DETERMINANTS OF INFORMATION TECHNOLOGY OUTSOURCING AMONG HEALTH MAINTENANCE ORGANIZATIONS

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ABSTRACT

We extend transaction cost economics by examining the effect of relaxing two of its underlying assumptions. First, transaction cost economics relies on an assumption of risk neutrality. We argue that organizations transactions vary in the risk they impose on an organization and that organizations are more likely to embed riskier transactions within a hierarchy. Second, transaction cost economics assumes that transactions are independently organized. We argue that organizations have an underlying propensity to organize transactions through hierarchy or contracting and that this underlying propensity is related to an organization's capabilities, such as absorptive capacity. The analysis shows that transaction organization is a function of transaction risk. Transaction risk, rather than uncertainty or firm asset specificity, is the most important factor determining transaction organization. And, the analysis shows that transaction organization is a function of an organization's absorptive capacity and technological diversity. This means that transactions within an organization are interdependent.

Transaction cost economics (Williamson, 1975; 1979; 1981; 1985) argues that transaction characteristics play a major part in the choice of control strategies by organizations. According to this theory, considerations such as firm specificity, bounded rationality, opportunism, uncertainty and small number conditions, in various combinations, explain firm decisions concerning transaction organization. The two limiting conditions of transaction organization are hierarchy, in which a transaction is included within an organizational bureaucracy, and a market, in which a transaction is completed at an arms-length relationship between two parties. There are a variety of hybrid organizational arrangements that exist between these two extremes.

The principle of bounded rationality suggests that a decision maker has limited ability to evaluate all possible outcomes of decisions. Opportunism refers to the possibility that parties to a transaction may not only pursue their self-interest but do so "with guile" (Williamson, 1981:554). Uncertainty and opportunism are not problematic unless a transaction requires firm specific assets. Firm asset specificity is the degree to which assets invested to accomplish a transaction are peculiar to the transaction, with relatively low usability outside of the particular transaction. When transactions have high asset specificity, uncertainty and actors are boundedly rational, actors have the chance to behave opportunistically and thus increase governance costs associated with the transaction. This provides an incentive for organizations to incorporate transactions within the organization.

Transaction cost economics has received broad empirical support. Shelanski and Klein (1995:352), in their review of the empirical literature on transaction costs economics, conclude that “the body of empirical research in TCE shows that a good deal of economic activity aligns with transactions in the manner predicted by theory.” Ferguson and Keen (1996) apply TCE to investigate the role and value of information and communication technologies in health care, and the extent to which they may impact the efficiency of services.

We extend transaction cost economics by relaxing two of its underlying assumptions. First, transaction cost economics relies on an assumption of risk neutrality (Chiles and McMackin, 1996). We argue that organizations transactions vary in the risk they impose on an organization and that organizations are more likely to internalize riskier transactions. Second, transaction cost economics assumes that transactions are independently organized. We

argue that organizations have an underlying propensity to organize transactions through hierarchy or contracting and that this underlying propensity is related to an organization's capabilities, such as absorptive capacity (Cohen and Levinthal, 1993). We test our arguments by examining information system development and operation among Health Maintenance Organizations (HMOs).

ORGANIZING INFORMATION SYSTEM DEVELOPMENT AND OPERATION

We present our arguments about the determinants of transaction organization within the context of information systems (e.g., Loh and Venkatraman, 1992, Malhotra, 1995, Nam, et al., 1996; Nelson, Richmond, and Seidmann, 1996). The usage of information systems has become ubiquitous in modern organizations. An important advantage of studying information systems is that their implementation requires the organization of two distinct transactions. First, the development of the system must be organized. Second, the operation of the system must be organized in a scheduled, production mode (we refer to this mode as production). Indeed, according to a recent survey by the Outsourcing Institute, application development and maintenance outsourcing now rank first and second, respectively, as the IT activities currently outsourced (Corbett, 1996).

