Determining a Firm’s Optimal Outsourcing Rate: A Learning Model Perspective

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Abstract

We present a decision model of a firm’s optimal outsourcing rate as an extension of Cha et al. [1]'s previous work on the economic risk of knowledge loss and deskilling in the outsourcing context. Specifically, the model examines the impacts of two critical model parameters—the knowledge transfer rate and the coordination knowledge depreciation rate—on the firm’s cost minimizing outsourcing rate. When the knowledge transfer rate is low we find that the optimal decision is either total insourcing or total outsourcing, depending on the coordination knowledge depreciation rate. However, as the knowledge transfer rate increases, the firm’s optimal decision becomes a selective outsourcing strategy that creates an interesting bargaining problem.

1. Introduction

Although firms that outsource IT activities may realize significant cost savings [2, 3], over time those firms may also lose much of the deep, experiential knowledge that is often accumulated while performing IT activities in-house [4-11]. In certain circumstances this potential knowledge loss may reduce, or even completely eliminate, the cost savings often associated with IT outsourcing [1, 12]. This raises an interesting research question:

To what extent should a firm outsource its IT activities to a more efficient, lower cost vendor given the complex trade-offs among (and the often unexpected impacts of IT outsourcing decisions on):

- the repository of experiential knowledge accumulated by a firm,
- the costs associated with producing IT services, and
- the costs associated with coordinating the production and use of these IT services?

To develop insights into this question we extend an organizational learning model presented in Cha et al.[1] to determine a firm’s optimal (or total cost minimizing) rate of outsourcing under a variety of knowledge conditions that may characterize an outsourcing relationship.

Cha et al. used their learning model in an IT outsourcing context to identify the conditions under which outsourcing is economically beneficial, the impact of project-length on the economic value of outsourcing, and the conditions under which a firm may become locked-in to a disadvantageous outsourcing project. In contrast, we use this model to examine a firm’s optimal rate of outsourcing. In order to address our research question we relax two of the critical assumptions of the Cha et al. learning model.

First, we treat the outsourcing rate as an endogenous variable as opposed to an exogenous variable as assumes by Cha et al. This relaxation allows us to examine a firm’s outsourcing rate as a strategic decision and to examine the knowledge conditions under which different outsourcing strategies (such as total insourcing, total outsourcing, and selective outsourcing strategies) may minimize a firm’s total costs.

Second, we reformulate the knowledge transfer rate (i.e., that rate at which the vendor transfers its production knowledge and expertise to an outsourcing firm) presented in Cha et al. Cha et al. assumed that the knowledge transfer rate was independent of the outsourcing rate. In contrast, we acknowledge that the rate at which a vendor transfers knowledge to a firm may depend on the extent of the outsourcing relationship; therefore, we model the knowledge transfer rate as an increasing function of the outsourcing rate. This enables us to investigate the impacts of a firm’s outsourcing rate decision on the cost tradeoff between gaining transfer knowledge from the vendor and losing experimental knowledge internally.
We examine the implications of the model through four different cases, where each case represents a different combination of two critical model parameters: a (high or low) knowledge transfer rate and a (high or low) knowledge depreciation rate. We find that when the knowledge transfer rate is low the firm’s optimal outsourcing decision is either one of two extreme strategies: total insourcing or total outsourcing. The optimal choice depends on the rate at which the outsourcing firm’s coordination knowledge depreciates. On the other hand, we find that when the knowledge transfer rate is high the firm’s optimal decision is to implement a selective outsourcing strategy in which the firm outsources only a portion of its IT services.

2. Brief Literature Review

Previous IT outsourcing literature has examined a firm’s optimal outsourcing rate based on transaction cost theory [13-15]. According to transaction cost theory, a firm incurs two types of costs to provide any product or service – production costs and coordination costs. Production costs are the costs incurred to make the product or provide the service and includes the cost of labor, material, and capital. Coordination costs are the costs incurred to monitor, control, and manage the work. A firm determines its boundary based on the tradeoff between the lower production costs and higher coordination costs [16-20] associated with outsourcing.

