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Influences on the Performance of Organizational Knowledge Transfer

by

Mark Meckler

A Dissertation Submitted to the Faculty of

The College of Business

In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

Florida Atlantic University

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Abstract

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Knowledge is a resource and an important asset that organizations leverage to attain their goals. In a competitive environment, efficient and effective transfer of knowledge within the firm is a strategic imperative. In each organization a system through which knowledge flows, arises by design and enactment. Like other resources, knowledge resources should flow to where they are needed, when they are needed. The flow of knowledge resources depends upon contextual characteristics of both the organization and the knowledge itself. This dissertation investigates characteristics that affect the internal flow of organizational knowledge between departments and types of employees. The study of knowledge transfer lies within the domain of knowledge management, linking strategy, organization theory and organizational cognition research. Effective knowledge management systems enhance strategy implementation and help maximize returns on organizational knowledge. These systems can offer the firm competitive advantage in speed and navigability. Knowledge management has broad theoretical scope. For this research, I draw

upon theory concerning business policy and strategy (the resource-based view of the firm, competitive advantage, strategic orientation), organizational theory and cognition (bounded rationality, organizational knowledge, event management, sensemaking), information technology (media richness, communication technology) and epistemology (critical naturalism). I offer a testable model that describes how (a) departmental membership influences (b) strategic orientation, locus of attention, communication media, sources of meaning and perceived knowledge impedance characteristics that affect (c) knowledge discernment behavior to determine (d) the performance of organizational knowledge transfer. The theory offers managers a somewhat rational approach to understanding and manipulating knowledge flows in order to alter the performance of knowledge assets in their firm.

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CHAPTER 1: A STRATEGY-BASED INTRODUCTION TO KNOWLEDGE TRANSFER AND DISCERNMENT

1.1 Introduction

As part of a survival effort and toward fulfillment of changing organizational needs, firms explore and expand in search of improved access to scarce or valuable resources (Andrews, 1971; Barney, 1997; Barney 1991; Chamberlin, 1933; Conner, 1991; Prahalad and Hammel, 1990; Wernerfelt, 1984; Wernerfelt, 1995). Such resources include financial capital, labor supplies, technology, physical inputs, and knowledge. Attention to the acquisition of knowledge has blossomed into a proposal that this resource may aid sustainable competitive advantage even in turbulent and increasingly competitive environments, contributing inordinately to chances of long term survival of the organization as industries and economies evolve (Wernerfelt and Karnari, 1987; Prahalad and Hammel, 1990). Research in organization theory has explained the centrality of information flows to the very concept of organization (Galbraith, 1973; Weick, 1979; Mintzberg, 1979; Daft & Lengel, 1984; Spender, 1996). Others have carefully explained the benefits of understanding the organization as a natural system (Scott, 1998) and a quasi-natural system (McKelvey, 1997). From these perspectives, knowledge is a resource critical to the long term survival of the business firm, and the efficient and effective handling of this resource is of major concern.

The process of knowledge transfer has been explored in the case of individuals, and in research concerning learning theory, education, training and development. However, there is much to be explained regarding the successful transfer of organizational knowledge

between members of different types of workgroups, departments and businesses. If strategic management (at least) concerns the efficient and effective acquisition and allocation of critical resources, we need middle-range theory that describes how, and predicts when, knowledge resources will move across organizational differentiation boundaries to areas of the firm where they are needed. This theory is needed for developing effective knowledge management systems which yield sustainable, rent producing advantages.

Furthermore, despite recent enthusiasm about organizational knowledge, it is not clear to either academics or practitioners what is, and what is not, organizational knowledge. This study also aims at lessening that problem. Organizational knowledge is not the same thing as scientific knowledge. Some academics have even argued that organizational knowledge is only a metaphor for scientific knowledge. However, a recent panel of fourteen management scholars discussing this issue concluded that organizational knowledge is best understood as a construct and not as a metaphor (Meckler, Fiol and Glynn, 2000). Therefore in this study, organizational knowledge is understood as those processes, routines, understandings, practices, recipes and explicitly objectified instructions and policies that are "tried and true," within the firm, and generally agreed upon as valid. This exempts general information, individual understandings, untried theories, and even right opinions.

1.2 The Knowledge Management Problem

The *general* strategic problem I am addressing is how to optimize a resource flow within the firm. In this project, the resource of focus is organizational knowledge, and the related organizational capability is managing organizational knowledge flows. Defining knowledge as a resource has a strong base in contemporary constructions of the resource-

based theory of the firm (Prahalad and Hammel, 1990; Barney, 1991). Capabilities are organizational attributes that allow the firm to coordinate and leverage its resources (Stalk, Evans and Shulman, 1992). Barney (1997) finds himself arguing that there are few empirical differences between resources and capabilities. Contrary to this line of thought, I retain the distinction, and understand capabilities as services, technologies and activities of administration, while resources are objects of these services. More to the point, I am maintaining a division between 'knowledge' as a resource, and 'knowledge management' as a directly related capability.

The *specific* problem I am addressing is how to optimize the flow of organizational knowledge around the firm. The problem, stated in these terms, is the concern of an administrative function called knowledge management. Advances in information technology have led to the first computer-based knowledge management systems, making broad use of advances in digital transmission hardware and relational database software. While advances in high technology contribute immensely to the design potential of knowledge management systems, they must be complimented by advances in our understanding of human cognition. Without a coordinated understanding of both technology and cognition, I fear that the computer-based knowledge management systems designed by programmers will not add significant value to the firm. I suspect they will be used and praised by high-tech employees, but ignored by the majority of others, increasing rather than attenuating current knowledge flow problems between different types of departments, and/or between members of the various professions scattered around the firm. Therefore, this dissertation is largely concerned with the cognitive issues that translate organizational knowledge into action.

From the perspective of organization theory, the research investigates the enacted rational boundaries (Simon, 1957; Weick 1979) imposed upon organizational cognition which affect organizational knowledge discernment behavior and organizational action. The findings can be integrated into hardware and software design to create more efficient and effective organizational knowledge management systems.

Ocasio (1997) makes the point that a firm's strategic behavior is a direct result of how organizational attention is focused, and that attention limits are bounded. Certainly, if an organization, or an organizational member, is not paying attention to all fronts, internal and external, it can not notice or make use of all potentially available knowledge. To the extent that organizations systematically pay attention to some fronts and ignore others, at least some available knowledge goes *undiscerned.*

I believe however, that there is more to the equation than attention alone. There are a host of contextual issues that influence what is perceived and how we make sense of our perceptions. These organization cognition issues are foundational to subsequent design of effective knowledge management systems, regardless of the technology level. It may, in fact, turn out to be the case that the use of certain low-technology knowledge management tools, such as meetings, conferences and journals, are as critical as high technologies to the effective performance of an organizational knowledge management system.

The task of the knowledge management theorist is, at least in part, to help build an organizational theory in which the managerial tasks of planning, organizing, leading, and controlling are related to keeping knowledge flowing effectively and efficiently into and around the firm. A *strategic* knowledge management theory should demonstrate how

knowledge management capability can be leveraged to provide sustainable economic rents (Spender, 1996) or other benefits for key stakeholders.

1.3 Strategic Resource Acquisition and Flow

The firm, seen as a quasi-natural entity (McKelvey 1997), positions itself to acquire resources (Wernerfelt, 1984) necessary for goal attainment. Organizational goals change over time as political and other institutional forces interact with production and profit generation processes (Selznick 1949,1957). For example, in exchange for local community support, organizational goal may be altered to accommodate the interests of the community. Furthermore, organizational constituencies develop differing goals and standards over time (Cameron, 1981) creating agency problems (Jenson and Meckling, 1976). For these reasons, part of a manager's leadership role is to communicate current goals throughout the firm and to convince agents to pursue them (Barnard, 1938) in order to coordinate and direct organizational efforts (Fayol, 1949). From a strategic perspective, organizational goals are intended to direct the acquisition and utilization of resources and capabilities which service those goals.

Mobilizing resources, including knowledge

Unfortunately, knowledge resources do not necessarily flow to areas and projects where they best benefit the firm. This argument generally holds true for all key resources and can be explained in terms of various central perspectives on organizations. Resource dependency theory (Pfeffer and Salancik, 1974), agency theory (Jenson and Meckling, 1976), and information impactedness in transaction cost economics (Williamson, 1975) can each provide partial explanations. For example, Jensen (1986) argues that excess free cash flow

will be used by managers who are not owners for inefficient purposes, padding their own jobs with perquisites and the organization with overdiversification. Who is to say that managers do not abuse excess knowledge as they do excess cash? From a resource dependency perspective, managers pursuing increased organizational power may impede knowledge flows to control related decision making authority.

However, and despite the existence of these explanations in terms of transaction cost economics, agency theory and resource dependency theory, I find these perspectives inadequate for actively managing the problem. For example, the transaction cost economist will have to identify the transactions involved in a knowledge transfer and then provide specific procedural mechanisms to reduce the transaction costs. Unfortunately, this does not imply any improvement in knowledge transfer quality, only efficiency. The agency theorist will have to provide techniques for motivating departmental members to spend valuable extra time and effort on knowledge transfers rather than use currently slack time for their own private benefit. Given the extent to which so many organizational members are already short on time (or 'temporal resources'), agency theory does not offer attractive or viable advise. Resource dependency theory is similarly unable to offer managers a clear mechanism for controlling the flow of organizational knowledge. Power would have to be shifted according to the best optimizer of knowledge flows, away from folks who are storehouses or roadblocks. However, tinkering with the balance of power within the organization may yield unexpected system-wide results that worsen, rather than strengthen organizational performance.

This dissertation focuses upon various forces that are disrupting the optimal flow of

organizational knowledge. I argue that departments – or more generally, *kinds* of departments – acculturate or institutionalize members of those types of departments. I will demonstrate that acculturation impacts certain behaviors, traits and preferences that impact knowledge transfer performance. Management can then act by either altering the behaviors, or by adjusting information systems to translate organizational knowledge to account for the traits and preferences of the members of different department types.

The acculturation process is a group dynamic that occurs despite (our sometimes) desires that we might avoid it happening to us at all. But put people together, and over a length of time (that depends upon the amount of pressure to accomplish something specific), group norms, behaviors and roles will form. This result is the fledgling group culture. It is new, perhaps fragile, but it is functioning to control the work behaviors and perspectives of the members. Management care and direction can be given to it's development, or it can be allowed to self organize. In any event, culture, like life, finds a way.

