supplier will not misappropriate the information but rather that he will agree to a network in which the revealed innovation will be incorporated in the exchanged good. Notice that the solution is inefficient because some trades which should be organized as a network relationship ($v_b < v^*$) are organized as an arm's-length transaction, and as a result, the innovation is not incorporated into the exchanged good.

The solution for v^* is quite intuitive. For example, as α increases, making the misappropriation of information more attractive to the supplier, the buyer's cut-off level increases. Further, as the relative variable cost of producing the innovation, i.e., $(\frac{K_x}{K_v})$, increases, producing the innovation becomes less attractive and the buyer's cut-off level increases. Likewise, as the default quality level v increases, the default option becomes more attractive to the buyer, reducing the attractiveness of disclosure and therefore increasing the non-disclosure region.

Given the buyer's disclosure strategy, his ex ante profit is:

$$[p_b F(v^*) + (1 - p_b)]\left(\frac{v^2}{4K_v}\right) + \frac{p_b(1 - \alpha^2)}{4K_x}\int_{v^*}^{\bar{v}} v_b^2 f(v_b)\,dv_b - C(p_b). \quad (1)$$

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[22] We assume that $\frac{v_b^2(1 + \alpha^2)}{4K_v} - S(I, v_b) - \frac{v^2}{4K_v} > 0\ \forall v_b$ to assure that the supplier always finds it optimal to accept the buyer's innovation.

This implies a unique optimal choice of investment, p_b^*, characterized by:

$$-(1 - F(v^*))\left(\frac{v^2}{4K_v}\right) + \frac{(1 - \alpha^2)}{4K_x}\int_{v^*}^{\bar{v}} v_b^2 f(v_b)\,dv_b = C'(p_b^*). \qquad (2)$$

Similarly, the *ex ante* profit for the supplier as a function of his investment, I, is given by:

$$[p_b F(v^*) + (1 - p_b)]\left(\frac{v^2}{4K_v}\right) + p_b\int_{v^*}^{\bar{v}}\left[\frac{v_b^2(1 + \alpha^2)}{4K_x} - S(I, v_b)\right]f(v_b)\,dv_b - I. \qquad (3)$$

As the buyer's dominant strategy is to choose p_b^*, the supplier's optimal choice of ex ante investment, I^*, is given by the following first-order condition:

$$-p_b^*\int_{v^*}^{\bar{v}} S_I(I^*, v_b) f(v_b)\,dv_b = 1. \qquad (4)$$

With the choices of p_b^* and I^* given by equations (2) and (4), the overall welfare generated by the buyer-supplier relationship is given by:

$$[(1 - p_b^*) + p_b^* F(v^*)]\frac{v^2}{2K_v} + \frac{p_b^*}{2K_x}\int_{v^*}^{\bar{v}} v_b^2 f(v_b)\,dv_b$$

$$- p_b^*\int_{v^*}^{\bar{v}} S(I^*, v_b) f(v_b)\,dv_b - I^* - C(p_b^*). \qquad (5)$$

We next analyze the outcome of the buyer-supplier interaction, as characterized above, by comparing it to the benchmark efficient (first-best) solution. Under first-best whenever an innovation occurs, the buyer will disclose the innovation and form a network with the supplier. The first-best levels of investment are given by the solution to:

$$\underset{p_b, I}{\text{Max}}\left[(1 - p_b)\frac{v^2}{2K_v} + \frac{p_b}{2K_x}E(v_b^2) - p_b E(S(I, v_b)) - I - C(p_b)\right] \qquad (6)$$

where $E(\bullet)$ is the expectation operator over v_b.

PROPOSITION 2.   *The outcome of the buyer-supplier interaction is characterized by underinvestment by both the buyer and supplier, as well as lower surplus, relative to the first-best outcome.*[23]

Proposition 2 points out that in our model, as is common in the incomplete contracting literature, a cost of incomplete contracting is inefficient

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[23] The proofs for this and subsequent results are provided in the Appendix.

ex ante investments. However, unlike the results in that literature, we also get inefficient *ex post* relationship decisions and hence *production* decisions. That is, the bulk of the incomplete contracting literature assumes symmetric information and, as a reasonable consequence, assumes that the parties will bargain to ex post efficient production decisions, given their earlier investment decisions. In contrast, our model assumes asymmetric information between the buyer and the supplier. As a result, the buyer and supplier will bargain to *ex post inefficient* production decisions for all $v_b < v^*$.

3. The Effect of Information Linkages

There are many potential ways to mitigate the inefficiency discussed above. For example, the supplier could make an equity investment in the buyer, thereby reducing the benefit of misappropriating the information. Of course, this would create moral hazard problems (see Riordan [1991]). Another approach is to put in place mechanisms which enlarge the space of contractible variables. However, given the technical nature of the information exchanged, what those mechanisms might be and what their characteristics might be would be specific to the particular industrial setting.

Given that the *default* quality is ex ante known and verifiable, one possibility is to allow for a noncontingent contract of the form $(\bar{q}, \bar{t})$, where $\bar{q}$ represents the number of units of the default quality, v, to be transferred and $\bar{t}$ represents the transfer payment, in the event that negotiations between the buyer and supplier break down.[24] However, it can be shown that, under reasonable assumptions, noncontingent contracting has no effect on the efficiency or choice of the exchange relationship in our model (see Baiman and Rajan [2001]).[25]

Another alternative for improving the efficiency of the exchange is for the buyer and supplier to initially establish an information linkage, *allowing them to later negotiate the final form of the relationship*. They can subsequently decide whether to expand the relationship into a buyer-supplier network (in which case additional information is exchanged) or revert to arm's-length transacting (in which case no additional information is exchanged). This initial information linkage creates an infrastructure whereby

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[24] Edlin and Reichelstein [1996] show that when investments are selfish, such contracts may completely eliminate hold-up problems, while Che and Hausch [1999] show that when investments are cooperative, noncontingent contracts have no value at all. In our model, the supplier's investment, I, is selfish, while the buyer's investment, p_b, contains both selfish and cooperative aspects.

[25] Sufficient conditions for a noncontingent contract to affect the outcome of the buyer-supplier interaction include settings with binding capacity constraints (for example, if production of the default value product affected the supplier's cost of producing the innovation product) or ones in which the marginal revenue from misappropriating an innovation decreases with the default output (e.g., instead of α being constant, it decreases in total sales). We choose not to pursue these ad-hoc specifications, which invariably result in the optimality of boundary solutions for the choice of $\bar{q}$.

information is shared unconditionally. Some of this information may be exchanged automatically as a result of enterprise software or vendor-managed inventory systems; some may be exchanged as a result of granting access to one's databases, factories, engineers, R&D labs, and reports, etc.; some may even be exchanged as a result of registering on an Internet exchange site.[26]

We consider a situation in which the buyer and seller can install an information linkage that transmits (in a coarse way) the *know-how* generated by the innovation. The supplier can use this know-how to partially incorporate the buyer's innovation into the supplier's production. Of course, the buyer still has the option of fully disclosing the innovation and its associated know-how and forming a network with the supplier.

Assume that the information linkage produces a non-contractible signal and that the knowledge transmitted by the signal is of the following form. For any innovation realized, v_b, the supplier obtains sufficient information from the signal such that, without any additional disclosure by the buyer, he is able to produce products of quality $\underline{v}$ either for the buyer or directly for the external market. If he chooses the latter outlet, he realizes a per unit revenue of $\alpha\underline{v}$. If the buyer chooses to reveal the technology underlying the innovation to the supplier, then, as in the base model, the supplier can produce units of quality v_b, and, if he misappropriates the information, obtain revenue of αv_b per unit by selling to the outside market.

When no innovation is realized, there is obviously no change from the analysis of the base model in section 2. Consider a realization v_b. If the buyer discloses nothing, his status-quo (no-agreement) profit is zero, while the supplier's is $\frac{\alpha^2\underline{v}^2}{2K_s} - S(I,\underline{v})$. Recall that in the base model, if the buyer discloses nothing, both the supplier's and the buyer's no-agreement profits are zero. Thus, the information linkage has improved the supplier's relative bargaining position. The buyer's profit with no disclosure but a network relationship is $\frac{\underline{v}^2(1-\alpha^2)}{4K_s}$. The buyer's profit from disclosure and a network agreement is $\frac{v_b^2(1-\alpha^2)}{4K_s}$. The benefit to the buyer from disclosure is thus given by: $\frac{(1-\alpha^2)}{4K_s}[v_b^2 - \underline{v}^2]$, which is strictly positive almost everywhere in the innovation region. We thus have the following result, which is counter to Proposition 1.

PROPOSITION 3.   *In the presence of the information linkage described in this subsection, the optimal disclosure strategy for the buyer is full revelation of his innovation to the supplier.*

Proposition 3 establishes that installation of the information linkage totally eliminates the inefficiency in the buyer's choice of exchange relationship (i.e., a network is formed for all innovations) and results in all innovations being fully incorporated in the product exchanged. The result provides an example of information complementarity. By the buyer granting the supplier more direct and unhindered initial access to its R&D lab

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Given the buyer's dominant strategy of choosing p_b^L, the supplier's optimal choice is given by the following first-order condition:

$$-p_b^L E(S_I(I^L, v_b)) = 1. \tag{10}$$

By comparing (4) and (10), one can see that in the presence of an information linkage, there is less likelihood of an innovation but, conditional on an innovation being generated, more likelihood of its being transmitted and used. Depending on the specific parameters of the problem, the supplier's investment could be higher or lower with the addition of the information linkage.

Given that the presence of an information linkage improves ex post efficiency but reduces the buyer's investment and has an ambiguous effect on the supplier's investment, under what conditions would the total buyer and supplier surplus be greater with such a linkage? We next characterize settings in which an information linkage increases overall surplus.

PROPOSITION 5.   *Consider the exogenous parameters v, K_x, K_v, and α. Holding any three of the above parameters constant, there always exists a range of values for the fourth parameter such that installation of an information linkage increases overall welfare. For parameters v, K_x, and α, the range is a lower interval of feasible values, and for K_v, it is an upper interval of feasible values.*

To explain Proposition 5, consider the case of v. Let $(\tilde{\alpha}, \hat{K}_x, \hat{K}_v, \tilde{v})$ be such that $v^* = \underline{v}$. Hold $(\tilde{\alpha}, \hat{K}_x, \hat{K}_v)$ fixed. Obviously $\tilde{v}$ is the lowest default quality which will allow our assumption of an interior solution to continue to hold (i.e., the lowest feasible v given $(\tilde{\alpha}, \hat{K}_x, \hat{K}_v)$). Proposition 5 states that there exists a $\hat{\tilde{v}} > \tilde{v}$ such that for all $v_b \in (\tilde{v}, \hat{\tilde{v}})$, installing an information linkage increases overall welfare. It is in this sense that an information linkage is Pareto preferred for a lower interval of v, or when v is relatively small, for a given set of (α, K_x, K_v). The interpretation of Proposition 5 for K_x, K_v, and α is similar.

Proposition 5 establishes conditions under which *total* buyer-supplier surplus is greater with such a linkage. However, with the linkage, the buyer's bargaining power is so decreased that he is worse off than without it. This is a situation in which there are obvious gains to trade. For example, the supplier could pay the buyer an upfront constant amount for agreeing to such a linkage, thereby making them both better off with the linkage. This would require the buyer and supplier to contract only on the installation of the linkage, not on its signal.

Proposition 6 establishes the symmetric result to Proposition 5.