However, there is little theoretical work in the literature that examines the impact of firm knowledge on firm production and coordination costs and therefore on a firm’s optimal outsourcing rate. One exception is the recent study by Anderson and Parker [12] who examine the effect of learning on a firm’s make/buy decision in a manufacturing environment. They examine the optimal outsourcing rate as a function of product modularity, discount rate, demand elasticity, and technology obsolescence when the project length is infinite. Similar to Anderson and Parker’s approach, we incorporate transaction cost theory into an economic learning model that explains how a firm’s learning-by-doing experiences (or its experiences with producing products) affect the level of knowledge and the resulting impact of these changes in knowledge levels on the firm’s production costs and coordination costs. However, given our focus on knowledge transfers in the IT outsourcing context, we make different assumptions concerning the accumulation of production and coordination knowledge by the outsourcing firm. These assumptions allow us to derive a set of counterintuitive results that help explain some observations in the IT outsourcing context.

3. Model

Following Cha et al. [1]’s approach, we use a modified version of Spence’s learning model [21-23] as the basis of our IT outsourcing model. This modified learning model is presented below. See [1] for more details.

The unit production cost of a firm at any given time \( t \) is

\[ c(t) = c_0 \left( \frac{k(t)}{k_0} \right)^{-\beta} \quad (\beta > 1), \]

where \( c_0 \) and \( k_0 \) are the firm’s initial marginal production cost and knowledge level respectively, and \( \beta \) is the innovation parameter, the size of which determines the impact of accumulated knowledge on production costs. The unit production cost \( c(t) \) is a decreasing function of knowledge level \( k = k(t) \), which implies that the firm’s unit production costs decrease (increase) as the firm accumulates (losses) knowledge over time.

The marginal change of knowledge level at time \( t \) is

\[ \frac{dk(t)}{dt} = q - \delta k(t) \quad (0 \leq \delta \leq 1), \]

where \( q \) is the fixed quantity of output and \( \delta \) is the knowledge depreciation rate. The intuition behind Equation (2) is that a firm producing more output will accumulate more knowledge via “learning-by-doing”. However, some knowledge is lost over time because of technology obsolescence, imperfect knowledge management practices, employee turnover, and other factors.

Note that Cha et al. [1] relax the assumption by Spence that the firm’s knowledge level is always increasing over time through learning by doing experiences. Instead, in Equation (2) they allow the firm’s knowledge to decrease over time when the output quantity \( q \) is relatively smaller than the marginal loss of knowledge \( \frac{q}{\delta} \) at time \( t \). This relaxation is particularly important in our modeling context since a firm’s repository of knowledge may decrease over time when outsourcing reduces a firm’s opportunity to accumulate its internal “learning-by-doing” experiences. Solving Equation (2) yields

\[ k(t) = \frac{q}{\delta} + (k_0 - \frac{q}{\delta})e^{-\delta t}. \]

By replacing \( k(t) \) in Equation (1) with Equation (3) the firm’s unit production cost is
c(t) = c_0 t q \frac{q}{k_0 \delta} + \left(1 - \frac{q}{k_0 \delta}\right) e^{-\delta t} \gamma^{-\beta} \quad (\beta > 1). \quad (4)

We construct a model of outsourcing based on the modified learning model presented above. We keep the same assumptions presented in [1] that a firm produces a total quantity q of IT services and the firm may decide to outsource any proportion (0 ≤ α ≤ 1) of its IT services to an outside vendor. We assume that the outsourcing rate is determined at the beginning of the contract (at time t = 0) and is fixed over the life of the contract. We also assume (similar to a leader-follower relationship) that the vendor accepts this contract without negotiation. The firm provides IT services in one of two ways; it either develops the IT services in-house or outsources these activities to the external vendor (which has lower production costs than the firm). The firm’s unit cost is the sum of all production costs and coordination costs.

However, to examine the optimal outsourcing rate that minimizes the firm’s total costs, we reformulate the unit cost incurred by the firm at any given time t as a function of the outsourcing rate α. Specifically,

\[ c(\alpha, t) = c^\text{PR}(\alpha, t) + c^\text{CO}(\alpha, t), \quad (5) \]

where \( c^\text{PR} \) is the cost to produce one of the q units that include the lower-level production processes such as research, analysis, design, coding, testing, and support; and \( c^\text{CO} \) is the cost to coordinate the production of one of the q units that include the higher-level coordination processes to manage lower-level production activities such as implementation and use of the software application to solve real business problems. The functional form of each cost component in Equation (5) is further discussed below.