Heavily influenced by a department types' tasks, this culture imposes (among other things) rational boundaries upon its members, leading to institutionalization of certain aspects of their behaviors and thought processes. Rational boundaries influence when group members pay attention and when they do not pay attention (Simon, 1957; Occasio, 1997). It influences each individual's language and communication style. It influences how social actors make sense of their working situations, and the subsequent decisions and actions that are taken. Over time these tendencies become work habits and institutionalized practices that can be found within department types *even across firms.* This claim is discussed in some detail in section 1.5, and quite extensively in section 2.4.

A major task of this dissertation is to demonstrate that this congruence exists withing department types, across firms. A finding of departmentally characteristic *'knowledge transfer styles'* among members indicates a powerful new mechanism for controlling the flow of organizational knowledge. Management can improve the flow or organizational knowledge without using expensive incentives or promotions, or excessive policies and procedures. By acknowledging that there are department-type specific institutionalized practices and processes, and auditing the behaviors and preferences they tend to create, information systems can be designed to transform and deliver organizational knowledge in department-friendly (user-friendly) configurations.

Organizational knowledge, as an asset constrained by these institutional forces (and agency and resource dependency forces), should be controlled and carefully managed, allowing neither too much nor too little to flow. I am doubtful that this managerial ability to carefully manage knowledge exists in most business firms. Perhaps this is because managers are working with a shortage of proper tools for the job. Be that as it may, those firms that *can* reconcile this shortcoming may gain an important competitive advantage over those who can not. When resources flow where they should, management is better able to navigate the firm by reliably processing strategic, tactical and operational directives. When resources flow freely and rapidly to areas of need, tasks, projects and operations go forward more effectively and efficiently. One of the primary goals of this dissertation is to provide managers with appropriate tools to assess and control the flow of organizational knowledge within the firm.

Knowledge is among the most critical of all strategic resources (Drucker, 1993;

Prahalad and Hamel, 1990; Reich, 1991). Therefore, properly flowing knowledge resources may offer competitive advantage through enhanced strategy implementation and general organizational speed. This would seem especially true in "knowledge-intensive" firms in which a high proportion of staff trade in knowledge itself. (Starbuck, 1992, 1993). For example, computer software projects' time-lines might be significantly shortened if organizational knowledge could be better transferred across project groups, and between clients, designers and software engineers and hardware engineers. Likewise, when organizational knowledge does not flow where it may do harm, the firm avoids costs associated with misunderstandings and intellectual property losses.

1.4 Defining Knowledge and Organizational Knowledge for Organizational Management Research

Before continuing too much farther, the object of study, i.e. organizational knowledge, and the related nomological net should be fully exposed. It is critical in a scientific ontology to have constructs that are clearly objectified so that the possibility of observation, identification and measurement exist. (Quine and Ullian, 1978). Knowledge is not a physical object that we are accustomed to pointing to and saying "lo, knowledge!" therefore direct observation and measurement can be thorny tasks. However the word "knowledge" is firmly anchored in our various languages. We use it in our natural day to day languages, in our religious languages, and our academic languages. What is odd and problematic is that it is especially embedded in the language(s) of science. This is problematic because scientific propositions and theories are by definition uncertain, while the word 'knowledge' tends to have a very certain and "absolutely true" connotation when

we use it. However, contrary to the absoluteness ths word implies in ordinary language, the vast majority of contemporary scientific and philosophical conceptions of knowledge have long since dropped any claim to absolute truth (e.g. Quine, 1951; Polanyi, 1962; Popper, 1963; Searl, 1995). The first task, then is to determine how to apply the terms "knowledge" and "organizational knowledge" for this study. Once a workable theory of organizational knowledge itself has been framed, characteristics of organizational knowledge, and characteristic of social actors that cause greater or lesser impedance during organizational knowledge transfers can discussed.

Epistemology is the discussion of how we come to assign truth and falsehood to our propositions about the world. Discussion about the nature of knowledge, what it is and what it is not, are in the realm of what is called ontology. Ontology deals with the definitions of the things we say exist – all the different objects we say exist -- such as physical bodies, constructs, forces, etc. To speak of knowledge as an asset is an ontological claim, that we are to treat it as a scientific object called a construct. This is concurrently a claim that organizational knowledge is not just an descriptive metaphor for scientific knowledge.

When one is explaining how we come "to know," we are engaged in a epistemological debate. These two conversations are easily confused. However, one way of sorting out the two is to place "knowing" in the cognitive realm, and "knowledge" in the ontological realm. How managers come to observe, understand and decide to grant a value of truth or falsehood to a statement is cognitive and therefore epistemological, while creating a construct called "organizational knowledge" which can flow around the firm is an ontological task. It is easy to see that the two areas must be reconciled: the ontological and

the epistemological – the knowledge and the knowing. I will first describe the general epistemological debate in science, and then lay out an appropriate ontology of knowledge and organizational knowledge, which will fit with mainstream contemporary philosophy and remain practical for organization theory.

1.4.1 Objectifying knowledge for use in empirical research

So what is a workable ontological stance for "knowledge" in organizational science? Quine (1987) called for a rejection of the word altogether in science: "I think that for scientific or philosophical purposes the best we can do is give up the notion of knowledge as a bad job and make do rather with its separate ingredients" (Quine, 1987, p109). However, Quine's naturalized epistemology remains attractive to the social scientist, even those interested in studying organizational knowledge. Furthermore, other well respected contemporary philosophers (eg Darcy, 1993; Searl, 1995; Goldman, 1999; Hacking, 1999) have found it necessary to include knowledge and truth in a scientific conception of the world.

Facing the quandary of preparing a definition of knowledge to use while speaking of management theory, but still wanting to work within the Quinian perspective of science, I contacted Dr. Quine at Harvard University. After two correspondences, a definition of knowledge was constructed that is compatible with Quine's rather strict ontological requirements, is compatible with the current work of Searl (1995), Goodman (1999) and Hacking (1999) and is practical for organizational research. "Your proposed definition of knowledge defines a meaningful notion and an important one, which could do with a name and is free of my troubles over 'knowledge'" (Quine, direct correspondence, 1997).

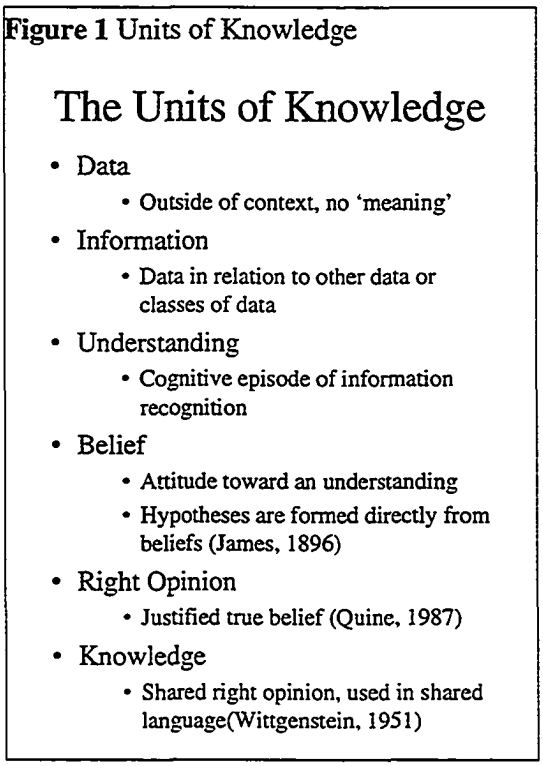
Scientific knowledge is information, assigned a truth-value, observationally verifiable, socially accepted and systematically fit into an existing 'web' of science. It implies no absolutes, and is subject to a change in truth-value as the winds of science blow.

On the empirical side, scientific knowledge is induced from meaningless primary bits called data, which are the building blocks of a progressive system which includes information, understanding (tacit and explicit), belief, right opinion and finally knowledge. On the theoretical side, scientific knowledge is derived from or implied by the scientific and social context within which it is embedded. Knowledge is constructed from both sides.

It is probably important to point out that accurate deconstruction of scientific knowledge is not always obvious. When we engage in sensemaking, we may create reasons, causes and other connections that "make sense" looking backward, but are really not part of the original construction (Weick, 1995). This is likely all the more true for organizational knowledge, because environmental contexts can change vastly over even short periods of time.

This definition and the related

Figure 1 Units of Knowledge



typology is constructed with the understanding that ontological objects such as knowledge, beliefs, information, etc. are social constructions, but are not necessarily subjective (Meckler and Baillie, 2000). Better ontological constructions are clear, parsimonious, general, useful and fit within the existing ontological landscape (Quine and Ullian, 1978). With this in mind, each construct implied by the definition will be defined, so that the entire definition may be useful in creating and discussing management theory without requiring revision of our existing deeply help assumptions.

Everything exists in some context, but *data* exist with minimal relation to any context. They are the primary bits of communication and have no sensible use in and of themselves. *Information* is data in specific contextual relation to other data or classes of data. For information to exist, there must be context, another specified something to which the data is relative. This context is most typically some kind of event, like an occasion or a situation (Peterson, 1998). Information can be simple or complex, as media and other contexts can be very rich or poor (Daft and Lengle, 1984).

Understanding is the cognitive episode of information recognition. *Belief* is a disposition (Quine, 1987), an attitude toward an understanding. *Hypotheses* are formed directly from beliefs.

> "Let us give the name of hypothesis to anything that may be proposed to our belief; and just as the electricians speak of live and dead wires, let us speak of any hypothesis as either live or dead. A live hypothesis is one which appeals as a real possibility to him to whom it is proposed. If I ask you to believe in the Mahdi, the notion makes no electric connection with your nature-it refuses to scintillate with any

credibility at all. As an hypothesis it is completely dead. To an Arab, however (even if he be not one of the Mahdi's followers), the hypothesis is among the mind's possibilities: it is alive. This shows that deadness and liveness in an hypothesis are not intrinsic properties, but relations to the individual thinker"(James, 1896 p88.)

Right opinion (Plato ~380BC) occurs when an understanding of information exists, and that understanding is scientifically believable (a live hypothesis), and the belief is confirmed by observation. Right opinion is thus justified true belief (Quine, 1987)

While knowledge goes beyond right opinion, it is not absolute. TRUTH, from a God's-Eye view is replaced by truth of the social scientific kind (Searl, 1995). This is also in acquiescence with Wittgenstein in confirming that knowledge exists and has a place in empiricism.. It just cannot have the quality of being absolute that we appropriate to the word in non-scientific uses.

1.4.2 Definition of knowledge

Knowledge exists when 'right opinions' are socially shared, empirically confirmed, and socially accepted to the point that they are used as such in our shared language.