PROPOSITION 6.   *Consider the exogenous parameters v, K_x, K_v, and α. Holding any three of these parameters constant, there always exists a range of values for the fourth parameter such that it is optimal to have no information linkage. For parameters v, K_x, and α, the range is an upper interval of feasible values, and for K_v, it is a lower interval of feasible values.*

Propositions 5 and 6 suggest potentially testable hypotheses. For example, some industries are made up of firms that base their competing products on incompatible technologies. For example, removable storage devices "...come in different shapes, sizes and capacities, like Compact Flash; Smart-Media; Sony Memory Stick and MiniDisc; Iomega's Zip, Jaz and Pocket Zip; ...the I.B.M. Microdrive; the Imation SuperDisk.... Some use magnetic technology; others are optical"(Marriott [2001], p.G1.). In such an industry each firm's innovation is relatively idiosyncratic and, therefore, a supplier producing components for Sony or Iomega, etc. has relatively less incentive to misappropriate the buyer's innovations—each supplier's α is relatively small. Proposition 5 predicts that such industries are more likely to have information linkages that result in a relatively free flow of initial information between buyers and potential suppliers. One example of this might be industries in which the norm is presentation of R&D results at conferences. Another example might be industry Internet exchange sites whose registration requires the disclosure of a relatively large amount of data.

The following example illustrates the results of Propositions 5 and 6.

EXAMPLE. Consider the following set of exogenous parameters: $\underline{v} = 15$; $\bar{v} = 35$; $\alpha = 0.8$; $f(v_b) = \frac{1}{20}$ (i.e., v_b is uniformly distributed on the interval [15, 35]); $S(I,v_b) = \frac{\sqrt{v_b}}{100 \cdot I}$; $C(p_b) = 4p_b^2$; $K_x = K_v = 5$. Figure 1 plots the marginal value to establishing an information linkage, defined by the difference in total surplus between the setting with an information linkage and the one without the linkage (i.e., the base model). The parameter being varied on the x-axis is the market price of the no-innovation product, i.e., v. At $v = 9$, we have $v^* = 15 = \underline{v}$. At this point, the settings with and without an information linkage yield identical total welfare. As v increases from 9, the setting with information links starts to dominate. This gain in welfare starts to diminish fairly soon thereafter and for values of v exceeding 11.98, the setting without an information linkage becomes the Pareto superior one. The same kind of figure can be constructed by increasing the values for K_x or α, or by decreasing the values for K_v.
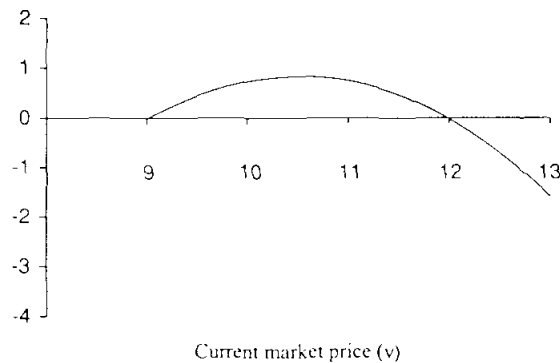

Current market price (v)

FIG. 1.—Marginal value to buyer-supplier relationship of establishing information linkages.

4. Partial Disclosure of Innovation

Throughout the preceding analysis, we assumed that an innovation was of value if and only if the buyer communicated all of the relevant information, thereby enabling the supplier to perfectly match the production process to the innovation. While this is descriptive of many settings, there are others in which a perfect match between innovation and production is not required for value to be created. In these situations, the buyer may have the ability to communicate a portion of the relevant knowledge regarding the innovation and the supplier may use that partial disclosure to produce a product that is of greater value than the default value product, but not as valuable as if the entire innovation had been communicated. Further, by going to a setting of partial disclosure we will be able to more clearly distinguish between the buyer's decision to form a network and his decision as to the amount of information that is incorporated in the product that is exchanged via the network.

In this section, we analyze the buyer's incentives to transfer knowledge when partial disclosure is feasible. We first identify conditions under which the buyer would never choose to partially disclose. The results derived in section 2 thus extend to these settings. We then identify conditions under which the buyer does choose to make partial disclosures and provide a full characterization of his disclosure strategy, as well as the parties' investment decisions. We also show that results analogous to Propositions 3 and 4 hold in this setting of partial disclosure.

The first issue is how to model partial disclosure. Different methods may be appropriate depending upon the underlying innovation and the different ways it can be exploited. We operationalize partial disclosure as follows. Assume the model as described in section 2, and assume that the buyer observes innovation v_b. If the buyer chooses to either not disclose the innovation or to fully disclose it, the game that follows is as described in section 2. However, the buyer now has a third option, that of partially disclosing the innovation to the supplier. In particular, the buyer can choose to reveal a sufficient amount of *know-how* to enable the supplier to produce products of the quality v_R, where $\underline{v} \leq v_R \leq v_b$.[27] Thus, the buyer can provide technological information that enables the achievement of a lower level of innovation than realized.[28]

When partial disclosure occurs, we assume that, should the buyer and supplier form a network, the supplier can produce units of quality v_R under the same cost function as assumed before, i.e., $S(I, v_R) + \frac{1}{2} K_x q^2$. The buyer can then sell these units at a price per unit of v_R. If no agreement is

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[27] See Bhattacharya, Glazer, and Sappington [1990] and Bhattacharya and Ritter [1983] for somewhat related models of partial disclosure of know-how.

[28] To simplify the specification of the bargaining game, we will assume that the buyer still communicates the value of the realized v_b, but only transfers enough know-how to enable the supplier to produce a lower-quality product, v_R, where $\underline{v} \leq v_R \leq v_b$.

too large, the supplier will be better off ignoring any partial disclosure and merely producing units of quality v for the buyer. In this latter case, the buyer will never partially disclose and we are back to the model described in section 2. We will also see no partial disclosure under the following conditions:

PROPOSITION 7.   *Suppose that $L_{11}(\cdot) \geq 0$ and that, $\forall\, v_b$, $\frac{v_b(1-\alpha^2)}{K_x} \geq L_2(v, v_b)$. Then, it is never optimal for the buyer to choose a partial disclosure strategy.*

The first condition assures that, assuming disclosure, the buyer's objective function is convex in the amount disclosed. This implies that, ignoring no disclosure, the buyer will either fully disclose or disclose v. The second condition assures that full disclosure is preferred to disclosing v. As an example, suppose that the cost function is given by $L(v_R, v_b) = (\frac{v_b}{v_R} - 1)$. Then, the condition indicates that the buyer will never choose partial disclosure if the exogenous parameters satisfy the inequality: $v^2(1 - \alpha^2) \geq K_x$.

Next, we more fully analyze partial disclosure. We first characterize the buyer's disclosure strategy. In particular, given non-trivial no disclosure, partial disclosure, and full disclosure regions, we characterize which innovations are in each disclosure region. We then find sufficient conditions for each disclosure region to be non-trivial.

PROPOSITION 8.   *Suppose that $L_{12}(\cdot) > 0$, and that $\forall\, v_b$, the function $\frac{L_1(v_R, v_b)}{v_R}$ is decreasing in v_R. Then, the buyer's disclosure strategy is to choose no disclosure for a convex set of the lowest values of v_b, partial disclosure for a convex set of intermediate values of values of v_b (with the level of disclosure increasing in v_b), and full disclosure for a convex set of the highest values of v_b.*

Proposition 8 is important for several reasons. First, as with Proposition 1, it establishes that innovations below some cut-off level will lead to arm's-length transactions and those above the cut-off level will lead to networks. However, unlike the results in sections 2 and 3, Proposition 8 establishes that some network relationships will not result in full disclosure and the full use of the realized innovation. Rather the buyer may, for certain innovations $v_b > v$, establish a network that exchanges units of quality v_R, $v_b > v_R \geq v$. Proposition 8 further establishes that for this region of network formation but partial disclosure, the quality of the product exchanged increases in the realized innovation.

Proposition 8 characterizes the arm's-length transaction/network regions, and the level of disclosure within the network regions, if they exist. The proof technique used to establish Proposition 8 also helps in identifying a sufficient condition for the existence of partial disclosures. Specifically, if an interior v_b exists at which the following condition is met, it is easily shown that all three disclosure regions are present:

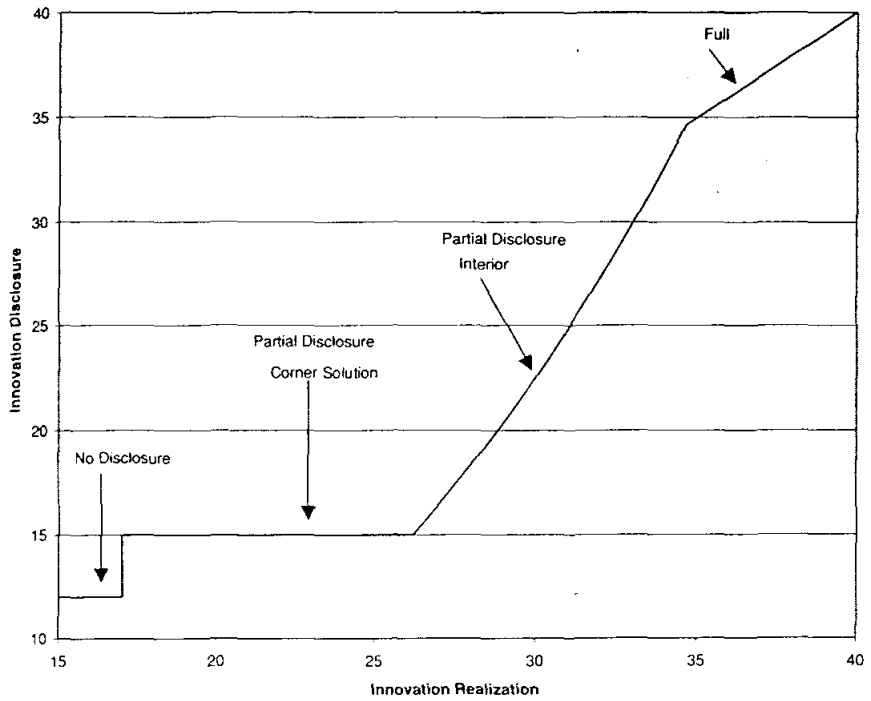$$\frac{(1 - \alpha^2)}{K_x} = \frac{-L_1(v_b, v_b)}{v_b}.$$

FIG. 2.—Optimal disclosure policy.

To illustrate Proposition 8, consider an example with the following set of exogenous parameters: $v = 12$; $\underline{v} = 15$; $\bar{v} = 40$; $\alpha = 0.8$; $f(v_b) = \frac{1}{25}$; $S(I, v_b) = \frac{\sqrt{v_b}}{100 \cdot I}$; $K_x = 12$; $K_v = 10$; $L(v_R, v_b) = 12 * (1 - (\frac{v_R}{v_b})^3)$. For this example, Figure 2 shows the transition of the buyer's optimal disclosure strategy (as a function of the realized v_b) from no disclosure to a corner partial disclosure, to increasing interior partial disclosures and, finally, to full disclosure. Notice that within the non-trivial partial disclosure region, the slope of the disclosure function is greater than 1. This follows from the fact that the disclosure function is continuous and goes from partial disclosure (where $v_R < v_b$) to full disclosure (where $v_R = v_b$).

Finally, recall that in Section 3 we found that with the no-partial disclosure model, installing the information linkage resulted in: a network being formed whenever it was efficient to do so; full disclosure of all innovations; and the buyer's investment moral hazard problem being exacerbated. Does installing such an information linkage have an analogous effect when partial disclosure is feasible? Consider the partial disclosure model with the assumptions in Proposition 8 and the information linkage described in section 3. If no innovation occurs, the problem is the same as with no information linkage. If an innovation v_b occurs and the buyer discloses nothing, it is the same as if the buyer discloses $v_R = v$, although the supplier will incur the extra cost $L(v, v_b)$ if he chooses to misappropriate the information and

produce the v units on his own. Therefore, non-disclosure is never efficient and the "no-disclosure" region in Proposition 8 vanishes. Further, the buyer's partial disclosure/full disclosure problem with the information linkage is the same as without. Therefore, Proposition 8 holds even in settings with an information linkage, except that the region for which the buyer forms a network and discloses $v_R = v$ extends to the left to v.

The information linkage thus leads to the formation of networks whenever it is efficient, i.e., for all innovations. This is the analog to Proposition 3. The difference between this result and Proposition 3 is that with partial disclosure feasible, installing an information linkage does not necessarily result in all innovations being fully exploited by the network. It is also evident that with partial disclosure feasible, the analog of Proposition 4 holds, i.e., installing an information linkage exacerbates the buyer's investment problem, because the buyer is forced to make disclosures of v when he would prefer to disclose nothing.