Development and production differ fundamentally in their uncertainty and risk (Lacity and Hirscheim, 1993, Nelson, Richmond, and Seidmann, 1996). Development is the far more uncertain activity. The software development industry is replete with stories about projects over budget, late, cancelled, and failing to deliver the promised functionality. Even after an information system is initially implemented, there is an ongoing relationship with the developers, to adapt the software to the particular organization in which it is installed, to provide enhancements, and to fix bugs. This ongoing maintenance and enhancement requires an ongoing, extended relationship. The ongoing phase provides developers chances for opportunism. For example, consider an university which has outsourced an on-line student registration system and wishes to customize it to fit unique characteristics of the university's environment. If the outside vendor will not have the ability to sell the customization to multiple customers, they may not wish to enhance the product unless they receive a substantial payment premium.

Production assumes the development of a system, and is relatively straightforward. Inputs tend to arrive in a reasonably orderly fashion, and the production process is relatively well-known. Most of the time, production is taken for granted and reflected in smooth organizational operation. However, the continued operation of the system is critical to organizational performance and any breakdowns can be very disruptive and give power to those who can deal with the uncertainty (Crozier, 1964).

The types of risk faced by organizations differs between development and production. The failure of a development project tends to have a more limited organizational impact than operational problems. The lost costs associated with the failure of a development project are those costs already incurred during the development process, costs associated with using a more costly existing system, and the opportunity costs associated with operating a system with less functionality than the planned system or not being able to expand operations as swiftly as desired. The failure of system that is being used in production has a far wider potential impact. Products may not be delivered to clients, inappropriate organizational decisions may be made, and, in an especially severe case, an organization's operations may grind to a complete halt (e.g., software problems with telephone switches that cause whole networks to go out; software problems with air traffic control systems that cause planes to go untracked).

Distinctions between development and production may also be driven in part by the need to divert resources for strategic activities. Production, with its requirements for ongoing maintenance, upgrades, troubleshooting, and managing and controlling some burdensome functions could force organizations to outsource such activities. Such risks are minimal with development.

In essence, development is uncertain because the probability of delivering a system that meets specifications on-time and on-budget is not a well understood process. Production, on the other hand, is relatively certain. Even assuming that the expected value for both development and production, which is the sum of the probability of each possible outcome times the magnitude of the outcome, is equal, the distribution of possible outcomes differs substantially. For development, there are a variety of relatively probable, moderately costly outcomes and moderately beneficial outcomes. For production, there are many low benefit outcomes (e.g., doing each transaction correctly is a benefit that is highly probable and

contributes relatively little to total organizational outcome) and a very few highly improbable, highly costly outcomes. While the expected values and variance of the outcome distribution may be equal, the skewness of the distributions can be substantially different. This difference in skewness may be an important factor in decision-making about transaction organization.

The difference in the skewness of distribution of outcomes means that organizational risk differs substantially between development and production. Risk refers to the negative side of the distribution, the possible losses (March and Shapira, 1987; Yates and Stone, 1992; Chiles and McMackin, 1996). Prospect theory suggests that actors discount gains more than losses, leading potential losses to weigh heavily in decision-making (Kahneman and Tversky, 1979). If risk plays an important part in organizational decision-making, then risk should be associated with a difference in transaction organization.

DETERMINANTS OF INFORMATION SYSTEM TRANSACTION ORGANIZATION

Transaction cost economics argues that the interaction of uncertainty and firm specificity affect the organization of transactions. Within information systems, firm specificity varies (Alpar and Saharia, 1995). For example, activities such as operating a data center are rather general activities. Regardless of whether an organization purchases or leases equipment, there is a large market of firms that have the capability of operating the data center. While there are some adjustments to individual organizational needs required, these adjustments are not as great as the adjustments required in developing a reporting system to support managerial decision-making. Managerial reporting systems are often idiosyncratic to a particular firm, which requires significant human asset specificity. Furthermore, producing and distributing reports can provide individuals access to confidential data, the release of which could be problematic. We assume, therefore that there is a range of firm asset specificity associated with the different transactions the firm needs to organize.