From theoretical contexts knowledge is deduced, and from empirical contexts it is induced. Tacit, (Polanyi, 1962, 1966) implicit and explicit understandings are ways of knowing. Social actors engage in inducing from observed empirical events and deducing from available theories, but are not always able to specify in the end what was induced, what was deduced and what were the sources. The meaning given to information through our understanding, and the truth values socially assigned which make confirmed beliefs (right opinions) knowledge, are defined only within the greater environmental context, and by

social convention. There is no TRUTH, nothing more to which to appeal, either for meaning or for scientific truth.

For example, accounting and finance-based information about the organization is knowledge when a) it has been earmarked 'true,' b) it has or may be verified through some empirical method, such as looking at actual inventories, or bank account balances, c) is not contradictory with appropriate theory, such as accounting theory or operations management theory, and d) has been granted the truth value "true" by not only an informed group of organizational experts, like accountants and other managers, but by the majority of organizational members and relevant external parties such that it is naturally spoken of as true in typical organizational discourse.

1.4.3 Organizational knowledge: "that works" and "that fits"

The previous example offers an idea of what I construe to be organizational knowledge. I offer a relativistic, social and pragmatic construction of organizational knowledge derived from the definition of scientific knowledge produced above. It clearly flows from the argument's of W.V. Quine, John Searl, Ludwig Wittgenstein, and William James. By "relativistic" I refer to the context sensitivity, the *a posteriori* quality of knowledge. "Social" refers to the final-cause, the foundation and the reference to which knowledge may be reduced. That is to say that at its root, knowledge is a non-subjective social construction. I use "pragmatic" to describe the decision rules favored by the social constructors -- the community of managers and employees. I call the pragmatic decision rules the "that works" and "that fits." criterion. That which *works* well when we attempt to forecast the future is given preference over that which does not work well, and that which

fits past observations and currently working theory is given priority over that which does not fit within a working paradigm.

Like scientific knowledge, standard units have not been assigned to organizational knowledge. There is currently no consensus, at least in the area of management science. Blackler (1995) describes (at least) five different notions of knowledge in the management literature, using Collins' (1993) notation of "embrained, embodied, encultured, embedded and encoded" (Blackler, 1995, p1022). Although Spender (1996) applauds this pluralism, it is one of my purposes to move away from a fragmented notion of organizational knowledge.

As I stated earlier, some may assert that organizational knowledge is a metaphor. Perhaps arguing that organizational knowledge is more of a close metaphor for scientific knowledge is a more viable path than trying to carefully engineer a viable ontological object. Social agreement and consistent empirical reference in business/organizational settings is far less common than in scientific situations, if it ever happens in organizations at all. The social context of organizational knowledge is the members of the organizational itself. However, if there were consensus within the organization, there would be no talk of transferring knowledge around the firm. Perhaps it is more correct, if less attractive, to speak of departmental knowledge, which slowly becomes organizational knowledge as it is transferred across departments. I prefer staying with the organizational knowledge construct by carefully limiting it's social and temporal range, and tempering its degree of certainty to something less than that of scientific knowledge.

1.4.4 Definition of organizational knowledge

Organizational knowledge is a set of internal organizational theories and

propositions, assigned truth-values, somewhat verifiable through observation, generally socially accepted by the in-group, and systematically fit into an existing 'web of beliefs' about the firm, it's processes, its stakeholders and its businesses. It implies no absolutes, and is subject to a change in truth-value as internal and external environments change.

With this definition, it becomes more plausible and possible to identify, observe and measure knowledge as opposed to information and the other related constructs. Good examples of knowledge in the organization include only those propositions which are agreed upon as true and which can be empirically confirmed. Examples include constructions derived directly from audited financial reports, findings of repeated marketing research, management practices and work processes that are "tried and true," existing instructions, recipes and procedures that are explicitly documented or "implicitly common knowledge."

One idiosyncracy of this ontology is that there is no "individual knowledge." That which social scientists have been calling "individual knowledge" or "personal knowledge" (Polanyi, 1962) is termed "right opinion." All knowledge is social knowledge, the question is really: to what social system does the knowledge belong? It is a common situation that an employee has knowledge that is not shared with the rest of the firm, but this knowledge is shared with members of another social system. For example, a lawyer in the compliance department at the investment bank Smith Barney may know important things that no one else in the firm knows. Thus it is not organizational knowledge from the perspective of the Smith Barney. However, if most/many other SEC financial compliance attorneys agree on these

points, it is *professional knowledge*. If no one else every heard these hypotheses, and/or there is not a significant degree of agreement on them, even if true, let us call them "right opinion."

1.4.5 Embedded and explicit organizational knowledge

Organizational knowledge, once acquired through internal innovation processes, research and development, market transactions, organizational intelligence procedures, or environmental scanning, needs to be integrated into the firm by using it, storing it or both. There are various storage mechanisms. Nelson and Winter (1982) demonstrate that over time, organizational knowledge may be stored within routines, becoming *tacit* (Polanyi, 1962) while *explicit* organizational knowledge may reside in various linguistic forms, such as standard operating procedures and product recipes. Perhaps organizational knowledge that was once explicitly understood becomes tacitly understood over time, as the habits and working routines make explicit understanding both unnecessary and inefficient. When it later becomes necessary to specify the reasoning behind each habit and element of a routine, i.e. to make the understanding explicit, it is not always very easy. We may make sense of the situation or the process (Weick, 1995), trying to make the reasoning and embedded organizational knowledge explicit, but as I previously stated, there is no real guarantee that these sensemaking derivations are true to the real reasons.

For example, in 1996 Nabisco International had trouble in Mexico fine tuning the flavor of the Oreo cookies coming off the production line. Despite much management and engineering expertise, there was no one in the firm who could remember or specify the variables in the routine process well enough to correctly adjust the flavor. After months of

effort, the organization finally found one of the original production engineers, a long retired Mexican octogenarian, who explained how idiosyncracies in the plumbing and machinery interacted with the ingredients, affecting the flavor, finally making the reasons for the process explicit for everyone's understanding.

It is not clear if the organizational knowledge itself is different when it is tacit and it is explicit. It seems more clear that our understanding of the organizational knowledge has changed from a tacit to an explicit understanding of organizational knowledge that is/was *embedded* within a routine. As a convention in this study, I refer to organizational knowledge itself as embedded or explicit, and reserve the term *tacit* as a description of the way in which we cognize organizational knowledge. Thus, I am disposed to using the term *tacit understanding*, but not *tacit organizational knowledge*. This use is not inconsistent with Polanyi (1962), although he prefers "tacit knowledge," but it does conflict somewhat with subsequent uses of the term *tacit* popularized by Nonaka in the 1990's.

Not all knowledge in the firm is organizational knowledge. Knowledge that resides in individuals is not necessarily organizational knowledge. Organizations that are depending upon knowledge stored in the memories of individual members may be in a weak strategic position. Among other things, individuals may leave the firm taking the knowledge with them, they may be opportunistic -- creating information impactedness and increasing internal transaction costs -- or they may forget that which they once knew. To protect the organization against these detrimental possibilities, individual knowledge may be transformed to organizational knowledge by storing it in the minds of many (i.e. redundancy) or in organizational documents and other media, or in technical and administrative routines.

The appropriate storage media is not necessarily dictated by the nature of the organizational knowledge. Complex cultural organizational knowledge may be embedded in stories, but it may also be made explicit in policies, laws, rules and regulations. Technical organizational knowledge may be often stored in explicit form in manuals, yet it is certainly also embedded in routines and in the actions of experts. Recently, digital archives in the form of relational databases have taken a primary place in the organization's knowledge library. As any researcher knows, it is at least as important to recall what is already known, as it is to acquire new knowledge. Much time can be wasted re-creating existing organizational knowledge that is simply forgotten or overlooked due to inadequate organizational knowledge management. Consequently, many firms are involved in the beginnings of "high-tech" knowledge management initiatives, offering experts incentives to make explicit, in the form of electronic documents, knowledge which is embedded in their minds and routines.

Storage media is strategically important. Organizational knowledge which, given a particular strategy, should transfer around the firm, ought to be stored in contexts that make it easy to transfer and easy to understand. Organizational knowledge that is sensitive and should not transfer to everyone should exist in a format that is difficult for an outsider to discern. Organizational knowledge that is critical to the survival of the firm must be saved in a clear and explicit form from the perspective of those who should know it. Organizational knowledge that contributes extensively to competitive advantage should be stored in formats that may transfer well within the firm, but do not transfer beyond the boundaries of the firm into the hand of competitors and potential competitors.

1.5 Department Types Determine Individual Differences

Lawrence and Lorsch's (1967) pioneering study of the plastics industry noted that the businesses with which they worked had four basic functional departments – sales, production, applied research and fundamental research. Across firms, department types were expected to develop similarities in a variety of characteristics (formality of structure, interpersonal orientation, time orientation, goal orientation) as they adjusted to the demands of more general environmental forces. Lawrence and Lorsch (1967) also argued that integration between the department types is critical to organizational performance, due to information and process interdependencies.

As argued so long ago by Lawrence and Lorsch, functional departments face common demands, especially within the same industry, leading to similarities in the way department type members go about their tasks. Unfortunately, when integration is necessary, members of "different departments will approach the problem from different frames of references and may have difficulty in collaborating effectively" (Lawrence and Lorsch, 1967, p 44). Because of department type differences, members of different departments will neither discern the same knowledge, nor make sense of the knowledge in the same fashion.

An organization is certainly not limited to four functional departments. Porter (1985) recognizes a host of core and support functions that participate within a firm's value chain. Core functional departments include research, development, manufacturing operations, marketing and sales, after sales support and general management. Support departments include (but are not limited to) purchasing and inventory control, shipping and receiving, compliance, administrative support, accounting, finance, human resources, information

systems and property maintenance.

The members of different department types will over time come to perform knowledge transfer related behaviors like other members of the same department type. Similarities in department type member's knowledge transfer style are likely induced by both micro-social and macro-social forces. Scott (1990) demonstrates how both of the processes are continually at work in the firm. Barley (1990) takes the argument to the department level, noting that general technological and institutional forces may impact departments and their members from the top down, while specific implementations of technology-to-task within department types will restructure socio-cognitive behaviors from the micro-level up. Thus, regardless of a micro-social or a macro-social view, powerful forces help socialize department-type members so that behaviors of those members become similar.

In this dissertation, I pay special attention to individual behaviors (within department types) that are associated with noticing, sensemaking and communicating because they are critical to the discernment and the transfer of organizational knowledge. I demonstrate that one can accurately predict the department type to which an individual employee belongs by measuring these organizational knowledge transfer related factors.