5. Conclusion and Future Research

An important characteristic of any buyer-supplier relationship is the amount and type of information that is exchanged between the contracting parties. An often-claimed advantage of buyer-supplier networks is the associated agreement to exchange more information and the investment in the network infrastructure to facilitate this exchange. A disadvantage of this enhanced information exchange is the increased possibility of the misappropriation of the information exchanged. This paper has studied the net efficiency effect of these two factors to better understand how buyers and suppliers choose to organize their relationships.

We have characterized the set of innovations for which the cost to the buyer of the supplier's opportunistic use of the disclosure is so large that the buyer will choose to forego the efficiency benefits of exploiting an innovation within a network and instead form an arm's-length relationship with the supplier. We then explored the effect of an initial information linkage between the buyer and the supplier. We found that the information linkage resolves the inefficiency in the buyer's choice of the exchange relationship, but exacerbates his investment moral hazard problem. Further, we characterized which innovations resulted in the formation of a network, and how much of that innovative know-how was shared with the supplier.

We believe that the study of the production efficiency/opportunism trade-off inherent in buyer-supplier networks is ripe for future research. One important issue is the study of mechanisms that can mitigate the cost of opportunism by enlarging the set of contractible variables. Identifying reasonable such mechanisms would depend on specializing the analysis to particular industries. More generally, this topic suggests that a firm's choice of its internal managerial accounting system should be viewed strategically, in the sense that it may provide data to potential network partners which can be

used to mitigate the firm's own opportunistic use of information shared with it by its partners.

We analyzed a model with a single supplier. It would be interesting to explore the implications of introducing alternative manufacturing sources, including the buyer's own internal production capabilities. With multiple external suppliers, we believe that, as long as the proprietary information must be disclosed during negotiation, and its subsequent use cannot be contracted on and monitored, the analysis would remain substantially unchanged. In particular, once negotiations started, the small numbers bargaining problem would arise. Allowing the buyer to have his own internal production would have two effects. It would make nondisclosure more attractive because the buyer could now exploit the innovation on his own. However, it would also increase the buyer's bargaining power, thereby increasing his share of the surplus created by disclosing and forming a network. Which effect dominates depends upon the efficiency of the buyer's internal production relative to the efficiency of the supplier's production. Under some assumptions about the buyer's cost of internal production, it is likely that the buyer would still disclose innovations above some cut-off point and our other results would continue to hold.

Our analysis made use of other restrictive assumptions, which could be relaxed in future work. For example, it would be useful to consider alternative representations of the cost of partial disclosure and to analyze their implications for the amount of information exchanged. We also simplified the distinction between arm's-length transactions and networks; it would be interesting to introduce the level of explicit coordination and the duration of the relationship as decision variables. Finally, we motivated the use of incomplete contracts by assuming that the proprietary information specified the feasible production set and was thus complicated, multi-dimensional and hard to describe ex ante. In our modeling, however, we represented the information as a scalar. A key reason for this simplified representation of the information is the inability of existing models of bargaining under asymmetric information to handle more complicated types of information. Extending the work in this area would be of obvious interest to both the accounting and economics literatures.

APPENDIX

Proof of Proposition 2. We first define an "artificial second best solution" as one where the investment levels are given by the solution to:

$$
\operatorname*{Max}_{p_b, I} \left[[(1 - p_b) + p_b F(v^*)] \frac{v^2}{2K_v} \right.
$$

$$
\left. + p_b \int_{v^*}^{\bar{v}} \left[\frac{v_b^2}{2K_x} - S(I, v_b) \right] f(v_b) \, dv_b - I - C(p_b) \right] \tag{A1}
$$

This is the optimal solution when the investment levels are chosen ex ante to maximize surplus, subject to the constraint that the buyer does *not* disclose innovations below cutoff v^*. It differs from the first best only in the existence of a non-disclosure region. Consider the objective in (A1) as a generic function $H(p_b, I, v^*)$, where v^* is viewed as an exogenous parameter. This implies the following first-order conditions with respect to the investment choices, denoted by p_b^{art} and I^{art} (where the superscripts refer to the artificial second-best solution):

$$H_{p_b}: -(1 - F(v^*))\left(\frac{v^2}{2K_v}\right) + \int_{v^*}^{\bar{v}} \left[\frac{v_b^2}{2K_x} - S(I^{art}, v_b)\right]$$

$$\times f(v_b)\,dv_b - C'\left(p_b^{art}\right) = 0. \tag{A2}$$

$$H_I: -p_b \int_{v^*}^{\bar{v}} [S_I(I^{art}, v_b)]\,f(v_b)\,dv_b - 1 = 0. \tag{A3}$$

From the second-order conditions and the cross-partials of (A2) and (A3), we obtain the result that the optimal choices of p_b^{art} and I^{art} are both strictly *decreasing* in v^*. Because the optimization problem in (A1) coincides with first best at $v^* = \underline{v}$, a direct corollary is that the artificial second-best solution exhibits strict *underinvestment* in both p_b and I relative to first-best. Obviously, the total surplus in this solution is also strictly lower than that of first-best.

Next, compare the outcome of the second-best buyer-supplier interaction to the artificial second-best solution. The two solutions have the same form for the overall welfare (compare (5) and (A1)) and differ only in that the investment choices under second-best are given by equations (2) and (4), while the investment choices under artificial second-best solution are governed by equations (A2) and (A3). It is clear therefore that the latter generates higher surplus because the investments are chosen to maximize surplus. Comparing (2) and (A2), a sufficient condition for $p_b^* < p_b^{art}$ is that the following inequality is satisfied:

$$\frac{(1 - \alpha^2)}{4K_x} \int_{v^*}^{\bar{v}} v_b^2 f(v_b)\,dv_b < -(1 - F(v^*))\left(\frac{v^2}{4K_v}\right)$$

$$+ \int_{v^*}^{\bar{v}} \left[\frac{v_b^2}{2K_x} - S(I^{art}, v_b)\right] f(v_b)\,dv_b$$

or

$$\int_{v^*}^{\bar{v}} \left[\frac{(1 + \alpha^2)v_b^2}{4K_x} - S(I^{art}, v_b) - \frac{v^2}{4K_v}\right] f(v_b)\,dv_b > 0. \tag{A4}$$

But the integrand in (A4) represents, for each v_b, the difference in the supplier's profit from accepting the revealed innovation from the buyer or

ignoring it and playing the no-innovation outcome. It is therefore strictly positive almost everywhere, implying that the expression in (A4) is strictly positive, as required. Moreover, comparing equation (4) to (A3), it is also evident that if $p_b^* < p_b^{art}$, then $I^* < I^{art}$ as well. Combining the two sets of results yields the conclusion stated in the proposition.

Proof of Proposition 4. We have to show that p_b^*, as characterized by equation (2) is strictly higher than p_b^L, as characterized by equation (8). Differencing those two equations yields:

$$C'(p_b^L) - C'(p_b^*) = \frac{(1-\alpha^2)}{4K_x} \int_{\underline{v}}^{v^*} v_b^2 f(v_b) dv_b - F(v^*) \left(\frac{v^2}{4K_v} \right)$$

$$= \int_{\underline{v}}^{v^*} \left[\frac{v_b^2(1-\alpha^2)}{4K_x} - \frac{v^2}{4K_v} \right] f(v_b) dv_b \qquad (A5)$$

Note that the expression in square brackets in (A5) is strictly increasing in v_b, implying that it reaches its maximum value over the range of integration at $v_b = v^*$. As $v^* = v\sqrt{\frac{K_x}{K_v(1-\alpha^2)}}$, this implies a maximum value for the expression of:

$$\left[\frac{v^{*2}(1-\alpha^2)}{4K_x} - \frac{v^2}{4K_v} \right] = \frac{v^2 K_x(1-\alpha^2)}{K_v(1-\alpha^2)4K_x} - \frac{v^2}{4K_v} = 0.$$

As $f(v_b) > 0$, this implies that the integrand in (A5) is strictly negative almost everywhere, and therefore that $C'(p_b^L) < C'(p_b^*)$. This in turn yields the desired result that $p_b^L < p_b^*$.

Proof of Proposition 5. We will construct a general proof that holds for any of the four exogenous variables. Denote this generic variable as "z." The case of "no information linkage" is captured by equations (2) and (4), and the definition of v^* in proposition 1. The case of "information linkage" is captured by equations (8) and (10). First note that if the exogenous parameters are such that $v^* = \underline{v}$, then the investment and disclosure choices under the two models coincide, and therefore so does total welfare. We will show that at $v^* = \underline{v}$, any change in an exogenous variable (z) that causes v^* to rise above $\underline{v}$ will have a greater marginal impact on total welfare in the "information linkage" setting than in the "no information linkage" setting, thus proving the result.

We start with the case of "no information linkage." Differentiating equation (2) with respect to z, we get:

$$C''(p_b^*) p_b^{*'}(z) = -(1 - F(v^*)) \frac{\partial}{\partial z} \left(\frac{v^2}{4K_v} \right) + f(v^*) v^{*'}(z)$$

$$\times \left[\frac{v^2}{4K_v} - \frac{v^{*2}(1-\alpha^2)}{4K_x} \right] + \left[\int_{v^*}^{\bar{v}} v_b^2 f(v_b) dv_b \right] \frac{\partial}{\partial z} \left(\frac{1-\alpha^2}{4K_x} \right) \qquad (A6)$$

By the definition of v^*, the second expression on the right hand side of (A6) is identically zero. Therefore, evaluated at $v^* = v$,

$$p_b^{*'}(z) = \frac{1}{C''(p_b^*)} \frac{\partial}{\partial z}\left[-\left(\frac{v^2}{4K_v}\right) + E(v_b^2)\left(\frac{1-\alpha^2}{4K_x}\right)\right] \tag{A7}$$

Total welfare in this setting is given by the following expression:

$$WN = [(1 - p_b^*) + p_b^* F(v^*)]\frac{v^2}{2K_v} + p_b^* \int_{v^*}^{\bar{v}}\left[\frac{v_b^2}{2K_x} - S(I^*, v_b)\right]$$

$$\times f(v_b)\,dv_b - I^* - C(p_b^*)$$

From equation (4), we know that $\frac{\partial WN}{\partial I^*} = 0$. Moreover,

$$\frac{\partial WN}{\partial p_b^*} = -(1 - F(v^*))\frac{v^2}{2K_v} + \int_{v^*}^{\bar{v}}\left[\frac{v_b^2}{2K_x} - S(I^*, v_b)\right]f(v_b)\,dv_b - C'(p_b^*)$$

$$= -(1 - F(v^*))\frac{v^2}{4K_v} + \frac{(1+\alpha^2)}{4K_x}\int_{v^*}^{\bar{v}} v_b^2 f(v_b)\,dv_b$$

$$- \int_{v^*}^{\bar{v}} S(I^*, v_b) f(v_b)\,dv_b \quad \text{(using (2))}$$

Therefore,

$$\left.\frac{\partial WN}{\partial p_b}\right|_{v^*=v} = -\frac{v^2}{4K_v} + \frac{(1+\alpha^2)}{4K_x}E(v_b^2) - E(S(I^*, v_b)) \tag{A8}$$

Next,

$$\frac{\partial WN}{\partial v^*} = p_b^* f(v^*)\frac{v^2}{2K_v} - \frac{p_b^*}{2K_x}v^{*2} f(v^*) + p_b^* S(I^*, v^*) f(v^*)$$

$$= p_b^* f(v^*)\left[\frac{v^2}{2K_v} - \frac{v^2}{2K_v(1-\alpha^2)} + S(I^*, v^*)\right]$$

(using the definition of v^*).