The key prediction of transaction cost economics is that the greater the uncertainty of a transaction and the greater the asset specificity of a transaction, the greater the likelihood that a firm will organize the transaction internally. For information systems, this implies that

Hypothesis 1: The positive effect of asset specificity on the likelihood that organizations use internal governance structures is greater for information systems development than for information systems production.

If managers are risk averse, then they will prefer to manage riskier transactions internally (Chiles and McMackin, 1996). Jacobs (1981) provides an organizational argument. He argues that it is precisely the risk of a transaction which drives labor market organization. Where organizations have employees engaged in activities in which errors could be extraordinarily costly to an organization (e.g., airline pilots for major carriers flying large aircraft), extensive firm internal labor markets and socialization practices are used to screen and train employees. Similarly, where transaction risks are high, organizations will use internal governance mechanisms because it will be easier to implement redundant, fail-safe governance mechanisms. For information systems, this implies that

Hypothesis 2: Information systems that are riskier, production information systems, will be organized with internal governance structures.

DETERMINANTS OF AN ORGANIZATION'S OUTSOURCING PROPENSITY

Typically, transaction cost economists assume that the transactions an organization uses to assemble its product or services are independent and that transaction cost arguments can be applied separately to each type of transaction an organization uses. Wholey, Christianson, and Peterson (1996) have demonstrated that transactions are not independent. They argue that there are externalities associated with the organization of transactions. Methods used in organizing a transaction create organizational capabilities to organize other transactions in a similar manner. This causes interdependence among transaction and a transaction organizing capability that is unique to an organization.

Cohen and Levinthal (1990: 128) used the term absorptive capacity to refer to an organization's ability to use "prior related knowledge . . . to recognize the value of new information, assimilate it, and apply it to commercial ends." Absorptive capacity gives a firm the capability of working at the leading edge of technological development. It also allows firms to tailor new ideas to the firm's specific technological environment. Both of these are firm specific assets, therefore absorptive capacity should be negatively related to a firm's propensity to outsource.

Hypothesis 3: The greater a firm's absorptive capacity, the less is the firm's outsourcing propensity.

Technology diversity, the range of different functions supported by an organization, also affects outsourcing propensity. We expect an inverted U relationship between diversity and outsourcing. At low levels of diversity, functional diversity will be positively related to outsourcing because packages often incorporate more functionality than the minimally required functionality. Organizations have an incentive to purchase these bundles of functionality. On the other hand, extremely diverse functionality support may be difficult to locate in prepackaged software. The difficulties in integrating a large variety of functions may cause organizations to be less reliant on outsourcing.

Hypothesis 4: The relationship between functional diversity and outsourcing propensity is an inverted U.

Organizational slack, "the difference between total resources and total necessary payments" to maintain the organizational coalition (Cyert and March, 1963: 36) should decrease outsourcing propensity. Rapidly changing technology gives organizations the opportunity to capitalize strategically on the change. However, this requires the investment of resources to stay at the cutting edge. While these resources can be invested either externally or internally, the problem with investing them externally is the ability to appropriate the returns from the investment of resources to the organization. Internal investment allows appropriation of new skills solely to the organization, which gives the organization a competitive advantage. High levels of organizational slack also permit core competencies to be developed and enhanced further. These core competency departments will also be more powerful and demand higher side payments.

Hypothesis 5: The greater the organizational slack, the lower the outsourcing propensity.