1.6 Discernment of Organizational Knowledge

In order for organizational knowledge to perform it must first be discerned by the members of different departments. Discernment refers to the cognitive processes of attending to, understanding, extracting, recontextualizing (Brannen, Liker and Fruin, 1998) and making explicit components contained in an event. Discernment of *organizational* knowledge is more specific only in that we are concerned with processing organizational knowledge rather

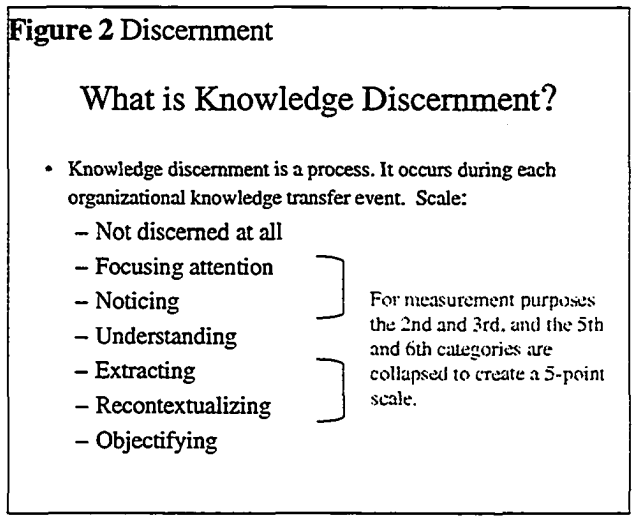
than individual opinions (right or wrong), feelings, information or data alone. To clarify terms, *"discernment"* of organizational knowledge refers to a process, while *"discerned"* organizational knowledge refers to a successful outcome, evidenced by acknowledging the presence and making explicit the specific knowledge embedded in an event.

Regrettably, overlooking organizational knowledge is all too easy. It is likely that one would observe different organizational members, that is, members of different departments, members of different firms, and members of different types of departments, tending to discern some organizational knowledge while ignoring or overlooking other organizational knowledge. These differences are a function of both the degree of salience of the organizational knowledge in question (Gardner, Chmiel and Wall, 1996) and human bounded rationality (Simon, 1957) in the form of cognitive biases and habits of the members of different groups, i.e. departments types, firms, etc. (Ocasio, 1997).

At any rate, it is obvious that not all events, instances or objects of organizational knowledge are discerned on all occasions by all organizational members. Ocasio (1997) points out that much of this is due to strategically selective focusing of organizational and departmental attention. Ocasio (1997) also points out that "focused attention facilitates perception and action towards those issues, and inhibits perception and action towards those that are not" (p 190) and that social, economic and cultural structures in the firm channel and distribute the firm's attention.

As depicted in **Figure 2**, discernment of organizational knowledge ranges on a cumulative low to high scale from 0) not discerned at all, 1) focusing attention, 2) noticing, 3) understanding 4) extracting, 5) sensemaking or recontextualizing and 6) objectifying. Discernment occurs each time that organizational knowledge transfer is attempted, externally from environment to organization or internally between organizational members.

Figure 2 Discernment



Regarding the 5th stage of discernment, I prefer Brannen's (see Brannen, Liker and Fruin,1998) narrowly constructed *recontextualization* to Weick's (1995) *sensemaking*. 'Sensemaking' is often used in broader terms than I find useful for detailed empirical research, encompassing many unspecified cognitive operations, and Weick (see Weick, 1996) has yet to clarify this through explicit operationalization. Important theoretical differences exist between extraction of knowledge and recontextualizing knowledge. Recontextualization, the uncertain act of interpreting what the extracted knowledge means "to us," adds the important possibility that knowledge may be produced as well as induced and deduced during the discernment process.

1.6.1 Variables influencing knowledge discernment

I propose five general hurdles to knowledge discernment. First and most obviously,

knowledge is often not found because it is not specifically being looking for. We may not discern new knowledge right in front of us if we are not looking for new knowledge. Miles and Snow provide theory that can help to explain differential knowledge seeking behavior, dividing collectives into categories named 'prospector' 'analyzer' 'defender' and 'reactor.' Secondly, organizational knowledge may not be discerned if it resides in a location -- a department, or plant, or country or anywhere -- beyond a group's normal range of attention (Occasio, 1997). I refer to this variable as a department's 'locus of attention.' Thirdly, discernment difficulties may spring from another rational boundary: alternative sources of meaning (Smith and Peterson, 1988) employed by members of different types of departments or professions as they attempt to make sense (Weick, 1979, 1995) of messages and events. When members of different groups utilize different sources to make sense of events, it is likely that they end up giving the same events different meanings. Fourth, organizational knowledge will almost certainly go undiscerned if it is sent via a communication media with which the receiver is unfamiliar, or not accustomed to using for that purpose. Finally, organizational knowledge may go undiscerned because of its own saliency characteristics – it is too complex; too unimportant or too deeply embedded (Chmiel and Wall, 1994). For example, organizational knowledge shared by bread bakers concerning "touch" and "feel" of the dough will more likely go undiscerned when it is implicitly understood (Polanyi, 1962) and stored in embedded routines (Nelson and Winter, 1982) or, in Hall and Hall's (1990) terms, it is embedded in "high context" Together these saliency characteristics can impede or aid the flow of organizational knowledge. For this reason, I give the name "knowledge impedance" to the variable representing the aggregation of these saliency characteristics.

It should now be evident that many of the administrative issues framed in this paper involve cognition "style" factors relating to knowledge mobilization. Furthermore, while departments and work groups do possess, share and make use of knowledge through group-level events and interdepartmental processes, it is the individual members of those departments who do the discerning, learning and participating.

Useful organizational knowledge may reside within the organization, and that is an asset. However, organizational knowledge is not necessarily shared throughout the organization, in fact it is rarely shared throughout the organization. Management must learn to take advantage of the fungible nature of organizational knowledge and have it flow within the firm, to members of different types of departments, but not let it flow beyond the firm. No matter how useful some organizational knowledge has proven to be within a particular department, if it doesn't transfer between members of different departments, if it doesn't flow, it may be an under-utilized resource.

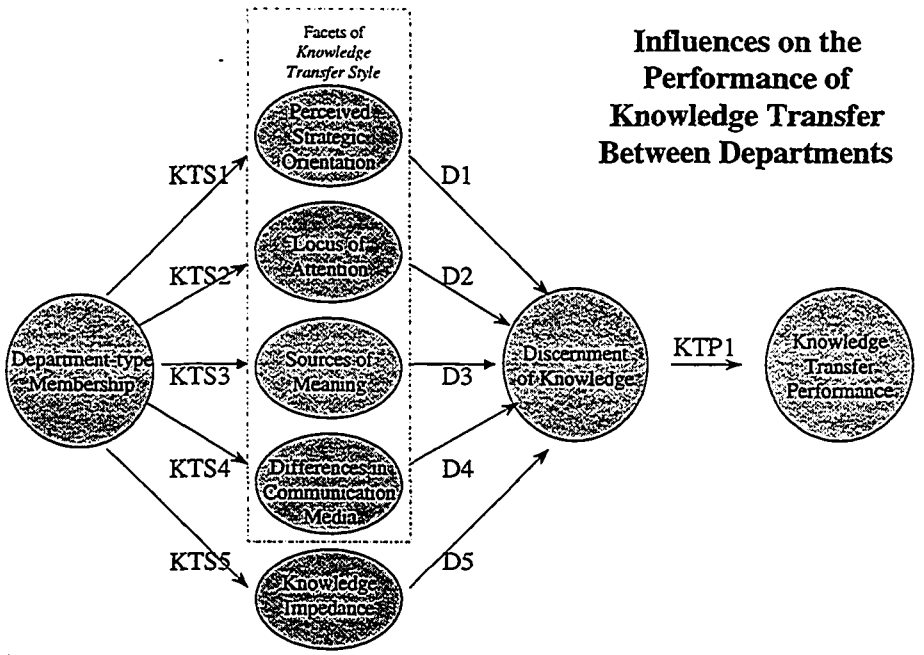
1.7 Path Dependencies of Organizational Knowledge and the Effect of Discernment on Knowledge Transfer Performance

A critical issue in strategy implementation is getting the right resources to the right places at the right times. Business firms can attempt to create asymmetries through knowledge-based strategies to gain competitive advantage. Such methods include organizational emphasis on learning, on innovation, on gathering market information, on analyzing the competition, on continuous improvement, etc. The problem is bringing about an efficient and effective flow of these knowledge resources so that economic rents can be earned from their existence. By understanding the key factors involved in organizational

knowledge transfer, senior managers can announce a strategy in an attempt to influence the discernment of knowledge and knowledge transfer performance.

I propose six constructs that significantly affect knowledge transfer performance. These constructs are (pictured in **Figure 3**), perceived strategic orientation, locus of

Figure 3 Path model: Influences on Knowledge Transfer Performance



attention, sources of meaning, communication media dysfunction, knowledge impedance, and discernment. The value of these variables is at least partly determined by the type of department of which the individual is a member. There are six operant relationships between these constructs which may be considered processes that must work in consort to achieve optimal performance. The constructs and relationships are described below.

1.7.1 Perceived strategic orientation

The relationships KTS1 and D1 suggest that membership in a type of department impacts each individual member's perception of departmental strategic orientation. This perception in turn influences that member's propensity for discernment of knowledge. Mode *types*, as described by Miles and Snow (1979) are prospector, analyzer, defender or reactor. For example, an individual who perceives their department as a prospector will likely give greater effort to sifting through all sorts of knowledge external to the department to find new uses for that knowledge. One who perceives their department as a defender will likely discern only external knowledge salient to the current way things are done in the department.

1.7.2 Locus of attention

A tendency for a social actor (i.e. a department member, or the member of a specific type of department) to attend to in particular locations and logics for knowledge describes the construct called the 'locus of attention.' Following the work of Occasio (1997), it is proposed that the attention of departmental members is limited or bounded, and the habitual or purposely targeted locus of attention has much influence over what knowledge is discerned.

Departmental members may look to absorb knowledge held in the external environment by other organizations with which they have frequent contact, such as suppliers and partners, or by customers and professional associations. On the other hand, an internal focus of attention might work well for firms with high research and development intensity, or in those firms which are tapping individual employees' knowledge to expand organizational knowledge.

If a department's attention is largely focused on one location, it may not notice

knowledge in other locations. Organizational knowledge will not likely be discerned if departmental members have attention focused externally, rather than within the firm. Certainly, organizational knowledge may be noticed by chance or intuition. However, an organizational member is *less likely* to notice and discern things where it does not go, look, scan or pay attention. When an organization does attend to knowledge in an unusual location, it may not successfully discern the knowledge because of the unfamiliar context and lack of an established routine.