### 3.1. Production Costs

We divide the production costs in Equation (5) into

\[ c^\text{PR}(\alpha, t) = \alpha \cdot c^\text{OS}(\alpha, t) + (1 - \alpha) \cdot c^\text{IH}(\alpha, t) \quad (0 \leq \alpha \leq 1), \quad (6) \]

where \( c^\text{OS} \) is the cost incurred by the external vendor to produce one of the q units; \( c^\text{IH} \) is the cost incurred by the firm to produce one of the q units. At time \( t = 0 \), we assume that the initial vendor production costs are less than the in-house production costs, which assures short-term benefits of an outsourcing decision.

The first term in Equation (6) shows vendor production costs that are incurred to the firm for the \( \alpha \) proportion of services using the vendor’s lower production costs. That is, we assume a time-and-material contract where the vendor’s production costs are passed directly to the outsourcing firm. The marginal change in the external vendor’s production knowledge is

\[ \frac{dk^\text{PR}}{dt}(\alpha, t) = (\alpha q + D) - \delta^\text{PR} k^\text{IH}(\alpha, t), \quad (7) \]

where \( \delta^\text{PR} \) is the rate of production knowledge depreciation and \( D \) is the quantity that the vendor produces to meet the demand of its other customers. The quantity \( D \) may be thought of as the degree of speciality or economies of scale for the vendor that has been confirmed to be an important driver of outsourcing decisions [24, 25]. The marginal change in the firm’s in-house production knowledge is determined by two factors. First, the vendor accumulates its learning-by-doing experiences through producing the total output quantity -- that is the sum of \( \alpha q \) (which it produces for the firm) and the \( D \) (which it produces for other customers). Second, some of vendor’s production knowledge depreciates over time at the rate of \( \delta^\text{PR} \).

Utilizing Equation (4), the associated vendor production costs are

\[ c^\text{OS}(\alpha, t) = c^\text{OS}_{0} + \frac{\alpha q + D}{k^\text{OS}_{0}} \frac{q}{k^\text{OS}_{0}} \delta^\text{PR} + \left(1 - \frac{\alpha q + D}{k^\text{OS}_{0}} \frac{q}{k^\text{OS}_{0}} \delta^\text{PR}\right) e^{-\delta^\text{PR} t} \gamma^{-\beta^\text{OS}} \quad (8) \]

where \( c^\text{OS}_{0} \) is the initial vendor production cost, \( k^\text{OS}_{0} \) is the initial vendor production knowledge level, and \( \beta^\text{OS} \) is the innovation parameter for outsourced production.

The second term in Equation (6) represents the in-house production costs that are incurred to the firm for the \( (1 - \alpha) \) proportion of services still kept in-house. The marginal change in in-house production knowledge for the firm is assumed to be

\[ \frac{dk^\text{IH}}{dt}(\alpha, t) = (1 - \alpha)q + \tau (\alpha q + D) - \delta^\text{PR} k^\text{IH}(\alpha, t) \quad (9) \]

where \( \tau \) is the knowledge transfer rate.

The marginal change in the firm’s in-house production knowledge is determined by three factors. First, the firm accumulates production knowledge through the learning-by-doing experience from producing the quantity \( (1 - \alpha) q \). Second, the firm accumulates production knowledge through knowledge transfers from the external vendor. That is, we assume that the vendor transfers a portion of its own learning-by-doing knowledge to the outsourcing firm. Third, the firm loses some in-house production knowledge through depreciation. The rate of production...
knowledge depreciation for the firm is assumed to be the same as the rate for the vendor.

In contrast to Cha et al., we assume that the proportion of production knowledge transferred from the vendor to the outsourcing firm increases with the outsourcing rate. That is, the more IT services the firm outsources the more production knowledge it will derive from the vendor. Specifically, we set

\[ \tau = f(\alpha) = \alpha \tau \quad (0 \leq \tau \leq 1), \]

where knowledge transfer rate (\( \tau \)) is linearly increasing with the outsourcing rate (\( \alpha \)). \( \tau \) is the upper boundary of knowledge transfer rate when the firm outsources all of its services.

