MANAGERIAL INFORMATION PROCESSING AND THE SPECIFICITY OF INFORMATION

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ABSTRACT

This paper addresses two questions: What information should a manager acquire personally and when should the manager delegate the acquisition of information to subordinates? Among the many potential sources of information in the environment, which sources should a manager monitor on a regular basis and which ones should he/she access only in response to a need for specific information? Borrowing the notion of asset specificity from transaction cost theory, the paper develops the concept of information specificity and argues that the answers to both these questions will depend on the specificity of the information being sought.

1. INTRODUCTION

There exists a considerable body of literature on how managers acquire and process information (Keegan 1974; Mintzberg 1975; Kurke and Aldrich 1983; Dollinger 1984). Much of this research has focused on two areas: Where do managers acquire information? Or, how do managers select channels/sources of information (Culnan 1983; O'Reilly 1982; Swanson 1987, 1992)? How do managers acquire information? Or, how do managers select media to acquire or to communicate information (Daft and Lengel 1984, 1986)?

One area that has not received as much attention is: What information do managers acquire? In particular, as Zmud (1990) points out, "More comprehensive examinations of managers' personal information behaviors are desirable. Of particular importance are studies aimed at understanding which of these behaviors tend to be delegated, the extent they are delegated, and why they are delegated." In this paper, we borrow, and adapt, concepts from transaction cost theory to address the question: When do managers delegate the task of acquiring information and when do they perform the task themselves? We develop the notion of information specificity and use it as the basis for hypothesizing on the information acquisition choices made by managers.

The organization of this paper is as follows. Section 2 briefly describes transaction cost theory while section 3 reviews the existing literature on how and where managers acquire information. Section 4 examines the assumptions of transaction cost theory in the context of managerial information processing. In section 5, we propose four strategies managers can use to acquire information, while in section 6, we develop the concept of information specificity. Section 7 defines the transaction costs associated with the acquisition of information by managers. In section 8, we develop propositions relating the information acquisition strategies to the specificity of the information being acquired. We conclude in section 9 with some suggestions for future research.

2. TRANSACTION COST THEORY

Transaction cost theory addresses the question: When does a company acquire an asset by making it internally, over a hierarchy, versus acquiring it over a market? The theory argues that companies will choose the alternative that minimizes the sum of the production and transaction costs for acquiring an asset. Given that markets, through specialization and economies of scale, usually have an advantage in production costs, firms will vertically integrate only in cases of market failure: that is, when the transaction costs of market exchange are sufficiently high to offset any advantage that markets may have in production costs.

The theory assumes that economic actors have bounded rationality and will, if given the opportunity, engage in
opportunistic behavior. The theory further assumes that the exchange process is beset with a degree of uncertainty so that it is not possible ex-ante to write a complete contract that anticipates all possible contingencies.

Under the above assumptions, the choice between markets and hierarchies is determined by the level of asset-specificity, or the extent to which an exchange is supported by transaction-specific investments. Transaction-specific investments are defined as "durable investments that are undertaken in support of particular transactions, the opportunity cost of which investments is much lower in alternative uses or by alternative users" (Williamson 1975, 1985). Transactions that are supported by high levels of asset-specificity should be governed by hierarchical structures whereas transactions that require only general purpose investments will most efficiently be conducted over markets.

3. REVIEW OF THE LITERATURE ON MANAGERIAL INFORMATION PROCESSING

As noted earlier, much of the literature to date has focused on where, and how, managers get the information they need.

3.1 Where Managers Get Information

Much research has shown that channel accessibility, and not the quality of information, is the main criterion used by managers in selecting an information source (Allen 1977; Culnan 1983; Gerstberger and Allen 1968; Hardy 1982; O'Reilly 1982; Rice and Shook 1988; Zmud, Lind and Young 1990). Culnan (1984, 1985) defined two dimensions of accessibility: (1) difficulty in physically accessing a source of information; and (2) difficulty in acquiring information from the source after having obtained physical access. Swanson (1987) offered a similar view in his channel disposition model, which examined both the quality of information available in a channel and the individual's access to a channel. Swanson (1992) subsequently refined the idea of an individual's access to a channel, characterizing it in terms of information-pull (the demander of information) and information-push (the supplier of information). He argued that access to a channel is not a sufficient condition to obtain information; the keeper of the information must also be willing to bear the often hidden costs of supplying information.

Zmud, Lind, and Young (1990) showed that the capacity to provide immediate feedback is another critical factor in a manager's choice of channels. They found that, for lateral communication, individuals were concerned with providing or obtaining feedback, channel accessibility, and information accessibility, whereas for downward communication, the concerns were targeting feedback, receiver accessibility, and tailoring information.