Finally, an department member may have particular biases, a favored *logical way* of paying attention. Discernment gained by attending to repeated similar events is an inductive method, while discerning the logical relatedness of different events is a deductive technique. Different departments may have more or less of a propensity to pay attention to either the inductive or the deductive constructions. For example, Quine (1951) argues that scientists as a group have a habit of attending to theoretical arguments, while ignoring the knowledge contained in inductive constructions, although both may be found in the same location.

1.7.3 Sources of meaning

Sources of meaning are systems of ideas and beliefs embodied in social systems (Smith and Peterson, 1988). A manager's appeal to a different source of meaning alters the way (s)he make sense of an observation, event or situation. Organizational members will turn to specific sources of meaning to make sense of different event types, depending on cultural or group biases and habits. Mintzberg's (1979) "coordinating mechanisms" are an example of a (limited) set of sources of meaning. Different department types develop such that their members tend to look to the manager(s) to make sense of things, while others types

of departments may tend to look to professional colleagues. An individual's characteristic sources of meaning impact both what organizational knowledge they discern and how they make sense of it.

Trust is also an important facet of organizational culture affecting members' willingness to give to and to take from organizational knowledge stores. Information impactedness (Williamson 1975) exists for many reasons. Trust is convincingly offered (Ouchi, 1980; Axelrod, 1984; Ring and Van de Ven, 1992) as a broad determinant of information impactedness and opportunism. Departments and individuals that have not received expected rewards in the past likely lose trust, and subsequently do not effectively participate in future organizational efforts. This phenomenon however, impacts the senders willingness to transfer the knowledge, rather than discernment by the receiver, and is therefore not the focus of the current study.

1.7.4 Communication media

The next relationship pictured is the effect that communication media have upon discernment. Knowledge sent in a medium that is rarely used to carry that sort of knowledge may be overlooked. Alternate knowledge types (inductive or deductive, complex or simple, high or low priority) may be better transferred with a particular medium. Richer media can carry more knowledge, but discernment of that knowledge can be difficult due to equivocality problems. Equivocal messages appear obscure, imprecise or ambiguous as opposed to unequivocal messages which are clear, specific and logically consistent. Despite its richness, a poem is typically less specific than a spreadsheet, and harder to unscramble. As a result, the different objects of knowledge contained within a poem are more difficult

to discern.

There is some evidence that media richness and equivocality are culturally sensitive. A spreadsheet may be relatively thin medium for members of human resources departments but be a rich medium for members of finance and accounting departments.

1.7.5 Knowledge impedance

While a pluralistic understanding of knowledge (Spender, 1996; Blackler, 1995) was rejected above (see section 1.5), different areas of knowledge may have varied associated characteristics from the perspective of subjects. Certain perceived knowledge characteristics can impede the other forces as they impact the discernment of knowledge. Knowledge Impedance is therefore included in the model twice, having a direct effect upon discernment and a moderating force on the relationship between knowledge discernment and knowledge transfer performance. The importance, the level of embeddedness, and the complexity are the key facets of the knowledge impedance construct.

Very important knowledge will likely be noticed and transferred more quickly than low priority knowledge. Uncovering and gaining an understanding of deeply embedded knowledge is more difficult than doing the same for knowledge that is explicit. When knowledge is deeply embedded in some context it will be more difficult to notice, to extract and to understand than explicit knowledge, which is on the surface. Finally, complex knowledge requires increased or richer context to make it clear, and members of departments without such context may shy away or fail at discerning such knowledge.

1.7.6 Knowledge transfer performance

Relationship KTS1 concerns the direct effect of discernment upon knowledge transfer

performance. The dimensions of knowledge transfer performance are the efficiency of the transfer and the effectiveness of the transfer. Efficient transfers minimize other organizational resources expenditures, such as time and equipment and other capital. Effective transfers go to areas where they are useful and needed. It is not enough for knowledge transfer to be fast. The direction of the transfer concerns whether the knowledge gets to the correct departments or end-users. If aim is poor, and knowledge moves very quickly to the wrong place, there is even the potential for damage to the firm. Knowledge is said to be useful if it is implemented to improve or create new processes, products, or procedures.

1.8 Department Types and General Proposition of the Research

The first column of relationships (KTS1-KTS5) described above and depicted in **Figure 3** contribute to describe what I call a departmental member's "knowledge transfer style." To the extent that group membership, common work roles, technologies, work related policies and procedures and other task-related variables create rational boundaries over time (Simon, 1957), social actors at multiple levels of aggregation -- individuals, work groups, departments, organizations, department types across organizations, and perhaps even industries -- may be said to develop particular knowledge transfer styles. Furthermore, to the extent that this is true, the performance of knowledge transfer between social actors will suffer as a direct effect of divergence in knowledge transfer style.

Theoretical arguments about bounded rationality (Simon, 1957), and socio-technical systems (Emery and Trist, 1965,), and micro-social processes (Trist and Bamforth 1951, Meissner, 1969; Zuboff, 1988) lead to the conclusion that similar knowledge transfer styles

may operate among the members of specific departments types. That is, accountants in the accounting department in one firm are very likely more similar in knowledge transfer style to other accountants in accounting departments in other firms than they are to computer programmers in their own firm. This proposition, that social actors can be classified by the knowledge transfer style of their type of department, is at the root of this study.

1.9 Testing and Results

I conduct my analysis of the knowledge transfer problem at the individual level. I test to see if the level of discernment of organizational knowledge influences the level of knowledge transfer performance. I also investigate at this level whether there are significant differences in the knowledge transfer styles of members of different types of departments, and of members of different firms.

Using the *Knowledge Transfer Style Survey* developed for this research, I find that I am able to discriminate fairly accurately between members of different types of departments by observing their knowledge transfer styles. More explicitly, individuals are identifying the type of department they belong to when they report their department's strategic orientation, locus of attention, sources of meaning, preferred communication media, and their perceptions of the importance, complexity and embeddedness of organizational knowledge.

Because members of different department types have different knowledge transfer styles, there arise knowledge transfer difficulties and severe under-performance of organizational knowledge resources. I have found that employees across departments and firms perceive that only about 55% of the organizational knowledge that has been identified as useful is actually put to use. That is, even after knowledge is discerned and identified as

useful, it only translates into action about half the time.

Finally, working from the premise of bounded rationality, I have established theoretical and empirical links between the under-performance of organizational knowledge and differences in knowledge transfer styles of members of different types of departments. My proposed solution to the problem is for management to assess the knowledge transfer style of their work groups and departments on a somewhat regular basis, and design and adjust the firm's knowledge management system to account for these differences. Furthermore, because of these similarities in knowledge transfer style within department types across firms, it will be more efficient to design knowledge management systems based upon general departmental profiles, so that individual firms might find useful 'off the shelf' knowledge management products less needful of customization.

CHAPTER 2 LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.0 Overview

This review serves the purpose of placing the current study into the broader context of existing related research. Knowledge management theory has emerged simultaneously from multiple research streams. Various work in organization theory has suggested a knowledge based view of the organization (Spender, 1997). A large volume of work in strategy discusses the role organizational knowledge plays in competitive advantage, from the resource-based view of the firm (Barney 1991) to discussions of fungible resources in transaction cost economics (Teece, 1982)

The review is broken into three main parts. The first section reviews general perspectives in organization theory and strategy to set the general theoretical context of the study. The discussion leads to an understanding of the organization as a quasi-natural system (McKelvey, 1998), composed of both loosely and tightly coupled organizational members, mediating between intentional strategies and natural (unplanned) adaptation to environmental forces.

The second section reviews literature specifically related to the constructs and relationships hypothesized in this project. While defining each construct, relationships between constructs will be discussed and formal hypotheses will emerge.

The third section offers a review of general epistemological frameworks for studying flows of organizational knowledge. It concludes with the adoption of a naturalist ontological and epistemological perspective that mediates the tension between positivistic and postmodern constructive viewpoints. The naturalist ontology treats organizational knowledge

as a discrete set of objects. The naturalist epistemology allows for these knowledge objects to be empirically observed and measured, despite the admission that subjectivity and relativism intrude upon all theory construction and theory testing.

2.0.1 Introduction to the literature review

This business strategy dissertation is created within the broader context of organization theory. From the organizational perspective, this work is largely influenced by: Spender (1996) who has begun a search for a knowledge-based theory of the firm; by Teece (1982) who links transaction cost economics with a resource based view of the firm; by Miles and Snow (1975) who carefully explain how an organization develops adaptive routines; by McKelvey (1997) who explains the utility of speaking of organizations as quasi-natural systems; by Levinson (1976) who fleshes out the non-rational side of organizational forces; by Simon (1957) and March and Simon (1958) who established the constraints upon the rationality of organizational members; by Thompson (1967) who offers a boundedly rational, yet open systems view of the organization; and by Peterson (1998) who extends the cognitive boundaries of the organization to sources of meaning that may lie beyond the firm.

Following Nelson and Winter (1982), I frequently speak of "organizational members." "An organization member is by definition a unit that can accomplish something on its own" (Nelson and Winter, 1982 p98). I also use the term "social actors" to convey pretty much the same idea, the difference being that an organization member is a social actor within an organization. Thus, individuals, groups, sub-groups, departments and divisions are each organizational members or social actors in their own right. Even informal groups are organizational members and social actors.

Contemporary knowledge management may be understood as an outgrowth of organizational theory, business policy and strategy, technology and innovation management, organizational learning, or cross-cultural management. While this study dips its fingers in each of these streams, I've constructed it primarily from the organization theory and business policy and strategy perspectives.

I have adopted a boundedly-rational, resource-based, quasi-natural, open-systems view of the firm. I establish this perspective of the firm and deduce and support hypotheses about organizational knowledge transfer utilizing the resource based view of the firm (Wernerfelt, 1984; Barney, 1991), strategic orientation (Miles and Snow, 1978), transaction cost economics (Williamson 1975, 1991), bounded rationality (March and Simon, 1958), sensemaking (Weick, 1995; Peterson, 1999), media richness (Daft and Lengle, 1984), strategic knowledge acquisition (Prahalad and Hamel; 1990) and organizational learning (Fiol and Lyles, 1985; March, 1991; Huber, 1991; Fiol 1994).

The purpose of the second portion of this literature review is reasonably and logically construing previous research findings to suggest that the success of knowledge transfer depends upon the relationships described at the end of chapter one, and depicted in **Figure 2.** I will examine the relationships in the order that they are shown in the diagram, building the full model in an orderly way. I alter the path diagram slightly as the conversation progresses to indicate how far along the discussion has come.