At $v^* = v$, again applying the definition of v^*, we can simplify the above expression to:

$$\left.\frac{\partial WN}{\partial v^*}\right|_{v^*=v} = p_b^* f(v)\left[S(I^*, v) - \frac{\alpha^2 v^2}{2K_x}\right] \tag{A9}$$

Finally, note that at $v^* = v$,

$$\left.\frac{\partial WN}{\partial z}\right|_{v^*=v} = \frac{\partial}{\partial z}\left[\frac{v^2(1 - p_b)}{2K_v} + \frac{p_b E(v_b^2)}{2K_x}\right] \tag{A10}$$

Combining the results from (A7)–(A10), we have the total change in welfare at $v^* = v$ for the no linkage case as:

$$WN'(z) = \left[-\frac{v^2}{4K_v} + \frac{(1+\alpha^2)}{4K_x} E(v_b^2) - E(S(I^*, v_b)) \right] \frac{1}{C''(p_b^*)}$$

$$\times \frac{\partial}{\partial z} \left[-\left(\frac{v^2}{4K_v} \right) + E(v_b^2) \left(\frac{1-\alpha^2}{4K_x} \right) \right] + \frac{\partial}{\partial z} \left[\frac{v^2(1-p_b)}{2K_v} + \frac{p_b E(v_b^2)}{2K_x} \right]$$

$$+ v^{*'}(z) p_b^* f(v) \left[S(I^*, v) - \frac{\alpha^2 v^2}{2K_x} \right] \qquad (A11)$$

Next, consider the setting with an information linkage. Total welfare is given as follows:

$$WL = \frac{v^2}{2K_v}(1 - p_b^L) + \frac{p_b^L}{2K_x} E(v_b^2) - p_b^L E(S(I^L, v_b)) - C(p_b^L) - I^L \quad (A12)$$

From (10), it is clear that $\frac{\partial WL}{\partial I^L} = 0$. Also, partially differentiating (A12) with respect to z:

$$\frac{\partial WL}{\partial z} = \frac{\partial}{\partial z} \left[\frac{v^2(1 - p_b^L)}{2K_v} + \frac{p_b^L E(v_b^2)}{2K_x} \right] \qquad (A13)$$

Next, taking the partial derivative of (A12) with respect to p_b^L and using (8) to simplify yields

$$\frac{\partial WL}{\partial p_b^L} = -\frac{v^2}{4K_v} + \frac{(1+\alpha^2)}{4K_x} E(v_b^2) - E(S(I^L, v_b)) \qquad (A14)$$

Finally, from (8), differentiating through with respect to z yields:

$$p_b^{L'}(z) = \frac{1}{C''(p_b^L)} \frac{\partial}{\partial z} \left[-\left(\frac{v^2}{4K_v} \right) + E(v_b^2) \left(\frac{1-\alpha^2}{4K_x} \right) \right] \qquad (A15)$$

Thus, using (A13)–(A15), the total derivative of (A12) with respect to z, i.e., the total change in welfare in the setting with an information linkage, is given by:

$$WL'(z) = \left[-\frac{v^2}{4K_v} + \frac{(1+\alpha^2)}{4K_x} E(v_b^2) - E(S(I^L, v_b)) \right] \frac{1}{C''(p_b^L)} \frac{\partial}{\partial z} \left[-\left(\frac{v^2}{4K_v} \right) \right.$$

$$\left. + E(v_b^2) \left(\frac{1-\alpha^2}{4K_x} \right) \right] + \frac{\partial}{\partial z} \left[\frac{v^2(1 - p_b^L)}{2K_v} + \frac{p_b^L E(v_b^2)}{2K_x} \right] \qquad (A16)$$

As noted earlier, at $v^* = v$, $p_b^L = p_b^*$ and $I^L = I^*$. Therefore, from (A11) and (A16), the excess marginal value to varying z in the setting with an information linkage is given by:

$$WL'(z) - WN'(z) = v^{*'}(z) p_b^* f(v) \left[\frac{\alpha^2 v^2}{2K_x} - S(I^*, v) \right] \qquad (A17)$$

The expression in square brackets represents the status quo profit to the supplier of misappropriating an innovation of $v_b = \underline{v}$ and is therefore strictly positive. Thus, by choosing to vary z in a manner that increases v^* above $\underline{v}$, i.e., such that $v^{*\prime}(z) > 0$, we are guaranteed that (A17) > 0, and hence that such a variation results in a strictly higher welfare for the setting with the information linkage.

Proof of Proposition 6. Suppose that the external parameters satisfy the following inequality:

$$\frac{\underline{v}^2}{K_v} \geq \frac{E(v_b^2)(1 - \alpha^2)}{K_x} \tag{A18}$$

We will show that in this range, the setting with no information linkage is strictly preferred.

First consider a setting with an information linkage. From (8) and (10), it is clear that the buyer will not invest in innovation and the supplier will not invest in cost reduction, leading to total welfare of $\frac{\underline{v}^2}{2K_v}$.

In the setting without a linkage, (A18) implies that the disclosure cutoff, v^*, satisfies:

$$v^* = \underline{v}\sqrt{\frac{K_x}{K_v(1 - \alpha^2)}} \geq \sqrt{E(v_b^2)} \tag{A19}$$

If (A18) is an equality, so is (A19), implying that v^* is strictly in the interior (as $\underline{v} < \sqrt{E(v_b^2)} < \bar{v}$); our analysis is thus valid for an open set of exogenous parameters.

From (5), welfare without an information linkage is given by the expression:

$$\frac{\underline{v}^2}{2K_v} - p_b\frac{\underline{v}^2}{2K_v}(1 - F(v^*)) + p_b\int_{v^*}^{\bar{v}}\left[\frac{v_b^2}{2K_x} - S(I, v_b)\right]f(v_b)\,dv_b - I - C(p_b), \tag{A20}$$

where p_b and I_s are characterized by the following equations, respectively:

$$\int_{v^*}^{\bar{v}}\left[\frac{v_b^2(1 - \alpha^2)}{4K_x} - \frac{\underline{v}^2}{4K_v}\right]f(v_b)\,dv_b = C'(p_b); \tag{A21}$$

$$-p_b\int_{v^*}^{\bar{v}} S_I(I, v_b)f(v_b)\,dv_b = 1. \tag{A22}$$

To show that this no-linkage welfare exceeds $\frac{\underline{v}^2}{2K_v}$, we will let the role of v^* be played by a free variable, j, and define a welfare function, $W(j)$, where j ranges from v^* to $\bar{v}$. Note that at $j = \bar{v}$, it is clear from (A21) and (A22) that $p_b = 0$, and $W(\bar{v}) = \frac{\underline{v}^2}{2K_v}$, which is the same as in the setting with an

information linkage. To complete the proof, we show below that $W'(j) < 0$ for all $j \in [v^*, \bar{v}]$, implying that $W(v^*)$ strictly exceeds $\frac{v^2}{2K_v}$.

From (A21), replacing v^* by j and differentiating with respect to j yields:

$$\left[\frac{-j^2(1 - \alpha^2)}{4K_x} + \frac{v^2}{4K_v} \right] f(j) = C''(p_b) p_b'(j).$$

For $j \geq v^*$, the quantity in brackets is negative, implying that $p_b'(j)$ is negative.

The partial derivative of $W(j)$ with respect to p_b is given by (using (A21)):

$$W_{p_b} = \int_j^{\bar{v}} \left[\frac{v_b^2(1 + \alpha^2)}{4K_x} - \frac{v^2}{4K_v} - S(I, v_b) \right] f(v_b) dv_b$$

$$= \int_j^{\bar{v}} \left[\frac{v_b^2(1 - \alpha^2)}{4K_x} - \frac{v^2}{4K_v} \right] f(v_b) dv_b + \int_j^{\bar{v}} \left[\frac{\alpha^2 v_b^2}{2K_x} - S(I, v_b) \right] f(v_b) dv_b.$$

As $j \geq v^*$, the first expression is positive almost everywhere (note that it is 0 at $v_b = v^*$); the integrand in the second expression is the supplier's status quo profit when innovation v_b is realized and so is positive as well. Thus, we have $W_{p_b} > 0$.

Next, using (A22), the partial derivative of $W(j)$ with respect to I is 0. Finally, W_j is given by:

$$-p_b f(j) \left[\frac{j^2}{2K_x} - \frac{v^2}{2K_v} - S(I, j) \right]$$

$$= -p_b f(j) \left[\left(\frac{j^2(1 - \alpha^2)}{2K_x} - \frac{v^2}{2K_v} \right) + \left(\frac{j^2 \alpha^2}{2K_x} - S(I, j) \right) \right] < 0.$$

(for reasons similar to those given above when we showed that $W_{p_b} > 0$). Combining all of these results, we get the desired result:

$$W'(j) = W_{p_b} p_b'(j) + W_I I_s'(j) + W_j = W_{p_b} p_b'(j) + W_j < 0.$$

Proof of Proposition 7. At $v_b = v$, full and partial disclosures are equivalent. Further, we know from our previous analysis that the buyer prefers no disclosure to full disclosure at $v_b = v$. Therefore, if full disclosure dominates partial disclosure for values of $v_b > v$, the buyer would never choose to partially disclose. Consider the buyer's partial/full disclosure problem (ignoring the no-disclosure option) upon realization of some v_b:

$$\underset{v_R}{\text{Max}} \frac{1}{2} \left[\frac{v_R^2(1 - \alpha^2)}{2K_x} + L(v_R, v_b) \right] \qquad (A23)$$

subject to: $v_R \geq v$; and $v_R \leq v_b$.

Given that $L_{11}(\cdot) \geq 0$, the objective function in (A23) is strictly convex in v_R over the relevant interval, $[v, v_b]$. Thus, the buyer's optimal choice is a

corner solution. If the solution is the upper bound, i.e., $v_R = v_b$, then he has in effect opted for full disclosure. It is sufficient to show therefore that this choice is superior to that of choosing the lower bound, i.e., $v_R = \underline{v}$.

Comparing the objective function at the two bounds, this reduces to showing that:

$$\frac{(1 - \alpha^2)}{2K_x} \left(v_b^2 - \underline{v}^2 \right) - L(\underline{v}, v_b) \geq 0. \tag{A24}$$

At $v_b = \underline{v}$, (A24) holds as an equality. A sufficient condition for (A24) to hold everywhere is that it increase weakly in v_b. Differentiating (A24) with respect to v_b then yields the condition stated in the result, i.e., $\frac{v_b(1 - \alpha^2)}{K_x} \geq L_2(\underline{v}, v_b)$.

Proof of Proposition 8. As full and partial disclosures coincide at $v_b = \underline{v}$, it is clear from our earlier analysis that it is optimal for the buyer to make no disclosures at the lowest values of v_b. Moreover, because the buyer's value of disclosing increases in v_b, while that of non-disclosure stays constant, the optimality of non-disclosure holds only for a convex set containing the lowest values of v_b.

Consider the buyer's partial/full disclosure optimization problem as laid out in (A23). The first-order condition for the buyer's choice of v_R, assuming an interior solution, is given by:

$$\frac{v_R(1 - \alpha^2)}{K_x} + L_1(v_R, v_b) = 0. \tag{A25}$$

At this point, the second-order condition is given by:

$$\frac{(1 - \alpha^2)}{K_x} + L_{11}(v_R, v_b) = \frac{1}{v_R}[v_R L_{11}(v_R, v_b) - L_1(v_R, v_b)] < 0. \tag{A26}$$

(from (A25) and the assumption that $\frac{L_1(v_R, v_b)}{v_R}$ decreases in v_R).

Therefore, if some v_R satisfying (A25) exists in the interval $(\underline{v}, v_b)$, it is the unique optimum. Further, totally differentiating (A25) and using the inequality in (A26), we have:

$$\text{Sign}\left(\frac{dv_R}{dv_b} \right) = \text{Sign}[L_{12}(\cdot)] > 0.$$

That is, the buyer's level of partial disclosure increases in the realized value of the innovation.