3.2 How Managers Access Information

Several different perspectives attempt to explain why managers choose certain media to access and communicate information. Short, Willians and Christie (1976) characterized communication media in terms of their ability to facilitate interaction and awareness of others in the communication. This view was expanded upon by Daft and Lengel (1984, 1986) who argued, in their media richness theory, that media use is determined through a rational process of aligning the richness of the media with the uncertainty and equivocality of the task.

Others have argued that an individual will use a medium only if there exists a "critical mass" of users on that medium (Markus 1987; Rice et al 1990). Fulk et al (1987) propose a social influence model in which media choice is influenced not only by the objective characteristics of the media and the task but also by social factors such as the opinions of others and norms of behavior in the group. A similar view, based on structuration theory, has also been expressed by Yates and Orlikowski (1992).

4. TRANSACTION COST THEORY AND MANAGERIAL INFORMATION ACQUISITION

Transaction cost analysis is generally applied at the organizational level of analysis — whether or not an organization should internalize a transaction. We believe, however, that the concepts of transaction cost theory can usefully be adapted to the individual level of analysis as well. We begin by arguing that the fundamental assumptions of transaction cost theory are valid in our problem setting.

Transaction cost theory applies to the acquisition of an asset; that information is an asset is commonly accepted (King 1984). All managers are boundedly rational (March and Simon 1958) and face uncertainty in their information requirements (Ackoff 1967). It is also widely accepted that individuals frequently engage in opportunistic behavior by manipulating the information they present to others, either deliberately misrepresenting information or restricting others' access to information for personal gain (Pettigrew 1972; Feldman and March 1981; Zmud 1990).

In the next three sections, we define concepts corresponding to the three major building blocks of transaction cost theory: the information acquisition strategies that can be employed by managers (governance structures in transaction cost theory), information specificity (asset specificity in transaction cost theory), and the transaction costs associated with the acquisition of information.
Table 1. Managerial Information Acquisition Strategies

<table>
<thead>
<tr>
<th></th>
<th>Self-Acquisition</th>
<th>Delegated Acquisition</th>
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<tbody>
<tr>
<td>Regular Monitoring</td>
<td>Relational Hierarchy</td>
<td>Relational Market</td>
</tr>
<tr>
<td>Focused Search</td>
<td>Spot Hierarchy</td>
<td>Spot Market</td>
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5. MANAGERIAL INFORMATION ACQUISITION STRATEGIES

Managers must make choices on two dimensions in selecting a strategy for acquiring information:

(a) **Self-Acquisition versus Delegation:** This dimension is derived directly from transaction cost theory. Analogous to the choice between a hierarchy and a market faced by a firm acquiring an asset, a manager must also choose between acquiring information personally (the hierarchical strategy) or delegating the acquisition of the information to a subordinate (the market strategy). Clearly, there are significant differences between a subordinate and a market, and between a hierarchy and a manager acquiring information personally. Thus, the analogy drawn here is valid only in a limited sense. For analysis at the organizational level, the fundamental choice addressed by transaction cost theory is whether or not the producer and user of an asset are the same entity: in a hierarchy, they are; in a market, they are not. This dimension addresses a similar choice at the individual level: that is, when are the user and acquirer of information the same person?

(b) **Regular Monitoring versus Focused Search:** This dimension is motivated by the unique characteristics of information as an asset and the distinctive nature of managerial information acquisition as contrasted with the typical transaction to acquire a traditional product. In general, a firm acquires a product to fill a specific need. Firms do not generally acquire products just in case they turn out to be useful. On the other hand, managers often need to scan the environment for potentially useful and relevant information without knowing exactly what information they are looking for. Given the large number of potential sources of information in the environment and the limited time available to managers, a manager must decide which sources to monitor on an ongoing basis (regular monitoring), and which ones to tap only in response to a need for specific information (focused search).1

These two dimensions together imply four different information acquisition strategies that a manager can follow. These are shown in Table 1 and explained in greater detail below.

(1) **Regular Self-Monitoring:** The manager personally monitors a potential source of information on an ongoing and regular basis. We call this strategy the relational hierarchy.

(2) **Focused Self-Search:** The manager, in response to a need for specific information, searches the environment to find the best source. We term this strategy the spot hierarchy.

(3) **Delegated Regular Monitoring:** The manager designates a subordinate to monitor a source of information on an ongoing basis and, on a regular basis, convey relevant information to him/her. We use the term relational market to describe this strategy.