DATA AND METHODS

POPULATION

We examine our arguments by studying information technology outsourcing decisions by Health Maintenance Organizations (HMOs.). HMOs provide health services insurance. In exchange for a premium, HMOs deliver the health care services needed by an individual for a given period of time. Supporting their overall business requires supporting substantial

insurance functionality, such as claims processing, and developing systems to monitor and support physicians. Examples of these systems include profiling physicians (Garnick et al., 1994), identify patients with chronic conditions (Wingert et al., 1995), analyze quality of care (Lawthers, 1993; Parente et al., 1995, Weiner et al., 1995), measure ambulatory care case-mix (Weiner et al., 1991), and develop risk adjusted primary care capitation (Fowles et al., 1996). Information technology is beginning to make tentative inroads in managing clinical data as well as administrative data (Krall, et al., 1995). While some systems have been operated for a number of years (e.g., claims processing), a number of the systems have been developed recently (e.g. clinical information systems). Over the past few years, HMOs have been heavily investing in information technology (Wholey et al., 1997).

In developing information systems, HMOs make decisions about developing a system and operating a system. These systems vary in degree in asset specificity and uncertainty/risk. The uncertainty/risk dimension is captured by the difference between development and production. The firm specificity dimension is captured by studying outsourcing decisions for data center management, claims processing, and reporting. Firm specificity is least for data center management. Data center management involves arranging equipment and scheduling workers. While there may be some site asset specificity, other forms of asset specificity may not be great. Claims processing consists of collecting all claims and encounter data from providers, entering it, validating it, and storing it into central files. There may be both site specificity here and information specificity as well. The claims data is an important informational resource that can give an HMO a competitive advantage, thus it is usually regarded as confidential. The claims data become the source data for reporting applications. Since reporting is used to support managerial decision-making, the reporting applications have to be sensitive to managerial styles that are likely to vary across HMOs and thus be firm specific and very confidential.

SAMPLE

We surveyed all HMOs that InterStudy identified as operating in the United States in June 1995 (N=588). 251 (43%) HMOs responded to the survey. InterStudy is an organization that has been tracking and surveying HMOs for over twenty years. They have considerable industry contacts and are widely regarded as one of the key sources of information about the

HMO industry. Their response rate here is below the response rate usually attained by InterStudy. InterStudy did follow their usual procedure and made repeated follow-up phone calls to HMOs to increase the response rate. We feel that the lower response rate is due to information technology being a specialized area within HMOs and due to the length of the questionnaire. Given the responses that we did receive, the relatively low response rate may also be due to many HMOs not having very well developed information systems and not responding to the survey. If this is the case, our results overstate HMO information system capability.

We examined response bias by using logistic regression to regress HMO response on HMO characteristics and HMO market characteristics. HMOs which contract primarily with multispecialty physician groups were more likely to respond than were IPA HMOs, and HMOs with Medicare enrollment were also more likely to respond. HMOs in the South Atlantic, West South Central, and Mountain regions were significantly less likely to respond than HMOs in the Pacific region. Since HMOs in all regions were less likely to respond than HMOs in the Pacific region, the regional effect appears to be due a greater tendency of HMOs in the Pacific region being more likely to respond. HMOs in markets with a large number of competitors were less likely to respond. There were no effects of HMO enrollment (size), national affiliation, and profit status on response.

MEASURES

HMOs were asked about outsourcing for claims processing, reporting, and data facility management functions. The series of questions for reporting started with a screening question which asked "Does your HMO provide a Reporting function (e.g., provider profiling, NCQA HEDIS analyses) either internally or through outsourcing?" Those HMOs responding yes, were then asked "How much of your HMO's REPORTING is outsourced? Please check <u>one</u> response: None; Some; Half; Most; All). Then HMOs were asked "What is the source of the information system portion of your REPORTING functions if it is performed internally? Please check <u>one</u> response: Completely acquired; Mostly acquired, partly internally customized; Half acquired, half internally customized; Mostly internally customized, partly acquired; Completely internally customized. [For analysis purposes, the scale on development was reverse coded so that higher values represented outsourcing.] Finally, HMOs were asked to "Please <u>rank</u> ("1"

being most important) the top three factors in deciding whether to outsource or internally customize your HMO's REPORTING information system. The items ranked were: Contractor has specialized personnel; Contractor has specialized equipment; Contractor is less expensive/cost effective; Contractor has large volume of business with HMO; No or few contractors available; Difficulty in coordinating contractor services; Difficulty in monitoring contractor performance; Financial risk in using contractor; Confidentiality of Information.