Now suppose that there exists a value of $\tilde{v}_b < \bar{v}$ at which the buyer fully discloses $\tilde{v}_b$. This implies that:

$$\frac{\tilde{v}_b(1 - \alpha^2)}{K_x} + L_1(\tilde{v}_b, \tilde{v}_b) \geq 0 \Rightarrow \frac{(1 - \alpha^2)}{K_x} \geq \frac{-L_1(\tilde{v}_b, \tilde{v}_b)}{\tilde{v}_b}. \tag{A27}$$

This in turn implies (from $\frac{L_1(v_R, v_b)}{v_R}$ decreasing in v_R), that for any $v_R < \tilde{v}_b$,

$$\frac{v_R(1 - \alpha^2)}{K_x} + L_1(v_R, \tilde{v}_b) \geq -L_1(\tilde{v}_b, \tilde{v}_b)\frac{v_R}{\tilde{v}_b} + L_1(v_R, \tilde{v}_b) \geq 0.$$

In other words, the buyer's first order condition is monotone increasing in v_R, leading him to choose the corner solution of $\tilde{v}_b$. Furthermore, for any higher value of $\hat{v}_b > \tilde{v}_b$, the first order condition at any point $v_R < \hat{v}_b$ must be even more positive because $L_{12}(\cdot) > 0$. Hence, the same monotonicity must hold for all higher values of $\hat{v}_b > \tilde{v}_b$, leading to full disclosure again. The set of full disclosure points is therefore convex and contains the highest values of v_b.

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PERSPEKTIF STRATEGIS DALAM OUTSOURCING TEKNOLOGI INFORMASI

*Unti Ludigdo**

PENDAHULUAN

Dalam dekade belakangan ini telah diungkap berbagai macam strategi bisnis yang relatif baru, meliputi berbagai bidang yang terkait dengan bisnis itu sendiri. Strategi bisnis baru tersebut antara lain meliputi *redesigning, reengineering, benchmarking, empowerment, strategic cost management*, dan *outsourcing*. Penerapan salah satu strategi bisnis baru tersebut akan berpengaruh pada keseluruhan sistem bisnis. Sebenarnya, muara dari munculnya berbagai strategi bisnis baru ini adalah berkaitan dengan pertanyaan "bagaimana perusahaan memenangkan persaingan di era bisnis global ini?" Suatu pertanyaan sederhana, namun memerlukan jawaban cermat dengan konsekuensi biaya mahal.

Apabila ditelusuri lebih jauh, terjadinya bisnis global ini sebenarnya dipicu oleh begitu cepatnya perubahan teknologi informasi. Dengan pesatnya perkembangan teknologi informasi tersebut, maka informasi yang dihasilkannya pun menjadi komoditas yang bernilai. Nilai informasi ini berkaitan dengan arti strategisnya, yang antara lain dapat berupa ketersediaan dan keandalan, dalam membantu memecahkan banyak persoalan manajemen; misalnya, informasi mengenai posisi perusahaan dalam persaingan, informasi mengenai posisi perusahaan pesaing, serta informasi mengenai perubahan lingkungan eksternal perusahaan lainnya.

Bagaimana pun juga, teknologi informasi telah secara dramatis mempengaruhi struktur organisasi secara keseluruhan (Luthans 1995, 27). Oleh karena itu, suatu keharusan bagi suatu organisasi bisnis untuk mampu menguasai dan memanfaatkan secara optimal teknologi informasi, sedangkan untuk mampu menguasainya secara memadai, setidaknya diperlukan suatu prasyarat umum, yaitu kesiapan sumber daya, baik sumber daya manusia maupun sumber daya material. Kesiapan sumber daya bukanlah suatu prasyarat yang mudah dipenuhi oleh semua organisasi bisnis. Berkaitan dengan permasalahan tersebut di atas, dalam artikel ini, secara berturut-turut akan dibahas mengenai teknologi informasi dan keunggulan kompetitif, teknologi informasi dan perubahan strategi perusahaan, strategi *outsourcing* teknologi informasi, dan faktor-faktor yang mendorong *outsourcing* teknologi informasi.

TEKNOLOGI INFORMASI DAN KEUNGGULAN KOMPETITIF

Informasi merupakan alat bagi manajemen untuk secara efisien dan efektif mencapai tujuannya, sehingga dalam era sekarang ini peran penting teknologi informasi telah diakui sedemikian rupa. Jonathan Newcomb, presiden dan CEO Simon & Schuster, mengakui tentang bagaimana teknologi informasi mengubah bisnisnya dan memastikan

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bahwa organisasinya menggunakan teknologi secara efektif (HBR September-October 1995). Alvin Tofler pun mengungkapkan tentang dominasi teknologi informasi dalam gelombang ketiga ini, dengan menyebutnya sebagai era informasi (Elliot 1992), sehingga dalam perkembangan selanjutnya, perubahan peran teknologi informasi yang mula-mula berperan sebagai alat efisiensi menjadi *enabler* bagi perusahaan dalam meraih keunggulan kompetitif ini telah memunculkan istilah baru; *strategic information system* atau bahkan *information as competitive weapons* (Indriantoro 1996).

Mungkin, kondisi ini dapat terjadi karena adanya pergeseran paradigma teknologi informasi dalam perusahaan bisnis, yang meliputi (Widodo Lo 1996):

1. Teknologi informasi merupakan salah satu keunggulan kompetitif dalam perencanaan strategis yang mampu meningkatkan kesejahteraan perusahaan bisnis.
2. Sistem informasi dikembangkan dengan berorientasi pada data, sehingga mampu menembus batas-batas fungsional organisasi.
3. Pengembangan sistem dilakukan dengan pendekatan *top-down* yang memungkinkan pengintegrasian sistem informasi untuk mengelola proses secara *cross-functional* berdasarkan misi organisasi.

Namun, berbagai argumen di atas tidak menjamin bahwa semua menyakini kalau teknologi informasi merupakan alat manajemen untuk mencapai keunggulan dalam kompetisi. Ini disinyalir oleh Yetton dkk. (1994), bahwa potensi teknologi informasi untuk mendukung atau menentukan suatu strategi kompetitif organisasi secara luas diperdebatkan dan secara luas pula masih diakui adanya kesulitan untuk menterjemahkan ke dalam realitas. Hal ini dapat dimaklumi, mengingat sulitnya mengkuantifikasi peran teknologi informasi dalam memperbaiki kinerja dan produktivitas perusahaan, terutama perusahaan di sektor jasa, sebagaimana diungkapkan oleh Quinn dan Baily (1994). Kenyataan lain yang menyebabkan munculnya keraguan ini adalah; tidak adanya standar keuangan untuk mengukur ROI, *revenue, profit*, atau *margin*, atau ukuran-ukuran ekonomi agregat, dari keberhasilan investasi dalam teknologi informasi ini (Quinn dan Baily 1994).

Manfaat Investasi Teknologi Informasi

Bagaimana pun juga, meskipun teknologi informasi merupakan *driver* dalam mencapai keunggulan dalam kompetisi, teknologi informasi bukanlah satu-satunya alat yang diperlukan. Masih ada alat-alat manajemen lainnya yang saling melengkapi dengan membentuk suatu hubungan sinergi dalam rangka mencapai hasil positif tersebut, misalnya keunggulan sumber daya manusia, keunggulan politis, dan keunggulan teknologi lainnya.

Ada beberapa manfaat penerapan teknologi informasi oleh organisasi bisnis, walaupun tidak semua manfaat tersebut dapat dikuantifikasi secara pasti atau pun secara finansial (*unmeasurable*). Sebagaimana yang dikemukakan oleh Bob L. Martin, presiden dan CEO Wal-Mart Stores' International Division, "Teknologi telah menjadi *pervasive* dalam bisnis, dia telah mengubah cara kami bekerja pada Wal-Mart. Kami menempatkan di tangan *assosiate* kami lebih banyak informasi agar mereka membuat keputusan untuk pelanggan dan merespon secara cepat situasi kompetitif" (HBR September-October 1995).

Beberapa manfaat penting yang *unmeasurable* dari investasi teknologi informasi oleh suatu perusahaan (khususnya perusahaan jasa), sebagaimana diungkapkan oleh Quinn dan Baily (1994) meliputi :

- *Memelihara pangsa pasar.* Pangsa pasar merupakan parameter kunci keberhasilan bagi eksekutif. Investasi teknologi informasi hanya memelihara pangsa pasar dapat memperlihatkan manfaat sedikit atau tambahan pada level perusahaan, dan ini akan menunjukkan tidak dapat diukurnya manfaat pada level industri.

- *Menghindari bencana kerugian.* Investasi teknologi industri yang berhasil mencegah kerugian yang sangat besar (karena kecurangan atau pun bencana alam) secara ekonomis adalah rasional, tetapi akan menunjukkan ketakterukuran perusahaan atau profitabilitas industri di mana pun juga.

- *Membuat fleksibilitas dan adaptabilitas yang lebih besar.* Dalam beberapa kasus, investasi teknologi informasi merupakan elemen penting dalam infrastruktur yang menjadikan perusahaan bertahan hidup dalam perubahan lingkungan eksternal yang cepat dan tak terduga. Investasi seperti ini memungkinkan

untuk bertahan hidup, tetapi tidak perlu laba yang lebih tinggi daripada sebelumnya.

- *Memperbaiki "responsiveness" garis produk baru.* Teknologi informasi telah menjadi penting bagi usaha perusahan jasa untuk memelihara atau menjadikan biaya lebih rendah, sementara perluasan variasi dan di luar jangkauan jasanya. Kompetisi sebelumnya telah menurunkan margin rata-rata bagi semua jenis industri jasa.
- *Perbaikan kualitas jasa.* Bagi beberapa perusahaan, teknologi informasi merupakan elemen kritis dalam pemberian jasa individual dan komunal yang lebih baik. Manfaat spesifik ini sulit untuk dievaluasi dalam terminologi keuangan.
- *Peningkatan kualitas hidup kerja.* Teknologi informasi telah membantu mengeliminasi tugas-tugas yang memberatkan, membuat pekerjaan lebih atraktif, memperpendek siklus pelatihan, dan perbaikan moral. Teknologi informasi juga *memanage* jumlah data yang besar untuk memperbaiki keselamatan, keamanan personal, dan kesenangan karyawan, pelanggan, dan masyarakat.
- *Kenaikan "predictability" operasi.* Di beberapa perusahaan, teknologi informasi merupakan alat penting dalam memprediksi penjualan, mengontrol persediaan, dan mengurangi fluktuasi dalam *revenue, profitability,* atau *employment.*

TEKNOLOGI INFORMASI DAN PERUBAHAN STRATEGI PERUSAHAAN

Perubahan dalam strategi bisnis biasanya didahului dengan adaptasi struktural, mengacu kepada teori-teori utama, dengan strategi yang menyebabkan penyusunan kembali proses manajemen perusahaan (Chandler 1961 dalam Yetton dkk. 1994). Perubahan merupakan kata kunci menuju perbaikan, karena hanya dengan perubahan, hal-hal baru secara relatif akan mudah diterapkan. Meskipun demikian halnya dengan organisasi bisnis, untuk mampu berkompetisi dan bahkan unggul dalam kompetisi, perusahaan harus mengadakan suatu perubahan. Perubahan tidak harus dilakukan secara radikal, namun dapat dilakukan secara bertahap tergantung kebutuhannya, dengan mempertimbangkan segala situasi dan kondisinya.

Keunggulan dalam teknologi informasi telah memainkan peranan yang menyolok dalam meramalkan perubahan dalam struktur dan proses organisasi (Robey dan Azevedo 1994). Teknologi informasi memainkan suatu peranan dalam banyak aspek bisnis perusahaan, dari pengembangan produk baru sampai mendukung penjualan dan layanan, dan menyediakan *market intelligence* untuk menyediakan alat untuk analisis pengambilan keputusan (HBR September-Oktober 1995). Teknologi informasi merupakan *driver* munculnya berbagai tuntutan dan upaya untuk mengadakan perubahan, baik dalam struktur maupun proses organisasi. Walaupun, seperti yang diungkapkan oleh Yetton dkk. (1994), nilai strategis transformasi *gradual* perusahaan sama sekali bukan konsekuensi langsung dari aplikasi teknologi informasi, tetapi suatu fungsi interaksi tersendiri dari organisasi, individu, dan faktor-faktor teknologi, untuk mana teknologi informasi merupakan katalisator awal.