The associated in-house production costs are

\[
c_{HI}^{in}(\alpha, t) = c_{0}^{HI} \left(1-\alpha\right)q + \alpha T(\alpha q + D) k_{0}^{HI} \delta^{PR} \left(1-\alpha\right)q + \alpha T(\alpha q + D) \right) - \delta^{HI} t - \beta^{HI}, \quad (11)
\]

where \( c_{0}^{HI} \) is the initial in-house production cost, \( k_{0}^{HI} \) is the initial in-house production knowledge level, and \( \beta^{HI} \) is the innovation parameter for in-house production. At time \( t = 0 \), we assume that the initial vendor production costs are less than the in-house production costs (i.e., \( c_{0}^{OS} < c_{0}^{HI} \)).

3.2. Coordination Costs

The firm must coordinate both vendor and in-house production. The marginal change of coordination knowledge is assumed to be

\[
\frac{dk^{CO}(\alpha, t)}{dt} = q - \delta^{CO} k^{CO}(\alpha, t). \quad (12)
\]

The key assumption here is that the potential loss of learning-by-doing knowledge (due to outsourcing) may also affect the depreciation rate of coordination knowledge. That is, the ability of project managers to effectively coordinate and manage the lower-level activities depends critically on a firm’s domain experience accumulated by performing the lower-level activities. So if a firm outsources its lower-level activities, it may lose much of this experiential knowledge over time which will hinder the abilities of project managers to effectively coordinate these activities. Therefore, we assume that the depreciation rate of coordination knowledge increases with the outsourcing rate \( \alpha \). Specifically, we assume the functional relationship

\[
\delta^{CO} = g(\alpha) = (1-\alpha) \delta^{CO} + \alpha \delta^{CO} \quad (\delta^{CO} \leq \delta^{CO}), \quad (13)
\]

where the depreciation rate of total insourcing (\( \alpha = 0 \)) is \( \delta^{CO} \) and the depreciation rate of total outsourcing (\( \alpha = 1 \)) is \( \delta^{CO} \). We include a fixed transaction cost \( z \) in the coordination costs that are associated with activities such as monitoring performance and managing contracts [17, 18].

The associated coordination costs are

\[
c^{CO}(\alpha, t) = z \cdot \alpha + c_{0}^{CO} \left[ q \left( \frac{1}{k_{0}^{CO} \left((1-\alpha) \delta^{CO} + \alpha \delta^{CO} \right) - \alpha \delta^{CO}} \right) - e^{-(1-\alpha) \delta^{CO} + \alpha \delta^{CO} \beta^{CO} \delta^{CO} t} \right] - \beta^{CO}, \quad (14)
\]

where \( c_{0}^{CO} \) is the initial coordination cost, \( k_{0}^{CO} \) is the initial coordination knowledge level, \( z \) is the unit transaction cost, and \( \beta^{CO} \) is the coordination innovation parameter.

4. Analyses

The firm’s objective is to minimize the total unit costs of outsourcing for a given project length \( T \) such that

\[
\min_{\alpha} C(\alpha, T) = \alpha C^{OS}(\alpha, T) + (1-\alpha)C^{HI}(\alpha, T) + C^{CO}(\alpha, T) \quad (15)
\]

where

\[
C^{OS}(\alpha, T) = \int_{t=0}^{T} c^{OS}(\alpha, t) dt, \quad (16)
\]

\[
C^{HI}(\alpha, T) = \int_{t=0}^{T} c^{HI}(\alpha, t) dt, \quad (17)
\]

\[
C^{CO}(\alpha, T) = \int_{t=0}^{T} c^{CO}(\alpha, t) dt. \quad (18)
\]

Since \( q \) is a constant in this model, we do not need to consider the actual costs to produce \( q \) units of output (i.e., \( q \cdot C(\alpha, T) \)). Since the closed form solution of Equation (16) is elusive [26], we analyze the model based on several different scenarios through the instantiations of major model parameters. Specifically, we find that the firm’s optimal outsourcing rate is determined by two critical model parameters: the knowledge transfer rate (\( \tau \)) that determines the behavior of production costs and the depreciation rate
of coordination knowledge \( \delta^{CO} \) that determines the coordination costs. Below we examine four cases that represent different combinations of these model parameters.