(4) **Delegated Focused Search:** The manager, in response to a need for specific information, designates a subordinate to search the environment and find the best source. We term this strategy the spot market.

6. THE SPECIFICITY OF INFORMATION

As noted earlier, one of the central tenets of transaction cost theory is the notion of asset specificity. There are many different forms of asset specificity, such as human specificity, site specificity, physical specificity, and time specificity. In the context of information, we define two forms of specificity: human specificity (or knowledge specificity) and time specificity. Within each category, we can further distinguish between specificity in use and specificity in acquisition (Table 2).

(a) **Human Specificity:** Information has high human specificity if it is meaningful to only one (or a few) individual(s). Human specificity arises because the information can only be interpreted in light of specific knowledge possessed by the individual(s) in question. Thus, human information specificity can also be termed knowledge specificity. Specific knowledge is not only possessed by a very limited number of individuals, it is also expensive to transfer — "the more costly knowledge is to transfer, the more specific it is, and the less costly the knowledge is to transfer, the more general it is" (Jensen and Meckling 1990).
There are two primary forms of specific knowledge: (a) scientific or technical knowledge, and (b) knowledge of context, or knowledge of particular circumstances of time and place (Hayek 1945; O'Reilly and Pondy 1979). Thus, the technical knowledge required to operate a complex piece of machinery falls in the former category while knowledge of the peculiarities of a machine that an engineer has acquired over years of operating the machine falls in the latter category. Similarly, the professional medical knowledge possessed by a doctor falls in the former category while the detailed knowledge that a doctor possesses about the idiosyncrasies of a particular patient that he/she has treated for a number of years falls in the latter category.

Further, we can distinguish between specificity in use versus specificity in acquisition. Information that is human specific in use can only be profitably used by the person with the necessary specific knowledge; however, the information may initially be acquired by someone other than this person. On the other hand, information that is human specific in its acquisition as well is such that only a person with the necessary specific knowledge can even acquire the information. A person without this knowledge would not recognize what information was relevant and useful.

Consider an example from the medical field. In a doctor’s office, a nurse will often measure the temperature and blood pressure of the patient. Doctors will, however, usually examine other indicators, such as physical symptoms, themselves. This is because temperature and blood pressure may be specific in use — only a doctor, with his/her specific professional knowledge, can decide what to do with the information — but they are not specific in acquisition since it does not take a doctor’s specialized knowledge to measure a patient’s temperature or blood pressure. On the other hand, information on the physical symptoms are specific in acquisition as well, because merely to know what symptoms to look for and to be able to distill the relevant signals, given the patient’s complaints, from all the various signals that the patient’s body may potentially provide, requires specific knowledge that only the doctor possesses and which cannot easily be transferred to the nurse.

Three other points may be useful to note here. First, specific knowledge of context is often acquired by an individual over a period of time as a natural by product of doing his/her job. Second, one reason specific knowledge is expensive to transfer is that it cannot usually be aggregated meaningfully (Hayek 1945; Christie 1993). Finally, information that is human specific in acquisition is usually specific in use as well: if being able to capture the information requires specific knowledge, it is reasonable to expect that the same knowledge will be necessary to use the information as well.

(b) Time Specificity: Information can also be time specific in its acquisition or in its use. Information is time specific in acquisition if it must be captured at a specific point in time, otherwise it becomes less useful or perhaps even unavailable. For example, scientists at the National Seismological Laboratory (NSL) must capture the magnitude of an earthquake at the time the earthquake strikes or it will never be available (assuming they are the only ones that monitor earthquake magnitudes). This information is, therefore, time specific in acquisition from the point of view of the NSL. Note, however, that the same is not true for a scientist elsewhere doing research on earthquake trends over time who can obtain the information from the NSL at any time in the future.

Information is time specific in use if it decreases in value unless used very soon after it first becomes available. An example is a stock quote to a specula-
tive investor: there is usually a very short window of time during which this information can be exploited. Again, this same information is not time specific in use to a researcher studying historical trends in the values of certain stocks. Information that is time specific in use is, by extension, time specific in acquisition as well: to use information right after it becomes available, one must capture it first.

7. TRANSACTION COSTS

There are four primary sources of transaction costs in acquiring information:

(a) Monitoring/Search Costs: These include the time, effort, and money, expended by an individual in either monitoring a source of information on a regular basis or conducting a focused search for required information. From a manager's perspective, these costs are clearly higher when the information is acquired personally than when the acquisition of the information is delegated to subordinates. Even from the organization's perspective, if we assume that the manager's time is more expensive than the potential delegatee's time, it would seem reasonable to push down as much of the information acquisition task as possible. Further, these costs are clearly higher when an information source is routinely monitored — and therefore requires an ongoing commitment of resources — versus when information is acquired via a focused search on an as needed basis.