Disebutkan secara luas, MIT Management dalam kerangka 1990-an menganggap bahwa strategi bisnis perusahaan memicu penjajaran (*alignment*) sesudahnya dan menyusun kembali struktur organisasi, proses manajemen, keahlian dan peranan individu, dan teknologi (Morton 1991 dalam Yetton dkk. 1994). Namun, McKenney (1995 dalam Indriantoro 1996) telah menguraikan dengan mendalam perubahan basis kompetisi bisnis karena teknologi informasi. Dengan mendasarkan pada hasil studinya di lima perusahaan besar di Amerika, McKenney meringkasnya menjadi kerangka perubahan yang meliputi tahapan-tahapan; (1) krisis pengolahan informasi dan pencarian solusi teknologi informasi, (2) membangun kompetensi, (3) memperluas cakupan teknologi informasi, (4) menggunakan teknologi informasi untuk memampukan struktur dan mendongkrak strategi, dan (5) teknologi informasi menjadi alat strategi dan pesaing mulai meniru. Jadi teknologi informasi tidak sekedar alat untuk meramalkan perubahan sebagaimana dikemukakan oleh Robey dan Asevedo di atas.

Sentralisasi dan Desentralisasi

Sentralisasi dan desentralisasi merupakan aspek strategis dalam pengendalian organisasi, dan sekaligus merupakan tema klasik dalam pembahasan mengenai struktur pengambilan keputusan di organisasi. Tapi berkaitan dengan

bagaimana teknologi informasi mempengaruhi sentralisasi dan desentralisasi, yang banyak muncul merupakan pendapat yang masih bersifat spekulatif, sebagaimana dinyatakan oleh Leavitt dan Whisler (1958; Malone 1997) yang memprediksi bahwa teknologi komunikasi akan menyebabkan pengurangan *middle management* dan sentralisasi pengambilan keputusan yang lebih besar.

Pendapat di atas kemudian menjadi jelas melalui studi yang dilakukan oleh Malone (1997), yang menghasilkan kesimpulan berupa tiga tahapan pergeseran cara pengambilan keputusan yang paling diinginkan berkaitan dengan perbaikan teknologi yang mengurangi biaya komunikasi dan koordinasi. Ketiga tahapan tersebut adalah:

1. Ketika biaya komunikasi tinggi, cara terbaik membuat keputusan adalah melalui *independent-decentralized decision makers*.
2. Ketika biaya komunikasi turun, *centralized decision makers* dapat mempunyai suatu perspektif yang luas dan dapat membuat keputusan lebih baik daripada terpisah (isolated).
3. Ketika biaya komunikasi terus menurun, dalam beberapa situasi pengambilan keputusan yang *connected-decentralized decision makers* lebih efektif.

Namun, Malone juga mengakui apa yang dikemukakan oleh DiMaggio dan Powell (1983), bahwa tidak hanya biaya komunikasi saja yang mempengaruhi sentralisasi dan desentralisasi dalam organisasi. Faktor-faktor lain yang juga penting pengaruhnya dalam sentralisasi dan desentralisasi meliputi; pola kepercayaan interpersonal, lokasi *decision-relevant information*, distribusi kekuasan sebelumnya dalam organisasi, peraturan pemerintah, budaya nasional, tradisi organisasi, dan personalitas individual. Dalam beberapa situasi dan waktu tertentu, kombinasi faktor-faktor tersebut dapat menjadi lebih penting daripada hanya biaya komunikasi dalam menentukan di mana suatu keputusan dibuat (desentralisasi atau sentralisasi).

STRATEGI *OUTSOURCING* TEKNOLOGI INFORMASI

Dalam menyikapi persaingan, membaca kekuatan dan kelemahan diri perusahaan merupakan langkah strategis

manajemen untuk mencapai keunggulan kompetitif. Kekuatan dan kelemahan perlu diketahui antara lain untuk menentukan dalam basis bisnis dan aktivitas mana perusahaan berpotensi mempunyai keunggulan, serta dengan strategi apa keunggulan tersebut dapat dipertahankan atau diperoleh. Dalam perspektif ini terdapat dua pendekatan strategi baru, yang apabila dikombinasikan secara tepat, memungkinkan manajer me*leverage* keahlian dan sumber daya perusahaannya melebihi tingkat yang ada untuk meningkatkan daya saing. Dua strategi baru tersebut (Quinn dan Hilmer 1994), adalah:

- Mengkonsentrasikan sumber daya perusahaan pada seperangkat *"core competencies"*, yang mana perusahaan dapat mencapai keunggulan yang *definable* dan memberikan nilai yang unik bagi pelanggan.
- Sumber daya lain di*outsource* secara strategis, yang mana perusahaan tidak mempunyai suatu kebutuhan *critical strategic* dan kapabilitas khusus.

Untuk me*leverage* sumber daya perusahaannya, manajer menggunakan beberapa cara berikut (Quinn dan Hilmer 1994):

1. Memaksimumkan ROI sumber daya dengan mengkonsentrasikan investasi dan energi pada apa yang terbaik dilakukan oleh perusahaan.
2. Mengembangkan *core competencies* yang mampu mengatasi hambatan-hambatan hebat dari kompetitor sekarang dan mendatang.
3. Kemungkinan *leverage* paling besar dari semua adalah kegunaan penuh investasi *supplier* eksternal, inovasi, dan kapabilitas profesionalnya, yang tidak mungkin dilakukan sendiri oleh perusahaan.
4. Dengan kerja sama ini, perubahan pasar dan situasi teknologi yang cepat dapat menurunkan risiko, memperpendek siklus waktu, investasi yang lebih rendah, dan membuat *responsiveness* yang lebih baik kepada kebutuhan pelanggan.

Dikaitkan dengan upaya penguasaan teknologi informasi, Wayne P. Yetter, presiden dan CEO Astra Merck menyatakan, "Kami membuat keputusan mengenai investasi teknologi didasarkan pada nilai kapabilitas bisnis mereka yang mungkin" (HBR September-October 1995). Nilai kapabilitas bisnis investasi pada teknologi informasi

tentunya tidak terbatas pada nilai informasi itu saja, tetapi juga menyangkut proses penguasaannya. Nilai informasi lebih menyangkut pada siapa yang menggunakan, kapan digunakan, dan dalam situasi apa digunakan (Wartono 1996), sedangkan proses penguasaan menyangkut darimana teknologi informasi diperoleh dan untuk apa.

Sejalan dengan pendekatan strategi baru di atas, terdapat dua pendekatan utama dalam proses penguasaan teknologi informasi, yaitu pendekatan stratejik (*strategic approach*) dan pendekatan komoditas (*commodity approach*). Pendekatan stratejik digunakan apabila operasionalisasi teknologi informasi memberikan keunggulan stratejik bagi perusahaan, sedangkan pendekatan komoditas digunakan apabila teknologi informasi yang diinginkan tidak akan mampu membedakan perusahaan (dalam pengertian mempunyai keunggulan) dengan kompetitornya. Apabila operasionalisasi teknologi informasi tersebut merupakan *core strategic service*, maka perusahaan menanganinya di dalam perusahaan, sedangkan apabila hal itu merupakan suatu komoditas, yang mana *supplier* dapat memberikan layanan yang lebih baik dan harga yang lebih murah dibandingkan departemen teknologi informasi perusahaan, maka perusahaan meng-*outsource*-nya (Lacity dkk. 1995).

Namun, untuk mendapatkan fleksibilitas dan kontrol yang maksimal dalam keputusan *outsourcing*, muncul pendekatan ketiga yang disebut pendekatan selektif (*selective approach*) (Lacity dkk. 1995). Pendekatan ini muncul dari kenyataan, bahwa fleksibilitas diperlukan karena adakalanya beberapa jenis sistem teknologi informasi merupakan suatu komoditas, tetapi masih terlalu kritis untuk diserahkan kepada pihak luar (*outsource*). Tetapi sebaliknya, tidak selalu aktivitas teknologi informasi yang merupakan *business-critical* harus dipelihara (ditangani) oleh perusahaan sendiri. Dengan mempertimbangkan kondisi di atas, manajemen akan mengarahkan keputusan pada efektivitas maksimalisasi fleksibilitas dan kontrol atas *outsourcing* teknologi informasi.

Ada beberapa pertanyaan yang dapat digunakan oleh manajer sebagai pedoman bagaimana seharusnya memilih pendekatan dalam memutuskan *outsourcing* atau tidak (Lacity dkk. 1995), antara lain adalah:

- Apakah sesuatu sistem benar-benar strategis? Pertanyaan ini terkait dengan kenyataan bahwa sistem

yang dipertimbangkan oleh manajer sebagai sistem strategis, kenyataannya tidak, dan sebaliknya.

- Apakah kita yakin bahwa teknologi informasi yang kita perlukan tidak akan berubah? Pertanyaan ini terkait dengan kenyataan bahwa dengan munculnya teknologi baru, kebutuhan teknologi perusahaan pun akan berubah.
- Jika suatu sistem adalah suatu komoditas, dapatkah dipecah-pecah? Pertanyaan ini berhubungan dengan kenyataan bahwa banyak sistem informasi merupakan bagian bisnis yang terintegrasi.
- Dapatkah departemen teknologi informasi perusahaan menyediakan sistem ini dengan lebih efisien daripada pihak luar?
- Apakah kita mempunyai pengetahuan untuk meng-*outsource* suatu teknologi yang tidak familier? Pertanyaan ini terkait dengan kenyataan, kebanyakan manajer berpikir bahwa tak seorang pun dalam perusahaan mempunyai keahlian cukup untuk menilai teknologi baru, sehingga mereka menyerahkannya ke pihak luar.
- Bagaimana kita dapat mendesain kontrak yang meminimalisasikan risiko kita dan memaksimumkan kontrol dan fleksibilitas kita? Untuk ini dibutuhkan pengetahuan segi yuridis dan keahlian mengenai sistem teknologi baru.
- Siapa staf perusahaan yang kita butuhkan untuk negosiasi kontrak yang kuat? Pertanyaan ini terkait dengan siapa-siapa yang seharusnya terlibat dalam proses negosiasi kontrak.
- Siapa staf perusahaan yang kita butuhkan untuk memastikan bahwa kita mendapatkan keuntungan dari kontrak teknologi informasi kita?
- Siapa staf perusahaan yang kita butuhkan yang memungkinkan kita mengeksploitasi perubahan?

Untuk lebih jelasnya, berkaitan dengan penjelasan pertanyaan-pertanyaan ini, lihat Lacity dkk. (1995).

FAKTOR-FAKTOR YANG MENDORONG *OUTSOURCING*

Outsourcing teknologi informasi bukan hanya sekedar *"flash in the pan"* keisengan manajemen, tetapi merupakan pertanda transformasi departemen teknologi informasi

tradisional dan menyediakan suatu pandangan pada kemunculan struktur ekonomi informasi organisasional (McFarlan & Nolan 1995). Karenanya, *outsourcing* merupakan alat strategis bagi manajemen dalam upaya menguasai teknologi informasi. Namun sebagaimana dijelaskan di atas, *outsourcing* bukanlah satu-satunya strategi terbaik. Meskipun dalam penggunaannya, strategi ini bersifat kontinjen, karena dalam situasi tertentu akan tidak tepat menggunakannya dan lebih tepat jika menggunakan strategi yang lain. Dengan kata lain, *outsourcing* teknologi informasi akan mempunyai manfaat strategis sebagai keunggulannya dan sekaligus mengandung suatu risiko sebagai kekurangannya.

Secara ringkas, berdasarkan pendapat Quinn dan Hilmer (1994) berkaitan dengan manfaat strategis dan risiko dilakukannya *outsourcing*, beberapa manfaat *outsourcing* teknologi informasi adalah:

- Perusahaan lebih dapat menekan investasi modal jangka panjangnya, selain investasi jangka pendeknya, untuk penguasaan teknologi informasi dan sekaligus dapat m*eleverage* kompetensi kuncinya secara signifikan.
- Perusahaan juga dapat menekan beberapa jenis risiko dan masalah-masalah manajemen yang tidak diinginkan berkaitan dengan upaya penguasaan teknologi informasi.
- *Outsourcing* dapat menyediakan fleksibilitas bagi perusahaan, terutama berkaitan dengan pembelian teknologi baru yang umumnya berkembang dengan cepat.
- Perusahaan tidak dibatasi hanya pada kapabilitas inovatif dirinya, lebih dari itu dapat memanfaatkan teknologi informasi yang dikembangkan oleh *supplier*.