### 4.1. Impact of Outsourcing Rate on Production Costs

Consider vendor and in-house production costs as a function of the outsourcing rate illustrated in Figure 1. The unit cost of vendor production \( TC^{OS}(\alpha,T) \) is decreasing in \( \alpha \) because the outsourcing vendor can produce more outputs \((aq + D)\) as \( \alpha \) increases, and this enables the outsourcing vendor to accumulate more knowledge and reduce its production costs.

\[
TC^{OS}(\alpha,T) = \alpha C^{OS}(\alpha,T) + (1-\alpha)C^{IH}(\alpha,T)
\]

As illustrated in Figure 2 above. The weighted vendor production costs \( \alpha C^{OS}(\alpha,T) \) increases from zero to \( C^{OS}(1,T) \) as \( \alpha \) increases (although \( C^{OS}(\alpha,T) \) itself is decreasing in \( \alpha \) ) and the weighted in-house production costs \((1-\alpha)C^{IH}(\alpha,T)\) decreases from \( C^{IH}(0,T) \) to zero (although \( C^{IH}(\alpha,T) \) itself may be decreasing or increasing in \( \alpha \) depending on the knowledge transfer rate). As a result, the total unit production costs \( C^{PR}(\alpha,T) \) are always decreasing in \( \alpha \) from \( C^{IH}(0,T) \) to \( C^{OS}(1,T) \) as illustrated in Figure 2. Although production costs are always decreasing, they decrease at a different rate depending on the knowledge transfer rate as illustrated by the shape (i.e., convexity/concavity) of each production cost curve. If the knowledge transfer rate is relatively low (e.g., \( \tau = 5\% \sim 15\% \)), the outsourcing firm must outsource at a higher rate to achieve the same level of cost reduction as a firm with a relatively high transfer rate (e.g., \( \tau = 25\% \sim 35\% \)).

### 4.2. Impact of Outsourcing Rate on Coordination Costs

The behavior of coordination costs as the outsourcing rate varies is determined by the knowledge depreciation rate. If outsourcing has no impact on coordination knowledge \( \delta^{CO} = \delta^{CO} \), using Equation (14) and (18),

\[
\frac{\partial}{\partial \alpha} C^{CO}(\alpha,T) = \int_{t=0}^{T} z dt = z T.
\]

In this case, \( C^{CO}(\alpha,T) \) is linearly increasing in \( \alpha \) as illustrated in Figure 3 below with \( \delta^{CO} = 5\% \). However, as \( \delta^{CO} \) further increases, the rate of increase...
in coordination costs becomes higher with an increase in $\alpha$. 

![Figure 3. Coordination costs](image_url)

5. Outsourcing Cases: Impact of Knowledge Transfer and Knowledge Depreciation

We present four different cases where each case represents a different combination of the knowledge transfer and knowledge depreciation parameters as shown in Figure 4. The specific values of all of the model parameters for the four cases are presented in Table 1.

![Figure 4. Four different cases of outsourcing and optimal outsourcing strategy](image_url)

**Table 1. Instantiation of Parameters**

<table>
<thead>
<tr>
<th>Notation</th>
<th>Description</th>
<th>Value</th>
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<tr>
<td>$q$</td>
<td>Outsourcing firm’s output quantity</td>
<td>4000 4000 4000 4000</td>
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</table>
5.1. Case I: Low Knowledge Transfer with High Knowledge Depreciation

In Case I we assume a low knowledge transfer rate ($\tau = 5\%$) and a high knowledge depreciation rate ($\delta^{CO} = 20\%$). This is a somewhat bleak scenario for the firm since it is able to capture only a relatively small portion of the vendor’s production knowledge and its coordination activities are seriously hindered. For Case I, the production costs curve is declining with the outsourcing rate as more IT services are produced with the vendor’s lower production costs. Interestingly, when the knowledge transfer rate is low, the total production costs curve is concave. This implies that the marginal benefits of reduction in production costs are increasing with the outsourcing rate. However, the coordination costs curve is increasing with the outsourcing rate. In fact, since the depreciation rate is so high coordination costs increase very rapidly with the outsourcing rate, which makes it more costly to implement total outsourcing than it is to keep all IT activities in-house (i.e., total insourcing). As a result, the shape of total cost curve is concave with higher total outsourcing costs than the total insourcing costs. The cost minimizing decision in Case I is to keep all IT activities in-house and outsource nothing despite the vendors’ lower production costs.