(b) Information Transmission Costs: These are the costs of transmitting information from the acquirer to the user, provided the two are not the same person. These costs are analogous to the costs of transferring goods from a seller to a buyer in a market transaction.

(c) Knowledge Transfer Costs: These are the costs of any knowledge that must be transferred from the user to the acquirer in order that the latter can interpret, and acquire, the correct information.

(d) Opportunity Costs: These are the costs of missed opportunities or losses suffered because the relevant information was not available to the right person at the right time.

8. RESEARCH HYPOTHESES

Following the logic of transaction cost theory, the fundamental proposition of this paper is that managers will choose among the different information acquisition strategies outlined above based on the specificity of the information. The specific hypotheses are summarized in Table 3 below.

As the table shows, we hypothesize that the time specificity of information determines whether or not an information source in routinely monitored. The rationale behind this is relatively simple. When information is time specific (either in use or in acquisition), the manager must be sure to capture the information as soon as it becomes available. The only way to be sure of that is to monitor the source of the information on an ongoing basis. On the other hand, information that is not time specific is probably more efficiently acquired only on an as needed basis.

In terms of the transaction costs defined above, therefore, we are arguing that, for time specific information, the increased monitoring/search costs incurred by regular monitoring will be more than offset by the reduced opportunity costs from being sure to capture the right information at the right time. On the other hand, for information that is not time specific, the efficient choice will be to economize on the monitoring/search costs.

Table 3. Hypothesized Information Acquisition Strategies

<table>
<thead>
<tr>
<th>Human Specificity In Acquisition</th>
<th>Time Specificity (Acquisition or Use)</th>
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<tbody>
<tr>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>High</td>
<td>Relational Hierarchy</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Low</td>
<td>Spot Market</td>
</tr>
</tbody>
</table>

207
The human specificity dimension, in particular, human specificity in acquisition, determines whether the manager should acquire the information personally or delegate the task. Information that is human specific in acquisition should be acquired by the manager personally. In this case, the increased monitoring/search costs will be more than offset by reductions in the information transmission costs, in the knowledge transfer costs (since, for someone else to acquire specific information, the manager must first transfer specific knowledge to that person which, by definition, is expensive to do: having the manager acquire the information himself/herself will, therefore reduce these knowledge transfer costs), and the opportunity costs (if the transfer of knowledge to the delegatee is not perfect, the manager may miss out on vital information: by monitoring the information personally, the manager reduces the chances of this happening).

On the other hand, when the information is not human specific in acquisition, the manager may find it efficient to reduce the monitoring costs by delegating the task to a subordinate. These savings should more than offset the increased information transmission costs. Further, there will not be an increase in the knowledge transfer costs (since no specific knowledge is required to acquire this information, no knowledge transfer need take place from the user to the acquirer, or any knowledge that does need to be transferred will be general knowledge that is inexpensive to transfer) or in the opportunity costs (since the delegatee possesses the needed knowledge, the probability of missing out on vital information should not be much higher than if the manager were to acquire the information personally).

Thus, we propose the following four hypotheses:

**Hypothesis 1:** To acquire information that is high in both time specificity and human specificity in acquisition, managers will use a relational hierarchy (regular self monitoring).

**Hypothesis 2:** To acquire information that has high human specificity in acquisition but low time specificity, managers will use a spot hierarchy (focused self search).

**Hypothesis 3:** To acquire information that has high time specificity but low human specificity in acquisition, managers will use a relational market approach (delegated routine monitoring).

**Hypothesis 4:** To acquire information that is low in both time specificity and human specificity in acquisition, managers will use a spot market (delegated focused search).

The reader may have noticed that the human specificity in use dimension does not affect the decision of what information a manager should acquire personally or which sources a manager should routinely monitor. However, the notion of human specificity in use can be very critical in determining an organization's overall information strategy and in the assignment of decision rights within an organization (Jensen and Meckling 1990; Christie 1993). A detailed discussion of these topics is outside the scope of this paper but we have nevertheless chosen to define the notion of information specificity as completely as possible in this paper so that the concept can be used as a basis for further work in different settings.

9. CONCLUSION AND SUGGESTIONS FOR FUTURE RESEARCH

This paper borrowed, and adapted, notions from transaction cost theory to address the questions: When should managers acquire information personally and when should they delegate this task? Which sources of information should a manager choose to monitor on a regular basis? We developed the notion of information specificity and its two dimensions, human specificity (or knowledge specificity) and time specificity, and argued that the information acquisition strategy used by a manager will depend on the specificity of the information being acquired. Clearly, the ideas presented in this paper need to be tested empirically.