Terdapatnya kekurangan strategi *outsourcing* teknologi informasi terutama berkaitan dengan risiko yang harus dihadapi oleh perusahaan, hal ini merupakan konsekuensi dari dilakukannya *oursourcing* itu sendiri. Dalam hal ini, masih berdasarkan pendapat Quinn dan Hilmer (1994), risiko *outsourcing* tersebut antara lain adalah hilangnya *critical skills*, hilangnya *cross-functional skills,* dan hilangnya kontrol atas *supplier* dalam penguasaan dan pemanfaatan teknologi informasi.

Berkaitan dengan pertumbuhan *outsourcing* teknologi informasi, McFarlan dan Nolan (1995) mengungkapkan adanya dua faktor yang mempengaruhi, yang meliputi:

1. **Dukungan aliansi strategis.** Nilai aliansi strategis telah diakui secara luas, yang mana kekuatan yang saling berhubungan akan mendasari pembuatan aliansi tersebut. Dengan mempertimbangkan adanya kesulitan untuk berkompetisi secara simultan pada semua *front*, maka dengan aliansi sebuah perusahaan akan dapat m*eleverage* bagian kunci dari rantai nilai dengan membawanya kepada *partner* yang kuat yang akan melengkapi keahliannya. Dengan hubungan ini akan dapat dihasilkan suatu kerjasama yang bersifat sinergis, yang mana pihak-pihak yang beraliansi akan benar-benar merasakan manfaatnya.

2. **Perubahan lingkungan teknologi informasi.** Komputer telah menjadi alat sentral dalam perkembangan teknologi informasi, dari tahun 1960-an dengan pemanfaatannya yang masih sederhana hingga pada tahun 1990-an pada era *networking*. Pada era 1990-an ini perusahaan mengintegrasikan komputer internal dan eksternalnya, sehingga mereka dapat mengubah struktur organisasinya menjadi lebih efisien untuk berkompetisi secara fleksibel dalam pasar global.

Penggunaan suatu strategi dalam kondisi tertentu bukanlah tanpa sebab, karena sekurang-kurangnya manajemen pasti mempertimbangkan biaya dan manfaatnya, selain faktor-faktor krusial lainnya. Dari penelitian McFarlan dan Nolan (1995), ditemukan ada banyak faktor yang menimbulkan kemungkinan dilakukannya *outsourcing* teknologi informasi, hal ini mungkin berbeda antara satu perusahaan dengan perusahaan lainnya. Faktor-faktor tersebut antara lain adalah:

- **Perhatian manajer umum tentang biaya dan kualitas.** Suatu studi mengenai efisiensi teknologi informasi yang didanai oleh departemen teknologi informasi dan dilakukan oleh suatu perusahaan konsultan, bukanlah persoalan bisnis masa datang yang cukup sederhana. Dengan *outsourcing* diharapkan efisiensi teknologi informasi dapat dipenuhi, dibandingkan dengan apabila dilakukan sendiri oleh perusahaan

(sourcing). Walaupun kemudian muncul pertanyaan, apakah *outsourcer* dapat secara cepat memobilisasi stafnya untuk merespon pengembangan pekerjaan yang diperlukan untuk mengejar produk dan jasa ke pasar yang berkembang lebih cepat. Kalau *outsourcer* tidak dapat melakukannya, tidak mustahil perusahaan akan kalah bersaing dengan kompetitornya. Tentunya hal ini merupakan kerugian bagi perusahaan, karena tidak sepadannya biaya yang dikeluarkan dengan kualitas yang diharapkan.

- **Gangguan dalam kinerja teknologi informasi.** Kegagalan untuk memenuhi standar jasa dapat memaksa manajemen untuk menemukan cara lain pencapaian reliabilitas informasi. *Outsourcing* merupakan suatu cara untuk memperbaiki kegagalan yang dilakukan oleh departemen teknologi informasi perusahaan, sehingga dapat memelihara daya kompetitifnya.

- **Kuatnya tekanan *supplier*.** Kelayakan yang tinggi dari *outsourcing* yang dikombinasikan dengan kekuatan *salesforces* yang agresif dari *supplier*, memungkinkan manajer umum perusahaan memaksakan alasan untuk *outsource*.

- **Menyederhanakan agenda manajemen umum.** Suatu perusahaan di bawah tekanan biaya atau persaingan, tidak melihat teknologi informasi sebagai *core competence*, dapat menemukan bahwa *outsourcing* adalah cara mendelegasikan *time-consuming*, masalah yang kacau *(messy problems)* sehingga dapat memfokuskan waktu dan energi manajemen yang langka pada *differentiator* yang lain.

- **Faktor-faktor keuangan.** Beberapa persoalan keuangan dapat menjadikan suatu perusahaan meng*outsource* teknologi informasinya. Salah satu faktor ini adalah kesempatan untuk mencairkan aktiva teknologi informasi perusahaan yang tak berwujud, kemudian memperkuat neraca perusahaan dan menghindari aliran investasi modal yang sporadis di masa mendatang.

- **Budaya perusahaan.** Nilai-nilai perusahaan dapat membuat sesuatu sangat keras bagi manajer untuk melakukan hal yang benar. Misalnya, suatu perusahaan bermaksud mengkonsolidasikan beberapa pusat

data yang dimiliki pada satu bagian yang tersentralisasi, yaitu departemen teknologi informasi. *Outsourcing*, yang didorong oleh manajemen senior, menyediakan penopang untuk menanggulangi jalan buntu dalam proses sentralisasi, karena hal itu tidak secara langsung dipersamakan dengan beberapa divisi atau staf perusahaan.

- **Eliminasi gangguan internal.** Tidak ada persoalan tentang bagaimana kecakapan dan penyesuaian diri manajemen teknologi informasi dan stafnya, tetapi biasanya yang ada persoalan adalah antara *end-user* sumber daya dan staf teknologi informasi. Untuk itu, *outsourcing* diharapkan dapat mengeliminasi persoalan tersebut.

- **Faktor-faktor lainnya.** Berbagai pemicu *(driver)* lain muncul untuk *outsourcing* dalam situasi yang spesifik, yang sangat mungkin berbeda antara perusahaan yang satu dengan yang lain.

SIMPULAN

Agar mampu mencapai keunggulan kompetitif, suatu perusahaan harus menguasai dan memanfaatkan alat strategis manajemen, yaitu teknologi informasi. Teknologi informasi telah mampu mengubah peta persaingan antarperusahaan, yang sebelumnya masih bersifat lokal kemudian berkembang menjadi global, meskipun teknologi informasi telah sedemikian mempengaruhi struktur dan proses kerja perusahaan.

Walaupun telah banyak yang merasakan dan mengakui peran dan manfaat teknologi informasi dalam mencapai keunggulan kompetitif perusahaan, masih ada yang belum yakin akan manfaat berinvestasi dalam teknologi informasi ini. Hal demikian terutama bagi perusahaan jasa yang terkait dengan *unmeasurable*nya manfaat teknologi informasi sebagaimana diungkapkan oleh Quinn dan Baily (1995).

Berkaitan dengan hubungan antara teknologi informasi dan perubahan strategi perusahaan, khususnya mengenai strategi pengendalian perusahaan dan cara pengambilan keputusan, berdasarkan hasil studi Malone (1997) terdapat tiga tahapan. Ketiga tahapan meliputi *independent-decentralized decision makers, centralized decision makers*, dan *connected-decentralized decision makers*.

Strategi *outsourcing* merupakan suatu alternatif dalam upaya organisasi bisnis menguasai teknologi informasi untuk mencapai keunggulan dalam persaingan. Terdapat dua pendekatan utama dalam *outsourcing* teknologi informasi, pertama adalah pendekatan stratejik, yang digunakan apabila operasionalisasi teknologi informasi memberikan keunggulan stratejik bagi perusahaan. Kedua adalah pendekatan komoditas, yang digunakan apabila teknologi informasi yang diinginkan tidak akan mampu membedakan perusahaan dengan kompetitornya. Namun dalam perkembangannya, berdasarkan hasil studi Lacity dkk. (1995) terdapat satu lagi pendekatan yang disebut pendekatan selektif. Pendekatan selektif ini muncul terutama berdasarkan diperlukannya fleksibilitas dalam menentukan sistem informasi yang seharusnya dan yang tidak seharusnya di*outsource* untuk mencapai hasil yang optimal. Adakalanya beberapa jenis teknologi informasi merupakan suatu komoditas, tetapi masih terlalu kritis untuk diserahkan kepada pihak luar. Tetapi sebaliknya, tidak semua aktifitas teknologi informasi yang merupakan *business-critical* harus ditangani sendiri oleh departemen perusahaan. Bagaimana pun juga dalam hal ini harus diingat, bahwa selain *outsourcing* teknologi informasi mempunyai banyak nilai positif (bermanfaat), namun di sisi lain juga mempunyai kekurangan-kekurangan tertentu berkaitan dengan risikonya.

McFarlan dan Nolan (1995) mengungkapkan bahwa ada dua faktor yang telah mempengaruhi pertumbuhan *outsourcing* teknologi informasi, yaitu dukungan aliansi strategis dan perubahan lingkungan teknologi informasi, sedangkan mengenai faktor-faktor yang menyebabkan dilakukannya *outsourcing* teknologi informasi, disebutkan oleh McFarlan dan Nolan ada tujuh faktor, antara lain yaitu perhatian manajer umum terhadap biaya dan kualitas, serta menyederhanakan agenda manajemen umum.

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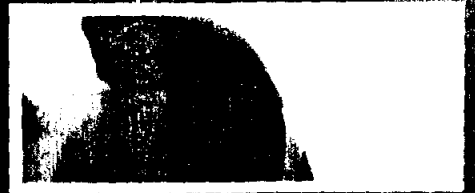
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john arnold
stuart turley

accounting for
management
decisions third
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comprises two chapters devoted to the analysis of the behaviour of cost flows and the management information system for recording and processing of cost information. This is an area which overlaps with some aspects of financial accounting. An understanding of the cost implications of actions is important for management decisions, but the system by which costs are 'accounted for' also affects the way in which results are reported in periodic financial statements. We look at the behaviour and estimation of costs in Chapter 6 and cost-recording systems in Chapter 7.

The framework chapters in Part 1 provide a conceptual foundation and a set of principles for decision making which, together with the understanding of the behaviour of cost flows from Part 2, are then applied to a number of areas of management decisions in the third part of the book. Individual chapters consider how accounting information can contribute to decisions in a number of specific areas of management, including the level of output (Chapter 8), pricing (Chapter 9), other operational factors (Chapter 10), the allocation of limited resources (Chapters 11 and 12), long-term decisions on investment and the acquisition of capital assets (Chapters 13 and 14), and the use of budgets and variance analysis in the planning and control of operations (Chapters 15–17).

1.4 The objectives and environments of organisations

Our concern is with the role and design of (management) accounting systems within organisations. An essential first step is to explore the nature of organisations and the procedures which are used to control their progress and development. We should stress at the outset that accounting is but one part of a highly complex decision-making and control process in most organisations. An appreciation of its context and limitations is an important prerequisite to the exploitation of its strengths.

What is an organisation?

The answer to this question is not at all obvious! Take, for example, the case of Marks and Spencer plc (although what we will say applies equally to many other organisations, whether in the public or private sector of the economy and whether or not they are profit oriented). When we talk of Marks and Spencer what do we have in mind – its stores and fittings, administrative buildings, stock of merchandise, fleet of vehicles, and so on? Although these are part of the picture, there is almost certainly more. What about the company's reputation and role as an employer, a purchaser of goods, a borrower, a supplier of goods and – more recently – of financial services, and as an investment vehicle for individual and institutional shareholders? All these aspects of the company's activities depend on people and on the nature of their relationships with each other under the umbrella provided by the activities of Marks and Spencer.