This second section is presented in a specific order. First I discuss how department-type membership influences characteristics of its members in terms of five constructs, and then I describe how each of these variables influence organizational knowledge discernment.

The first relationship is between an employees perception of their department's strategic orientation and it's the impact of that perception upon that individual's knowledge discernment behavior. The second relationship is how the locus of attention of the member affects discernment of knowledge. The third relationship concerns how sources of meaning influence discernment, and the fourth how preferences for alternative communication media impact knowledge discernment. Next, the fifth relationship, the joint effect upon discernment of importance, complexity and explicitness (what I name "impedance") is discussed. Finally, I discuss how organizational knowledge transfer performance is contingent upon discerning organizational knowledge. In a very general way, the first two constructs, perceived strategic orientation and locus of attention, describe an organizational member's intent, and the other three constructs set the member's sensemaking context.

Other related forces may influence knowledge transfer performance. They are largely contained in Weick's (1979) equivocality construct, which deals with ambiguity of meanings appropriated to events. Weick follows Thompson (1967), proposing that organizations are constructed to cut down on equivocality from the environment. Since 'equivocality' is roughly equivalent to the state of 'not knowing for sure' Weick's (and Thompson's) approach is in a sense a knowledge-based view of the firm. Certainly a need exists to investigate equivocality's direct effect on knowledge transfer performance. High levels of equivocality would likely affect the accuracy of the knowledge transferred. In this dissertation, I deal with the effect of equivocality upon the discernment of organizational knowledge through the complexity/simplicity and implicit/explicit facets of knowledge impedance, but I do not deal with the direct effect of equivocality upon knowledge transfer

performance. This project will be limited to the influence of the five above-mentioned intent and sensemaking constructs as they affect the performance of organizational knowledge transfer by altering organizational discernment capabilities. The accuracy of the knowledge transfer from start to finish will not be assessed.

2.1 Organizational Theory and Natural Systems

2.1.0 Overview

Lawrence and Lorsch's (1967) contingency approach asserted that some organizational designs were better for use in more simple environments, and others better suited for more complex environments. Borrowing this simple vs complex idea to describe theories instead of organizational structures, Scott (1998) describes more standard theoretical perspectives as viewing organizations as rational systems, and more complex perspectives of organization as natural system approaches. Describing the organization as a quasi-natural system, McKelvey (1997) finds a middle ground where organizations are both intensional entities and naturally adaptive open systems. I will first review some fundamental approaches to understanding organizations, limiting them to areas where strategic action may be involved. As a result of this discussion, I explain why McKelvey's (1997) perspective is taken for the current study.

2.1.1 General organizational perspective

Ulrich and Barney (1984) and Thompson (1967) take a strategic "free choice" rather than a deterministic perspective on organizational contingency theory. Both judge different theories on their pragmatic basis. The rule is to select business policies by what will likely work best at each different level of aggregation and each different type of managerial task involved in required actions. For example, efficiency type theories (Ulrich and Barney, 1984) such as scientific management and transaction cost analysis ought to be strategically applied to technical systems (Thompson, 1967) where high process control is both desirable and possible. Resource dependency theories are best used at the organizational level (Ulrich

and Barney 1984), or for administrative systems (Thompson 1967) where decisions are made about which resources are critical, what constitutes a source of advantage, and how to allocate resources. The lesson here is that the organization need not be run from a single general perspective or "tightly linked" set of policies. Different organizational sub-systems that operate in different local environments adapt by utilizing (different) theories and policies that work in their locale. Attempts to unify, or tightly link the system will generally hamper the adaptive mechanism and short-change the importance of differences in operating environments.

Like Ulrich and Barney, Donaldson (1987) proposes that neither of the two major prevailing theories of structural change -- "contingency determinism" nor "strategic choice" -- is adequate. Donaldson's (1987) research proposes an alternative formulation called "structural adjustment to regain fit" (SARFIT). The results indicated that firms engage in a cycle of change in strategy, leading to mismatch and low performance, followed by structural adjustment to a new match and improved performance. Neither the stricter contingency determinism nor the looser strategic choice theories adequately modeled the changes. The results did, however, support Donaldson's SARFIT model. This result indicates that the adaptive mechanisms do not operate smoothly and incrementally when policies are centrally dictated. Rather, entropy slowly erodes the system until radical change and new energy is injected to realign the firm with the broader environment.

Donaldson's (1987) study brings to the fore issues of how change occurs and how to keep entropy from damaging the firm. This type of question has been dealt with extensively with population-type theories. Unfortunately for the strategic manager, population theories

like evolutionary change (Tushman and Romanelli, 1985), population ecology (Hannan and Freeman 1989; Aldrich,1979), industry analysis (Porter, 1981; Spender, 1991), and environmental fit (Miles and Snow, 1982), are not discussed as applicable to tasks, events and processes – the core elements of the manager's work. These theories are applied rather to sets of organizations, to industries and to larger institutional systems. However, it is clear that small local adjustments in tasks and processes are critical to organizational efficiency and effectiveness. There is a clear difference between theories that deal with large aggregations of events, and those that deal with implementation specifics. Scott (1995) translates this technical-to-institutional continuum into theories that view systems as either closed or open.

2.1.2 Rationality in organizations

According to Thompson (1967) organizational structure is the basic construct by which organizations impose bounded rationality (Simon 1957). However, this rational system approach overlooks for the most part the behavioral nature of organizations. Simon's (1957) primary contribution to organization theory is the idea of "administrative man," working within a framework of "bounded rationality" and displaying "satisficing" behavior. March and Simon's bounded rationality (1963) is one of the first views of the organization as a partially open system. They offer a view of the organization as constraining, closing, or buffering an otherwise open system, with the organizational environment influencing how social actors draw meaning from data and information. Actions and decisions toward strategic intent are bounded by social actor's cognitive inability to make completely rational judgements. This stark juxtaposition to the purely "rational man" closed the door on theories

of organization that did not offer cognition a place of importance.

Although Thompson (1967) may be criticized for over-dependence upon rationality, the finding that different parts of the organization, or organizational members (Nelson and Winter, 1982) should be more open or more closed to environmental turbulence remains a key contribution to the organizational literature. Core processes need to work more as closed systems, buffered from change and turbulence so that basic survival functions can continue. Boundary spanning members need to function more as open systems exposed and interacting with external environments. (Thompson, 1967).

In the work of Thompson, we see the roots of McKelvey's (1997) quasi-natural system perspective. The organization functions as a rational intensional agent, but with characteristics of an open system. The firm is designed for ingesting, filtering and transforming variable and unpredictable flows of knowledge and other resources, and ordering and storing them in rational predictable units for processing.

2.1.3 Leadership, coordinating mechanisms and sources of meaning

Perhaps in the work of Henri Fayol (1949 trans), who noted that unification of command in the firm is necessary for a smoothly functioning whole, can be found the roots of "coordinating mechanisms" (Mintzberg, 1979) and "sources of meaning" (Smith and Peterson, 1988). While organization structure is a source of meaning or mechanism through which Simon's (1957) bounds of rationality are set, structure is not *the only* source. Fayol reminds us that leaders are also a source of meaning in the firm. We now understand that individuals and local cultures draw upon various sources of meaning as mechanisms to make sense of events, to communicate, and to make decisions (Smith and Peterson, 1988). A more

comprehensive list of sources of meaning is included in **Figure 4.** I plan on examining which of these sources of meaning different social actors refer to in different knowledge transfer situations.

Figure 4 Key Sources of Meaning in Business Organizations

Organizational culture	National Culture
Unwritten rules embedded in the sub-culture	Religions
Subordinates	Family
Specialists Outside specialists	Customers
Co-workers	Norms specific to a professional field
Superior(s)	Knowledge specific to a professional field
Internal financial reports	*Suppliers*
Ones own experiences and training	

Parsons' (1959, 1966) structural-functional theory describes adaptation, goal attainment, integration and latency (AGIL) as the functions of all social systems. On each level of theory, a functional analysis can be applied with each type of function dictating a particular structure. This contingency perspective is highly rational with four basic functions, and each function dictating a particular structure. The idea that each system is nested within another and that the analysis goes on ad-infinitum, brings to the fore the importance of context to organization theory. The message of this sort of "system structural" or "micro-deterministic" (Astley & Van de Ven, 1983) theory is that managers must be adaptive, striving to have their organizations "fit" the greater environment. While I find system structural theory intriguing, I am not going to accept such a rigid and deterministic framework as a basis for my work.

2.1.4 Economic effects of opportunism, trust and information impactedness

Coase's (1937) theory of the firm, while it did not receive much attention until the 1970's, is perhaps the earliest attempt to explain how environmental mechanisms could

dictate organizational actions. The highly rational model of the firm discusses the firm's interaction with the marketplace, and the adaptive processes driven by forces of efficiency. Organizational form is driven by internalization of those transactions that have especially high monitoring/governance costs on the open market. Williamson (1975) uses this theory to explain the superiority of the m-form corporation, and Teece (1982) uses it to explain the efficiencies of the multi-product strategy.

Both Ouchi (1980) and Ring and Van de Ven (1992) add to this theory by introducing a middle ground between markets and hierarchies: clans and cooperative arrangements which are based in trust rather than opportunism. Axelrod's (1984) game theoretical treatise on the rational evolution of cooperation helped move transaction cost economics and other organization theory forward to explain new institutional forms such as the network organization. Ring and Van de Ven's(1992) piece has neatly tied organizational theory to other research from marketing and sociology, allowing managers a rational basis for cooperative relationships through recurrent contracting.

Like transaction cost theory, agency theory contains the basic assumptions of opportunism and information impactedness (Williamson, 1975, Eisenhardt, 1987). For financial markets, opportunism and information impactedness mean that higher orders of control are necessary to force boards of directors and managers to operate in the best interest of shareholders. The market for corporate control (Black, 1989) is described as a governance device keeping inattentive boards of directors and overly self-opportunistic managers more or less in line.

Boards of directors are stuck squarely between this pressure from financial markets

and the opportunism of managers. In order to allay the adverse effects of the agency problem, they need to negotiate contracts that align agents' goals with the principals (Eisenhardt, 1987). For managers, these outside forces demanding reduced information impactedness dictate the creation and implementation of business policies and contractual incentives that encourage knowledge flows. Agents gain power when they hold knowledge important to the firm, and in the absence of specific policies and incentives, will often opt not to share their valuable knowledge. Principles of firms argue that such knowledge assets are the property of the organization. Various companies, in order to reduce impactedness and increase the viability of knowledge management systems, have begun to offer bonuses and other incentives to employees who contribute valuable individual knowledge to organizational knowledge databases. (Lancaster, 1997).