One area that we did not explore in this paper but which should be a fruitful area for future research is the interaction between information technology (IT) and information specificity. IT can help to reduce the human specificity of information, either by helping to establish a context that allows information of high specificity to be interpreted away from its initial source, or by facilitating the sharing of specific knowledge among members of the organization. Expert systems are clearly an attempt to make specific knowledge more widely available within an organization. Similarly, shared databases such as Lotus Notes, or systems designed to enhance the size (breadth and depth) and the centrality of organizational memory (Walsh and Ungson 1991; Ackerman and Malone 1990) can facilitate the sharing of knowledge about particular circumstances of time and place that may have been unavailable or uneconomical to share otherwise.

IT can also increase the specificity of information — in particular, the time specificity of information. By facilitating more widespread dissemination of information in a shorter period of time, and by reducing both the feasible and the effective response times, IT can often reduce the window of opportunity within which an individual or
organization must act, thereby making information more time specific.

On the other hand, the specificity of information can restrict where, and how, information technology can be effectively used. Consider the long standing debate on whether IT leads to centralization or decentralization. For IT to lead to the kinds of centralization effects that Leavitt and Whister (1958) predicted, we have to make the assumption that almost all information has low specificity in use so that the people at the top have the necessary knowledge to use it effectively. This may have been true in the classic hierarchical manufacturing organization, where the production task could be separated from the management of that task, and much of the information could be meaningfully separated from the context, aggregated by computer, and sent up to the top levels of management.

However, we would expect that in the modern advocacy, the percent of human specific information is probably much higher, so that the decision rights must be located with the performers of a task who have the needed specific knowledge (Jensen and Meckling 1990; Christie 1993). In these organizations, the information does not have meaning separated from the task, information and the task are tightly coupled, or “information + context = meaning” (O’Reilly and Pondy 1979). Thus, the overall prediction would be that the greater the percent of specific knowledge in an organization, the greater the need for decentralization.

Another stream of literature to which the notion of information specificity may be relevant is the media choice literature. In particular, the concept of information specificity may serve to complement the notion of message equivocality in media richness theory. Thus, managers can use low richness media to capture information that is not knowledge specific (particularly context specific) or information that is specific but for which they already have the specific knowledge. Frequently, however, managers need to receive information that requires specific knowledge of context that the manager does not possess. In these cases, managers must turn to richer media that allow them to capture the information and the context. From a longitudinal perspective, this could also explain why individuals choose rich media to disseminate a new idea. At this stage, there is a need to establish shared meaning and convey specific knowledge of context, but once the recipients have knowledge of the context, information can be transmitted effectively over low richness media. This may also be why managers predominantly use rich media such as face-to-face. Their jobs are often fragmented and interrupt driven. Thus they frequently use rich media to establish a shared context, that is, to understand or convey information of high specificity, for the great variety of issues they face.

Finally, although we have focused this paper at the individual level of analysis, the notion of information specificity should be useful at the organizational level of analysis as well. An organization may be able to use the notion of information specificity to define an overall information strategy. For instance, the extent to which an organization uses gatekeepers may depend on the distribution of specific knowledge within the organization: information that is highly human specific can obviously not be captured by a gatekeeper who does not have the specific knowledge. Where an organization focuses its environmental scanning resources will depend on the potential time specificity of the information from the different components of the environment. Finally, where information gets routed once it comes into the organization, and how the organization allocates decision rights, will also depend on the distribution of specific knowledge within the organization and the specificity in use of the information.

10. REFERENCES


1. The choices presented here are consistent with Huber (1991) who noted that the process most routinely used by managers to acquire information is searching. Searching can occur in many forms: (a) scanning, or the wide-ranging monitoring of the organization's external environment for potentially relevant information, (b) focused search, when the manager searches in a narrow segment of the organization's external or internal environment for information to address a specific problem (or opportunity) that they face, (c) performance monitoring, defined by Huber as "both focused and wide-ranging sense of the organization's effectiveness in fulfilling its own pre-established goals," and (d) noticing, or the unintended acquisition of information.

We are not suggesting that a source not routinely monitored by a manager cannot occasionally be scanned by the manager in an unfocused search for opportunities. Similarly, the source that a manager turns to when faced with a need for specific information may very well be a source that he/she monitors regularly. In fact, it is quite likely that the manager will first search those sources he/she is most familiar with.