EXAMINING THE DETERMINANTS OF TRANSACTION ORGANIZATION

For each HMO there are six responses about outsourcing. These responses can be categorized by process (developing an information system service; providing an information system service) and product (data center management; claims processing; and reporting). This results in a 2x3 design. We use analysis of variance to test the effect of process and product on transaction organization. Since there is likely to be an organizational main effect on transaction organization, since transactions in an organization are interdependent (Wholey, Christianson, and Peterson, 1996), fixed effects are included for each HMO. As well as controlling effectively for spurious effects at the HMO level, this approach allows the comparison of the relative importance of transaction characteristics (process, product) and organizational characteristics (the HMO fixed effects) in predicting transaction organization. This comparison is done by comparing the F-statistic for each effect.

EXAMINING THE DETERMINANTS OF OUTSOURCING PROPENSITY

The effects of organizational characteristics on outsourcing are examined by recovering the organizational fixed effects from the analysis of variance and regressing these fixed effects on organizational factors. By the nature of their construction, these fixed effects measure the propensity of a firm to outsource, independent of transactional characteristics.

We measure absorptive capacity by including total full-time-equivalent (FTE) personnel for information systems support (the personnel included are managers, administrators, analysts, programmers, network support staff, trainers/user help; equipment support staff; computer operations staff; and clerical). The greater is absorptive capacity, the less likely is the organization to outsource. Only 211 HMOs supplied information on full-time equivalent personnel. For HMOs which did not supply FTE information, we set an indicator to one and set

the FTE measure to zero. This allowed the inclusion of these HMOs in the multivariate analysis of outsourcing propensity.

We measure functional diversity as the number of information technology functions supported by the HMO where the functions are: benefits management; capitation rate analysis; case mix arrangements; claims management; contract management; credentialling; data warehouse; clinical decision support; managerial decision support; diagnostic episode cluster analysis; direct user analysis of data; electronic data interchange; interactive voice recognition; membership/enrollment; patient/contract billing; peer review analysis; physician profiling; severity adjustment; tracking member eligibility; tracking patient care results). A linear and quadratic term for number of functions supported is included to allow the relationship between functional diversity and outsourcing propensity to take on an inverted U functional form.

Organizational slack is measured as per member, per month information system support costs. To avoid losing cases, per member per month costs are set to zero and an indicator for missing cost data is set to one in cases where HMOs did not provide cost information.

We include the natural logarithm of HMO enrollment to control for scale economies in developing information technology. An indicator for HMOs less than two years old controls for the fact that young HMOs may be forced to rely on outsourcing during a startup. Indicators for HMO type (Group, Staff, Network, Mixed, with the contrast being IPA) controls for differences by organizational form noted by Wholey, Christianson, and Peterson (1996). An indicator for federal qualification controls for greater reporting requirements to the federal government. Regional indicators control for geographic differences in information technology use. Finally, indicators for affiliation with Blue Cross or local organization control for access to information technology through a national organization (the contrast is nationally organized HMOs; we estimated models with local HMOs being the contrast but found that using national HMOs as the contrast provided clearer results).

Research on HMOs show significant differences across HMO types in organizing decisions (Wholey and Burns, 1993; Wholey, Christianson, and Peterson, 1996; Christianson, Wholey, and Peterson, 1997). Group HMOs are based on physicians working in multispecialty medical group practices (there are four subtypes of Group HMOs: Group, Staff, Network, and

Mixed) . IPA HMOs (Independent Practice Associations) are based on physicians operating as individuals or in small, single-specialty group practices.

We checked for differences in the effects of all independent variables between Group HMOs and IPA HMOs. The results indicated that the effect of FTE differed between the two HMO types, so we included an interaction of IPA with FTE in the final model.