5.2. Case II: Low Knowledge Transfer with Low Knowledge Depreciation

In Case II, we continue to assume a knowledge transfer rate is low (i.e., $\tau = 5\%$) that leads to the same production cost curve that you see in Case I). However, we now assume a lower coordination knowledge depreciation rate ($\delta^{CO} = 15\%$) that results in a more gradual rise in coordination costs as the firm sets a higher outsourcing rate. In this case the total costs curve is still concave (with the same production costs curve); however, the costs of total outsourcing is now lower than the costs of keeping all IT activities in-house due to lower coordination knowledge depreciation. Therefore, in this case the firm will choose to outsource all of its IT activities to minimize total costs.

In the first two cases, when knowledge transfer rate is low, there is a bang-bang solution -- either total insourcing or total outsourcing. Whether the optimal decision is in-house or outsourcing depends on the coordination knowledge depreciation rate. However, as we will see below, in the last two cases the choice of an optimal outsourcing rate may not be a simple bang-bang solution.

5.3. Case III: High Knowledge Transfer with Low Knowledge Depreciation

In Case III we assume a knowledge transfer rate is relatively high (either $\tau = 25\%$ or $35\%$) and a knowledge depreciation rate that is relatively low
In this case, the high knowledge transfer rate transforms the shape of the total cost curve from a concave shape (as in Cases I and II) to a convex shape (or U-shape) as shown in Figure 5 (Case III). Given the shape of the total cost curve, the firm will choose a selective outsourcing strategy (i.e., an outsourcing rate greater than 0 but lower than 1) to minimize total costs. In other words, a high transfer rate allows the outsourcing firm to use a selective outsourcing strategy to gain substantial knowledge transfers from the vendor without sacrificing much of its own in-house learning-by-doing experiences. Further, as the knowledge transfer rate increases, for example from 25% (illustrated Figure 5 – Case III - in a solid line) to 35% (illustrated in a dotted line), the firm will choose an even lower outsourcing rate since the total costs decrease with this change. Interestingly, the vendor may be interested in encouraging the firm to increase its outsourcing rate as much as possible by decreasing the knowledge transfer rate. In the extreme case, if the vendor decreases the transfer rate enough for the total cost curve to be transformed into a concave shape as shown in Case II, the firm will choose to outsource all of its IT activities. However, this manipulation of the transfer rate by the vendor conflicts with the interests of the outsourcing firm since such a manipulation increases the firm’s total costs; that is, with a higher knowledge transfer rate the firm can realize lower total costs by implementing a selective outsourcing strategy. This conflict raises an interesting bargaining problem.

### 5.4. Case IV: High Knowledge Transfer with High Knowledge Depreciation

In the Case IV we assume a high knowledge transfer rate and a low knowledge depreciation rate. Similar to the previous case, the high knowledge transfer rate transforms the total costs curve into a convex shape (or U-shape), again leading the firm to choose a selective outsourcing strategy to minimize its total costs. The difference in this case is that the firm will choose a lower outsourcing rate than in Case III due to the higher coordination costs associated with outsourcing. Again, from the vendor’s perspective, the vendor may be willing to encourage the firm to increase its outsourcing rate as much as possible by decreasing the knowledge transfer rate. However, as illustrated in Case I, if the vendor sets a very low knowledge transfer rate, the total cost curves will transform back to a concave shape (as in Case I), forcing the firm to keep all of its IT activities in-house (i.e., total insourcing). This will restrict the ability of the vendor to successfully manipulate the knowledge transfer rate. However, as in Case III, this conflict also raises an interesting bargaining problem.