This perception suggests that an organisation might be viewed as a group of participants, each of whom makes efforts (*contributions*) on behalf of the
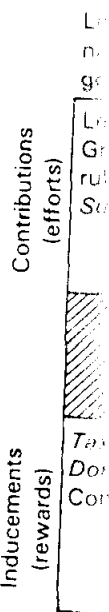
organisation and in return receives rewards (*inducements*). The basic criterion for any individual continuing to participate in the organisation is that his or her rewards (inducements) should exceed his or her efforts (contributions). This view of an organisation as an inducement–contribution process is shown in Figure 1.1.

We might illustrate the meaning of some of the boxes in Figure 1.1 by reference to Marks and Spencer. Managers, for example, make contributions to the organisation which are generally non-financial. They contribute mental and physical effort, creativity and other skills. In return they receive both financial and non-financial rewards. The financial rewards will usually include salary payments and bonuses. Non-financial rewards might involve the pleasure that comes from job satisfaction, status and power. Customers contribute financial revenues when they purchase goods from the company. They may also contribute loyalty by preferring to shop at Marks and Spencer even when similar goods are available at a similar or lower price elsewhere. In return, they enjoy the satisfaction which comes from wearing or using the goods which have been purchased.
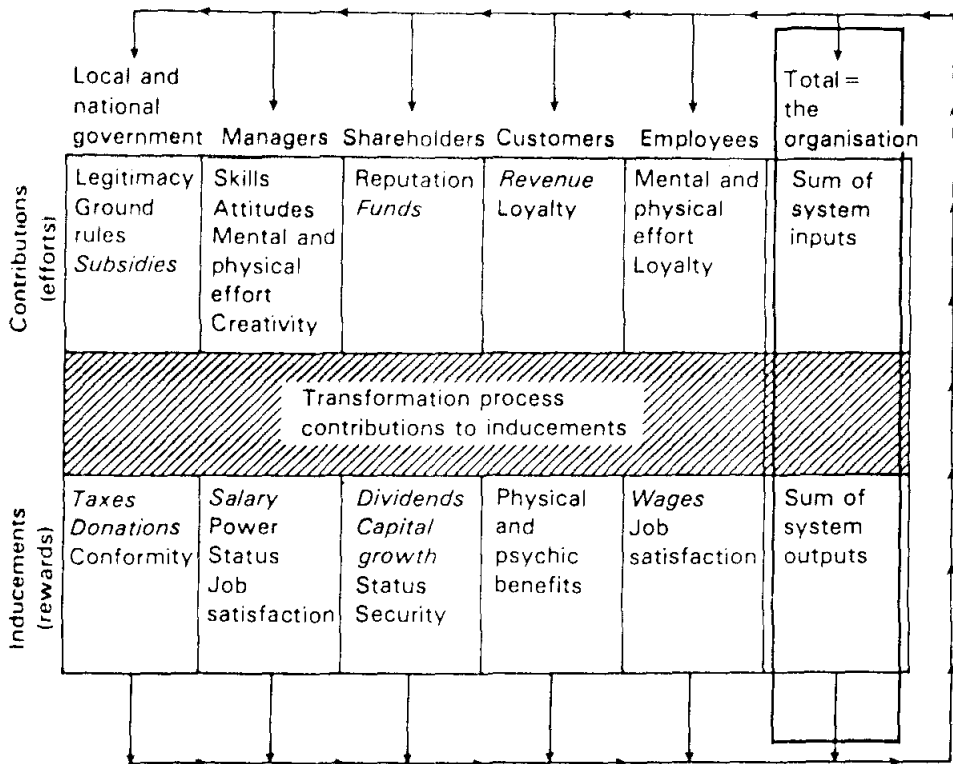
	Local and national government	Managers	Shareholders	Customers	Employees	Total = the organisation
Contributions (efforts)	Legitimacy Ground rules *Subsidies*	Skills Attitudes Mental and physical effort Creativity	Reputation *Funds*	*Revenue* Loyalty	Mental and physical effort Loyalty	Sum of system inputs
	Transformation process — contributions to inducements					
Inducements (rewards)	*Taxes* *Donations* Conformity	*Salary* Power Status Job satisfaction	*Dividends* *Capital growth* Status Security	Physical and psychic benefits	*Wages* Job satisfaction	Sum of system outputs

Figure 1.1 Organisation as inducement–contribution process* (based on A.M. Tinker and E.A. Lowe, 'A rationale for corporate social reporting', *Journal of Business Finance and Accounting*, Spring 1980).

*Financial items are in *italics*.

The shaded area in the middle of Figure 1.1 represents the *transformation process*, where the contributions from the various participants (the *system inputs*) are combined together to provide the *system outputs* which are then used to 'pay' rewards to the various groups of participants.

Several interesting conclusions emerge from analysing the nature of an organisation in this way:

1. All contributions (inputs) are combined and 'transformed' to provide the total inducements (outputs) to be distributed to participants. A contribution change by one group may affect the inducements which can be offered to another. For example, the withdrawal of subsidies by local or national government may affect the wages or other employment prospects of employees.

2. The allocation of total inducements between participants must be such that each participant (or possibly each group of participants) receives inducements which are at least equal to the contributions provided.

3. Contributions and inducements may be either financial or non-financial.

4. The efforts which participants are willing to make will be influenced by the rewards they expect. However, their expectations will be conditioned in part by what has actually happened in the past. Thus, the inducements of one period will influence, to some extent, the contributions of the next period.

5. The managers of organisations have a dual role. First, they must satisfy their own expectations and ensure that their rewards are at least as great as their contributions. Second, they must keep all the other participant groups happy in order to maintain the viability of the organisation. Their ability to achieve the first objective will depend in part on their success in achieving the second! Maintaining the viability of the organisation will involve managers in identifying the minimum inducements required by each participant, in ensuring that sufficient total inducements are available to meet the needs of each participant and in ensuring that all participants do receive inducements greater than their contributions.

The task of management

The dual role of management, explained above, is more easily described than accomplished. An organisation is not a self-contained, isolated entity – it has to operate in an environment which constrains its behaviour.

First, the 'technology' available in the environment affects the ability of the organisation to transform total contributions into total inducements. New equipment and machinery will affect its production process. New marketing and selling techniques will affect the way in which and the success with which it markets and sells its products. New computer developments will affect its administrative procedures. These and other changes in available 'technology' complicate the task of management.

The *New* Accounting Manual

A Guide to the Documentation Process
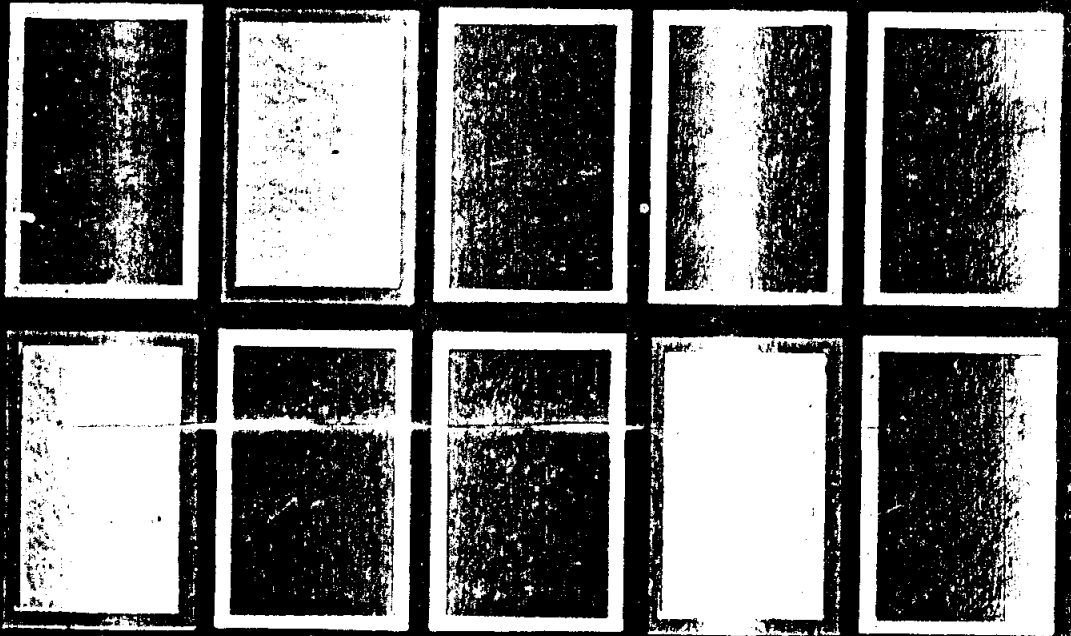
Athar Murtuza

DOCUMENTING ACCOUNTING INFORMATION SYSTEMS

13.1 INTRODUCTION

This chapter focuses on getting to know the workings of an accounting information system (AIS) and learning tools that can facilitate its documentation. We start by explaining what information is, describing a system, and defining an information system. Then, an information system and its components are described in detail, including the various types of information systems, such as management information systems (MIS) and accounting information systems. Then, the roles played by the accounting information system within an organization are explained.

Following the description of an accounting information system is a discussion of the tools, such as flowcharts and data flow diagrams, used to analyze and document an information system. Learning the use of such tools is crucial for those charged with the documentation of accounting procedures. Such documentation techniques allow accountants to understand, evaluate, design, and document accounting procedures.

13.2 WHAT IS INFORMATION?

Information is knowledge communicated or received concerning a particular fact or circumstance (a person, place, or thing). Information and data are not the same. Information is data that has been processed or organized into output that is meaningful to those receiving it. Data usually represent observations or measurements of events that can be of importance to potential users as a result of further processing. It must be seen as the input received by an information system for further processing, after which it converts into information. In contrast to data, information is the processed output that is organized, meaningful, and useful to the person who receives it.

The desirable characteristics of information include:

- Reliability
- Relevance
- Timeliness
- Completeness
- Understandability
- Verifiability

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OUTSOURCING
Implementasi di Indonesia

Raih Keuntungan-Keuntungan Strategik, Taktikal dan Transformasional untuk Perusahaan Anda dengan Penerapan Outsourcing

Ir. Chandra Suwondo, MM. Ph.D

Sekilas Lintas Outsourcing

Bagian ini akan membahas ringkasan dan pengertian *outsourcing* secara umum. Ringkasan ini diharapkan dapat menjadi dasar untuk pengertian dan pembahasan yang lebih dalam pada bab-bab selanjutnya.

Awal timbulnya *outsourcing*

Sebenarnya, prinsip-prinsip *outsourcing* telah dijalankan sejak dulu. Pada waktu itu, bangsa Yunani dan Romawi menyewa prajurit asing untuk bertempur pada peperangan mereka serta menyewa ahli bangunan untuk membangun kota beserta istana. Dengan perkembangan sosial yang ada, prinsip *outsourcing* mulai diterapkan dalam dunia usaha.

Definisi *outsourcing*

Outsourcing adalah pendelegasian operasi dan manajemen harian dari suatu proses bisnis kepada pihak luar (perusahaan penyedia jasa *outsourcing*).

Hal-hal yang didelegasikan

Hal-hal yang didelegasikan dalam *outsourcing* adalah suatu fungsi dan proses bisnis tertentu untuk disisipkan dalam operasional bisnis perusahaan secara keseluruhan.

Pengaruh *outsourcing*

Outsourcing mempengaruhi suatu organisasi secara keseluruhan dalam hal berikut:
* Bentuk organisasi.
* Pekerja.
* Cara operasional.
* Cara pengukuran.

Evolusi *outsourcing*

Sejak revolusi industri, perusahaan-perusahaan telah berusaha keras menemukan langkah terobosan untuk mendapatkan keuntungan kompetitif dan meningkatkan penjualan. Tipe umum perusahaan pada abad 20 adalah perusahaan besar terintegrasi yang dapat "memiliki, mengatur, dan mengontrol secara langsung" semua asetnya (Corbett, 1996, hal.14).