RESULTS

DETERMINANTS OF TRANSACTION ORGANIZATION

Table 1 shows the response patterns to the outsourcing questions. Two interesting patterns are apparent. For development, the distribution is bimodal – firms tend to either make or buy. For production, the responses are heavily skewed towards make. The distinction between development and production captures a fundamental difference in transaction organization.

Table 2 shows the analysis of variance results for transaction characteristics effects on outsourcing decisions. The results support an interpretation of transaction characteristics being the most important determinant of transaction organization. The contrast between system development and system operation (production), which is our measure of uncertainty/risk, is the most important determinant of transaction organization (F = 685.85). The type of transaction being organized, which is our measure of asset specificity, is the second most important determinant of transaction organization (F = 16.31). The interaction of uncertainty and asset specificity is the third most important determinant of transaction organization (F = 9.38). The HMO fixed effect, while significant, has the smallest F statistic (F = 2.82).

There is support for Hypothesis 1, that the interaction of uncertainty and firm specificity causes organizations to internalize transactions. Developing reporting systems, which is an uncertain activity of a firm specific asset, is most likely to be internally organized (the mean is 2.41). However, claims processing is more likely to be outsourced than data center operations.

There is strong support for Hypothesis 2, that risky transactions are organized internally (the F for production is 685.85).

The reasons HMOs noted for their organizing decisions provides further understanding of the results. HMO responses were categorized into internal and external organization. If the HMO's response to an outsourcing information technology development question was 3, 4, or 5, the HMO was categorized as externally organized, otherwise it was categorized as internally organized. This was done separately for each product (data center; claims; reports).

For HMOs using external organization (outsourcing), the top two reasons cited for organizing choice for claims processing and reporting were expense and specialized personnel. The top two reasons cited for data center organization were expense and coordination. In the case of data centers, specialized personnel was the third most mentioned reason. Given outsourcing, it appears that expense and specialized personnel are key reasons justifying the decision. This suggests that obtaining scale economies and access to specialized personnel are important determinants of firms choosing to use external sources.

For HMOs using internal organization (developing in-house), the two most important reasons varied by product. For claims processing, the two most important reasons were confidentiality and expense. For the data center, the two most important reasons were coordination and monitoring, For reporting, the two most important reasons were coordination and confidentiality. Given internal organization, coordination and confidentiality are key reasons justifying the decision. Both of these are consistent with an asset specificity interpretation, with coordination referring to site specific assets or physically specific assets and with confidentiality referring to human asset specificity (see Shelanski and Klein, 1995: 341, for descriptions of these types of assets).

DETERMINANTS OF THE UNDERLYING PROPENSITY TO OUTSOURCE

Table 3 shows estimates of the model regressing the fixed effects measure of underlying propensity to organize on organizational characteristics.

Hypothesis 3, that absorptive capacity decreases outsourcing propensity, receives partial support. The effect of FTE personnel is negative among Group HMOs is marginally significant ($p < .06$) and not different from zero among IPA HMOs. This difference between Group HMOs and IPA HMOs has been found in other research on HMOs, and reflects the underlying organizational characteristics of the two HMO types. Wholey, Christianson, and Peterson (1996) argued that Group HMOs have an inherent tendency to internalize

transactions in order to minimize coordination costs. Group HMOs have an easier time doing this than IPA HMOs because they are based on physicians working in organizational environments.

Hypothesis 4, that there is an inverted U relationship between technological diversity and outsourcing propensity, is supported.

Hypothesis 5, that organizational slack decreases outsourcing propensity, is supported.

HMOs less than two years old are more likely to rely on outsourcing, probably to quickly get information systems operational. Federally qualified HMOs are less likely to outsource. HMOs affiliated with national HMO firms are less likely to outsource than are local HMOs or HMOs affiliated with Blue Cross. This suggests that national affiliation gives HMOs access to in-house information technology. Since Blue Cross is a loose network of organizations, rather than a hierarchical headquarters-subsidiary relationship, HMOs affiliated with Blue Cross do not gain the advantage of access to in-house expertise. For-profit HMOs are more likely to outsource.