2.1.5 Organizations as open systems

An open system has the characteristic capability of self maintenance by utilizing the throughput elements obtained from the external environment. That is, an open system organization adapts, rebuilds and repairs itself, utilizing the very same resources it processes to reach it's other goals (Pondy and Mitroff, 1979). Because the environment changes, the firm needs interaction with the environment as often as possible to ensure "requisite variety" in the system (Ashby, 1968). Pondy and Mitroff (1979) used the requisite variety hypothesis to compile the so called "Law of Limited Variety:" This law dictates that an organization exhibits no more variety than the variety to which it has been previously exposed. This implies that exposure to a variety of events and information gives the organization the ability to adapt to subsequent challenges in a variety of ways. It also implies that possibilities for

innovation are modest when exposure to variety is diminished. This principle of innovation and creativity is confirmed by Evans (1991).

In a recent advancement of the open systems view, McKelvey (1997) associated organization science with biological models and called for much more use of biological models in all our research streams. However, McKelvey also reminds us that organizations are only "quasi-natural" with the intentionality of organizational members mediating the effects of natural evolutionary processes (McKelvey, 1997) such as those described by Miles and Snow (1975) and Nelson and Winter (1982).

Although boundaries of open systems are very hard to define, boundary spanning is an important part of the functioning of the system. Pfeffer and Salancik (1979) say persons are not included per se, only activities and behaviors are included. Evan and Freeman (1988) hold a stakeholder view of the organization, which includes customers, shareholders, suppliers, community and employees, with management coordinating all the stakeholders of this interactive organizational system.

Some of the newer organizational forms, such as matrix organizations (Lewin, 1996), network organizations and virtual organizations make the boundaries even fuzzier and units of analysis all the more difficult to set. Porter's (1985) value chain offers a decent model for setting organizational boundaries. The value chain describes products and services moving through a process beginning with inputs, through each of the within firm transition phases where economic value can be added to the product or service, to the output phases, in which the product or service is delivered to customers. Value chain boundaries (the inputs stage and the output stage) are specific to each firm, forcing neither an overly loose nor an overly

constrained conception of the organization. Where one firm's value chain clearly reaches deeply into the operations of its suppliers, another firm may set their value-added limits at their purchasing and receiving function. I recall Chandler's (1962) now famous litany that over time, "structure follows strategy." Using Chandler's rule and Porter's value chain, I conclude that the boundary of a firm is dictated by the strategy.

From a strategic perspective, activity occurs in response to demands or preferences from the environment (Scott 1993). Ashby (1968) also demonstrated that deviations from goals will direct the subsequent behavior of a system. This finding supports Selznick's (1957) account of organizations deviating from business goals in favor of survival goals as they transform into institutions. Another further element of open systems is that they can experience "negative entropy." This phenomenon, also described as morphogenesis (Buckley, 1967) describes open systems' ability to ingest resources of greater complexity than their outputs, and turn it into energy and work, thereby growing to higher levels of complexity, ability and organization (Buckley 1967).

As stated above, open organizations are hierarchical: systems are composed of clusters and levels, subsets within subsets. However, Weick (1976), working from theory developed by Ashby (1969), demonstrated that more complex systems (which survive) tend not to have rigidly defined relationships between subsystems. Weick (1976) brought this general systems theory concept to the study of administrative science.

The idea of loosely coupled systems has since become an important concept in both organization and management theory. As systems become more complex, equivocality and uncertainty grows. As uncertainty increases the linkages between subsystems must become

looser so that sub-system incompatibilities and other errors do not continually cause meta-system side effects. This principle can be translated into advice for managers: in order for a complex organization to work well over time, allow the sub-systems to be loosely coupled.

Taken together, the collected work on organizational evolution and change and open systems (e.g. Buckley, 1967; Pondy and Mitroff 1979); Aldrich, 1979; Nelson and Winter, 1982; Hannan and Freeman, 1977,1984; McKelvey and Aldrich, 1983; Ulrich and Barney, 1984; Tushman and Romanelli, 1985; Gersick 1991; Van de Ven and Poole, 1995) indicate that knowledge, varying in complexity and content, may be ingested by organizational departments and transformed to accomplish work and to maintain organizational equilibrium within the greater industrial environment.

This growth process occurs both through routine adaptation and internal generation of new processes (innovation/mutation) which slow or reverse forces of entropy. As knowledge flows through the organization, the functional departments ingest and digest what they can. From a strategic perspective, ingesting, breaking down and reconstructing knowledge inputs into useful resources helps fight off the decline stage of the natural organizational life cycle. This natural systems process of ingesting, digesting and reconstructing data, information and knowledge may be collectively referred to as discernment.

2.1.6 Rules and actions

Rules, policies, programs and other strategic initiatives do not always govern actions. Both institutional theory (Selznick, 1957; DiMaggio and Powell 1983; Scott 1987) and population ecology (Hannan and Freeman, 1979; Aldrich, 1977) describe how organizations

deviate from rational goals for a variety of reasons, mostly due to interaction with external environments. The resource dependency school Pfeffer and Salancik (1978) is principally concerned with the external control of the organization. This is an outgrowth of both Selznick's (1957) explanation of "cooptation of power" and a resource based view of the firm in which the resources are manipulated and controlled.

I find little fault in these perspectives, and therefore do not expect that policy directives and strategic knowledge management initiatives alone explain knowledge discernment in organizations. While a directive to search for or pay attention to knowledge on specific topics may increase organizational attention, it will not guarantee successful knowledge acquisition or transfer. Organizational members have rationality boundaries and alternative motives which may hamper or prevent knowledge acquisition and transfer directives from reaching successful termination. However, I do expect to find that non-power related factors still account for a significant portion of the variance in discernment and knowledge transfer performance.

2.1.7 Combining open systems and the resource based view

Opens systems theory adds increased perspective to the resource-based view of the firm. A principle characteristic of open natural systems is that they learn and experience morphogenesis while closed systems head toward morphostasis (Ashby, 1968). Morphogenesis refers to processes that change the system: learning, growth, differentiation. Morphostasis concerns processes that preserve a system's initial structure or state (Scott, 1998).

When groups or organizations operate as open systems, organizational knowledge

becomes a dynamic source of sustainable competitive advantage. As morphogenetic processes take hold, the firm naturally grows in complexity, naturally differentiating its form and processes. It is this learning, changing, differentiating process that we call innovation. Social actors that can protect their differentiated knowledge from others, while promoting their own morphogenesis, hold a competitive advantage. Business firms that can control how open different sub-systems are to external knowledge in effect are able to manage the morphogenisis/morphostasis process.

Again, this is well reflected in Thompson's (1967) theory of buffering only certain subsystems in the firm. Thus, the emphasis of Prahalad and Hamel's (1990) core competency approach to organizational architecture and strategy is to obtain core competencies by acquiring knowledge and skills that are hard to copy and to protect those competencies from becoming public commodities.

The integration of morphogenesis into organizational theory also introduces the possibility that organizations create their own futures and environments, a rebuff to micro-determinist's and strict industrial economists. The differentiation process operating in a complex open system (like a business organization) can lead to innovations that were not predictable by observing the state of the industry. Chrysler's creation of the mini-van is just such an example. The internal innovation created a new market and reshaped a powerful old industry.

2.1.8 Basic view of organizations for this study: the quasi-natural organization

A natural system approach is fundamentally different from a rational system approach. Blau (1956) stated something to the effect that running an organization by the

micro rules of rationality is irrational, because that perspective does not account for the nonrational aspects of human behavior in social situations. Selznick proposed that organizations are social systems, and behave much like an organism, attempting to adapt and survive.

The principle of "goal complexity" is apparent in all the natural systems approaches, both closed and open. There are always stated versus real goals of the organization. Selznick (1957) explained that organizations engage in behavior that is contrary to the stated goals in order to maintain legitimacy and survival. According to Scott (1998), Selznick (1949) may have been an important force behind the perspective of an organization as an open and natural system. Selznicks's work with the TVA led to his institutional approach, describing organizations as organic social actors, coopting with their environment(s) to gain legitimacy, adjusting their goals in order to survive, and thereby acquiring a distinctive personality (Selznick, 1957).

Certainly organizations deal with the environment in a host of ways, not only via cooptation. Organizations may interact with the external environment strictly on the level of discrete market transactions, scorning any of the sacrifice and cooperation implied by long term relationships and partnerships (Williamson, 1979). Yet, the open-natural system approach that I favor, which is supported by Scott (1998) has similar characteristics to ideas about cooptation developed by Selznick. Systems *need* the environment to survive, rather than survive *in spite of* this interaction.

In complex natural systems (see Scott, 1995) such as social systems, informal structures are created based on the personal preferences of the specific collection of

participants (Pfeffer and Salancik, 1978). As participants change, so does the organization change. There are constructs like informal authority, coalitions, non rational responses, adaptive mechanisms and subcultures. The organizational diagnosis (Levinson, 1972) approach has also been an important technique offered to locate those non-rational adjustments of which Selznick spoke. McKelvey, (1997) brings these themes together, explaining that treating organizations as quasi-natural systems allows us to include both intentionality of organizational members and natural determinism of organizational actions by external forces.

The loose coupling concept developed by Ashby (1968), introduced to organizational studies by Cyert and March (1963) and made more explicit by Weick (1976), plays an important role in the basic perspective on organizations adopted in this research project. Pfeffer and Salancik (1978) explained that the organization is a loosely knit coalition of interest groups. The authors demonstrate how various organizational sub-groups have different perspectives and preferences.

As was briefly discussed in a previous section, organization theory by Thompson (1967) demonstrates how different organizational perspectives may be more appropriate at different levels of the organization. The technical core, he proposes, should operate as much as possible as a closed rational system. Production operations need to be buffered from external inconsistencies so that they may operate with maximum efficiency. Groups at the technical core (Thompson, 1967) are protected from variances in resource flows, remaining closed systems for as long and often as possible. When the environments become turbulent and buffering and smoothing of the boundaries of the system is untenable, rationing of

resources results. This creates inefficiencies, until the closed technical systems are halted, adjusted or replaced, resealed and restarted.

In other functional parts of the organization, an open systems approach is more appropriate. Boundary spanning members need to be fully exposed to a fluctuating environment, continuously scanning, and acquiring new knowledge. Other groups (at the managerial level) intercede between the boundary spanning groups and the operations groups, filtering the acquired resources.