### 6. Managerial Implications

The decision model presented in this paper enables an informed discussion about a firm’s optimal choice of outsourcing rate under the presence of complex relationships among the firm’s knowledge levels, production costs and coordination costs. The critical implication is that given these complex relationships there is no rule of thumb for determining the optimal outsourcing rate.

For example, one rule of thumb that is ruled out by the model is that firms should engage in selective outsourcing (or choosing an outsourcing rate “in the middle”) to effectively mitigate risk [27-29]. Given Cases I and II described above this rule of thumb is not effective, particularly in cases where the outsourcing firm has not established and maintained an effective shared knowledge management system with the vendor.

In their recent case study analysis, Willocoks et al. [30] observed that many outsourcing firms that previously implemented a selective outsourcing strategy now regret their decision to outsource and complain of “paying for the vendor’s learning (that is seldom transferred to the firms), while learning little themselves (as a result of reduced amounts of in-house production).” This observation is consistent with our findings in Cases I and II. Of course, a significant increase in coordination costs (often driven by a loss of coordination knowledge) worsens the situation, making total insourcing a more attractive option than outsourcing.

Other rules of thumb that are ruled out by our model are rules such as “if outsourcing is good, outsource it all” or “outsourcing is too risky, just don’t do it” (see Cases III & IV). For example, a firm may find a selective outsourcing strategy is optimal if it can increase the rate of knowledge transfer through investments in knowledge management systems, including communication systems, group decision support systems, and collaborative application development systems (e.g., code repository and CASE tools). These investments can help the firm obtain substantial knowledge transfers without sacrificing much of its own learning-by-doing experiences and further decrease the total costs, making selective outsourcing a very attractive strategy. Further, this selective outsourcing strategy (enabled by the high knowledge transfer) may also give the firm more managerial and strategic flexibility by decreasing its heavy reliance on external vendors for IT services [31]. For example, outsourcing firms often decide to backsource the technical capability associated with
application development in order to handle some non-routine firm specific IT problems [30]. However, the extent of the firm’s outsourcing (or outsourcing rate) affects the cost and ease of the transition of IT services from the vendor to back in-house. That is, a higher outsourcing rate implies a larger erosion of the firm’s internal, experiential knowledge, making the decision to backsource much more costly and difficult in the short-term [1].

Although the outsourcing firm may want to increase the knowledge transfer rate to lower costs, it may be difficult to establish and maintain effective mechanisms for doing so. In this case, the outsourcing firm may be forced to fully rely on the vendor’s expertise, especially if:

- the outsourcing firm lacks an initial repository of production knowledge that is substantial
- investments in knowledge management systems are too expensive
- costs of replacing legacy systems (or integrating them with new investments) are too high, or
- vendors are unwilling to support a substantial knowledge transfer (even if the proper mechanism were in place).

A good example is the recent increase in back-office business process outsourcing where the firm’s whole functions or processes that embed IT activities are outsourced. In this case, the firm should focus mostly on lowering its coordination costs to minimize the total outsourcing costs. For example, the firm should invest more in areas such as contract management and project management. The firm should also invest in business process reengineering that may increase the process modularity. This may decouple the IT production activities from the coordination activities and consequently reduce the coordination costs [32].

In summary, in order to make an informed decision, it is incumbent on managers to understand the complex relationships outlined in the model when negotiating an outsourcing contract. Further, it is incumbent on the manager to understand the impacts that knowledge retention and transfer investments may have on these relationships and thus, on the form of the contract. Large errors could easily be made. Given the sensitivity of outcome to the parameters of the model, poor knowledge and contract management will erode any benefits of the outsourcing relationship.

7. Conclusion

In conclusion, we examined the extent to which a firm should outsource its IT activities for four different cases of outsourcing where each case represents a different combination of two critical model parameters: a (high or low) knowledge transfer rate and a (high or low) knowledge depreciation rate. We find that when the knowledge transfer rate is low that the firm’s optimal outsourcing decision is either one of two extreme strategies: total insourcing or total outsourcing. The optimal choice depends on the rate at which the outsourcing firm’s coordination knowledge depreciates. On the other hand, we find that when the knowledge transfer rate is high that the firm’s optimal decision is to implement a selective outsourcing strategy in which the firm outsources only a portion of its IT services.

8. References