DISCUSSION

The analysis supports the prediction from transaction cost economics that the interaction of uncertainty and firm asset specificity affect transaction organization. The analysis strongly supports the transaction cost economics claim that characteristics of transactions are an important determinant of transaction organization. The analysis extends transaction cost economics in two ways. First, transaction organization is a function of transaction risk. Transaction risk, rather than uncertainty or firm asset specificity, is the most important factor determining transaction organization. Second, transaction organization is a function of an organization's absorptive capacity and technological diversity. This means that transactions within an organization are not independent.

We interpret the effect of the difference between development and production as a risk effect. While the magnitude of the effect is unquestionable, the interpretation of its meaning is questionable. We examine some alternative interpretations.

The development and production distinction could be a measure of firm asset specificity, with production having higher asset specificity. The argument could be made that

the asset specificity in production is due to site specific reasons. For example, common equipment and the problems with scheduling processing of separate sub-systems could lead to economies of having the systems operated together. While this explanation is certainly plausible, it does have difficulties. The primary difficulty is that the explanation for asset specificity also holds for development. New sub-systems, which can be either developed internally or purchased, are interdependent with existing sub-systems. In fact, an argument could be made that the interdependencies and externalities in development are actually greater, because interfaces and coordination mechanisms have to be specified whereas in production these interfaces and coordination mechanisms are better known.

It could be that instead of measuring risk, the development and production distinction measures transaction routineness. Production technology, in this case, is much more routine and well-known, and is thus organized internally. Or, it is easier for organizations to incorporate routine transactions such as production than novel activities such as development. The difficulty with this explanation is that it implies organizations should incorporate all activities that can be routinized. A central observation of transaction cost economics is that organizations do not do this. Many goods and services that can be produced in a routinized fashion are acquired in a spot-market. Thus, the routinization explanation explains too much.

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Table 1
Response Frequencies for Outsourcing Decision

Process (Uncertainty / Risk)	Product (Firm Specificity)	Make All	Make Most	Make Half	Buy Most	Buy All	Mean
Development	Data Center Operations	59	37	23	58	54	2.84
	Claims Processing	59	37	23	58	54	3.05
	Reporting	51	97	33	26	20	2.41
Production	Data Center Operations	172	27	3	2	6	1.30
	Claims Processing	174	62	2	2	6	1.39
	Reporting	193	32	6	5	2	1.28

Table 2
Analysis of Variance for Outsourcing Degree

Effect	Numerator Degrees of Freedom	F
Product (Firm Specificity)	2	16.31*
Process (Uncertainty / Risk)	1	685.85*
Product * Process	2	9.38*
HMO	247	2.82*

Denominator degrees of freedom are 1090
* - $p < .01$

Table 3
Determinants of the Underlying Health Maintenance Organizations Outsourcing Propensity

Effect	Estimate	T-Statistic
Absorptive Capacity, Functional Diversity, and Organizational Slack		
Total FTE	-.039	-1.91
IPA * Total FTE	.028	1.21
Missing FTE data	-.100	-.66
Functions supported	.137*	2.06
Functions supported^2	-.006*	-2.13
Costs per member month	.052*	2.55
Missing costs	-.008	-.06
HMO Controls		
Log of enrollment	.008	.31
Less than 2 years old	.467**	2.86
Group	.232	1.37
Staff	.053	.20
Network	-.027	-.18
Mixed	.218	1.95
Federally qualified	-.218*	-2.17
Local	.289*	2.56
Blue Cross Affiliation	.389**	2.87
For-profit	.284**	2.81
Geographic Controls		
Northeast	.133	.69
Mid Atlantic	-.013	-.07
South Atlantic	-.056	-.34
East South Central	.000	.00
West South Central	-.316	-1.64
East North Central	-.034	-.23
West North Central*	-.407	-2.14
Mountain	-.168	-.80
Intercept	-.725	-1.49
Adjusted r-squared	.20**	
N	242	

** - $p < .01$; * - $p < .05$