Thompson bases all of his propositions upon "norms of rationality," and this may seem inconsistent with the fundamental irrationality of individuals about which Blau (1956) and Selznick (1957) and Levinson et al (1962) speak. Thompson is speaking of organizational level rationality not individual rationality. He clearly admits to fundamental irrationality, but points out that organizations strive for rationality, especially at the technical core so that they may most efficiently forecast and plan for future action. However, it can be argued that this assumption (about rationality) is somewhat abused by Thompson, making his theory easier to defend, while ignoring the fundamental reality that social actors are only boundedly rational at best.

Combining McKelvey's quasi-natural system approach with Selznick's (1957) institutional process, Pfeffer and Salancik's (1978) coalitions, and Thompson's (1967) sub-group contingency perspective, yields a view of the organization as a loosely bound system of organizational members with differing preferences and perspectives, and differing orientations regarding how they interact with their external environments and how they need their resources to flow.

2.2 Review of General Perspective on Strategy

2.2.1 Roots of strategic research

The older work in strategy and governance generally focuses on the history and strategies of politico/military organizations and operations. The first major business strategy was provided by Tilles (1963). Tilles' contribution emerged from a long stream of summaries by political and military masters of the ages (Sun Tzu 1963, Machiavelli 1950, Napoleon 1940, Lenin 1927, Montgomery 1958, etc.) and from the work of Matloff and Snell (1953) on large coalitions, Although, (thankfully) we have come a long way from dealing with business strategy as a modified 'war plan,' a number of those basic military principles concerning strategy have in fact transferred to business literature and practice. In contemporary academic strategy literature, the rationality and usefulness of the formal military planning process for business has been more or less debunked, yet many marketing and management textbooks used in business schools maintain it as fundamental principle.

Many of the historical terms are therefore familiar, and the related commonsense strategic principles are well summarized by Quinn (1980) and Mintzberg and Quinn (1991). The grand strategy and battle strategy can be translated into the organizational terms of corporate and business level strategy, each having sub-plans involving tactical maneuvers and detailed physical operations. Each strategy should be complete in itself and should embody the following principles: communication of clear, decisive objectives; active maintenance of initiative rather that reaction; concentration of forces and resources in specific places at specifically chosen times; flexibility to bend and not break; leadership which is both well coordinated and fully committed to each of the primary goals; the use of

speed, secrecy and intelligence to achieve surprise, and security at all vital operating points (Mintzberg and Quinn 1991).

2.2.2 Contemporary business strategy

Business strategy concerns both the creation of value that yields economic rents and the development of ongoing competitive advantage resulting from these value creating functions (Barney, 1997). It is important to review at least the basics of modern business strategy so that we can investigate whether or not knowledge based strategies in particular have in the past or are likely in the future to yield economic rents (either directly or indirectly) in multi-divisional corporations or in business units.

Contemporary work in business strategy has emanated from two general streams of thought. The initial paradigm begins with the works of Ansoff (1965) and Andrews (1965), taking on the task of describing the formulation of business strategy. Ansoff's prescribes a systematic approach to navigating the firm within its environment and positioning it to deal with the future. His long term planning approach to strategy includes researching historical trends, analyzing opportunities and threats in the environment, a portfolio analysis dealing with strengths, weaknesses and goal congruence, and finally a diversification analysis (Ansoff, 1965). Ansoff also contributed the term synergy to the strategy literature, describing how two or more projects may assist each other.

Henry Mintzberg (1972, 1973, 1975,1976) loosened the ties to strict formalism and formulation and played a strong role in the broadening of the strategy concept. This formulative work led the way to work offering alternative concepts of strategy (Eg. Quinn, 1980) and to the primacy of strategic analysis (Porter, 1980) over strategy formulation.

Quinn's (1980) contribution is an important alteration to the stream of research, defining strategy as a pattern or plan that collectively integrates alternate organizational goals into a whole.

This perspective on strategy can be translated into the language of systems theory by relating alternate organizational goals to 'loosely coupled coalitions' (Pfeffer and Salancik, 1978), and the integration of these coalitions into a working whole to 'adaptive processes'. Describing strategy as an emergent pattern rather than an induced plan moved strategic thought away from Ansoff's rational planning model, imbuing it with social constructionism (Weick, 1979).

2.2.3 Transaction cost theory, fungible resources and knowledge

Transaction cost theory is an efficiency driven model in which a firm behaves rationally trying to minimize costs. These costs include those encumbered in market transactions related to gathering true information, to governing and to reducing opportunism (Coase 1938, Williamson 1975). Because transaction costs can be high in terms of both capital and managerial time, the firm seeks ways of reducing them. Internalizing functions may reduce many of these costs, since the hard-to-govern open market contract is replaced by an authority relationship. When internalization occurs, fiduciary duty is created between the agents and the organization limiting opportunistic behavior and making information more readily available. (Williamson 1975).

Teece (1982) adds a perspective to the relationship between transaction cost economics and strategic management. He argues that diversification facilitates the use of excess (slack) resources, thereby enhancing overall efficiency. The firm under this view is

an entity specifically designed to organize assets so that they have a greater value as part of a firm than as part of the open market. Demonstrated here is the importance and the interplay of resource efficiency, synergy and information impactedness. For increased economic rents to be generated, reductions of information impactedness must be created (Williamson, 1975) allowing knowledge resources to flow where they are needed when they are needed. All slack resources, including knowledge and managerial and capital asset time, are sources of potential leverage through movement and multiple uses.

The "fungible" character of slack is at the root of Teece's (1982) theory. Fungible resources are those that can be used in a number of ways. Fungible resources that are highly mobile are more useful. Thus fungible slack, such as capital, knowledge and managerial time can be traded around the organization so that multiple returns are produced with few associated costs. These abnormal returns are what is meant by the term "economic rents" frequently used by Barney (1997) discussing the resource based view. If the excess resources are not really fungible, they are not so useful. This is better than leasing unused equipment hours and unused management hours, because the transaction cost for those contracts would be very high.

Unfortunately, I do not believe that managerial and organizational knowledge are among the most fungible of all resources. Despite advances in information and communication technology, information impactedness is a real problem (Williamson, 1975) and must be conquered. While knowledge certainly may have many uses, and is in principle highly portable, knowledge seems in many cases to be more difficult to transfer (see Szulanski, 1996) than financial resources (cash) or human resources (management). It is for

this specific reason that when firms begin targeting knowledge as a source of competitive advantage, the knowledge management systems need to be studied, expertly designed and improved. A look at the popular press, and the pages of the business sections of newspaper indicate that the aforementioned time is now.

2.2.4 On the very possibility of strategic management

Astley and Van de Ven (1983) offer a thought provoking meta-theory matrix on managerial action which comments on the possibility of strategic management. They demonstrate that from certain organizational perspectives, pro-active management is simply not a factor. They divide the schools of organizational thought into a matrix of micro/macro levels of analysis and deterministic versus free-choice to yield four basic views of organizations. These four quadrants which result from the determinist/voluntaristic vs. micro/macro level of analysis of organization each house different schools of thought (system structural, strategic choice, natural selection and collective-action), regarding the strategic role of management.

From the natural selection perspective, managers attempts to realign the firm with the industry may be insufficient to aid survival or goal attainment. From the system structural viewpoint, the firm can make specific adaptive adjustments to achieve a fit within a determined environment. In the strategic paradigm, detailed tactical and operational strategies are seen as effective ways of navigating, maneuvering and positioning the business within its environment. Under this most pro-active of perspective theories, the firm may enact its own environment and shape the future, rather than meet it (Astley and Van den Ven, 1983; Prahalad. and Hamel, 1990)

2.2.4.1 Industrial economics

The industrial-economic mind set, led by Schmalensee (1975), Rumelt (1991) and Michael Porter (1981), and the population ecology school (Aldrich, 1979; Nelson and Winter, 1982; Hannan and Freeman,1977,1984; McKelvey and Aldrich, 1983; Aldrich and McKelvey and Ulrich 1984; Ulrich, 1987; Tushman and Romanelli, 1985; Gersick 1991; Van de Ven and Poole, 1995) describe the firm interacting with the environment, and economic trends and life-cycles dictating organizational actions. This micro-deterministic perspective (Astley and Van de Ven, 1993) contends that managers need to be aware of the greater industrial situation, because industry and environment explain the larger part of the variance in business unit profits and survival, not corporate membership or active management (Schmalensee 1985, Rumelt 1991). I do not concur with the micro-deterministic point of view, and I contend that knowledge management strategies may significantly shift the balance of impact from industry to the corporate and business level. Some support of this contentions is offer late in this chapter in *Section 2.3 Knowledge Management.*

Despite the industrial economic and population ecological perspective that strategic management may be relatively powerless in the face of industry forces, other theory indicates that managerial action holds the key to firm performance. Michael Porter (1985, 1987) asserts that even if the corporate effect is null, each business unit has operational level strategies that may very much affect its own performance. Through the value chain, the operational core of a firm may extend not just from inputs to outputs, but all the way upstream to the suppliers and downstream to the customers (Porter, 1987), perhaps extending certain functions and processes in the firm beyond the industrial economist's boundaries of

the industry segment.

This "extended" firm is an explicit change of perspective from earlier models of "input-transform-output" business organizations. It changes the scope and design elements of the organization: the outreach and permeability of the boundaries; the concept of structure as a set of interacting processes and events as well as divisions of tasks and specialized labor. This flexible, flowing concept of organization is a major turning point for administrative science. It opens the door for a view of organizations as open systems --organic social actors that both learn and are self maintaining -- quasi-natural (McKelvey, 1997) organisms that depend upon the external environment for survival rather than struggling with it at arms length.

Detailed work has also been done specifically testing these theories of the relative importance of strategy at different levels of organization. As mentioned above some question the importance of corporate level strategy. Schinalensee (1985) published a much-cited article pulling a major industrial economic debate between classical focused economists who claim that market power and industry are the primary determinants of profitability, and the revisionist school that emphasizes efficiency of corporations, following Coase and Williamson's (1975) general logic, into the strategy literature.

Shmalensee's (1985) analysis of variance study found corporate effects completely insignificant, industry effects important (explaining nearly 20% of the variance of rates of return), and SBU effects marginal. Shmalensee interprets the "industry importance" finding as evidence for a classical industrial economic approach. The corporate "Peters and Waterman effect" was not found.

Wernerfelt and Montgomery (1988) tested these findings, and they were generally supported, and Chatterjee & Wernerfel (1991) generally reproduced these findings. Rumelt (1991) also found that the corporation explains very little of the variance in the profitability of business units. He writes "if one business-unit within a corporation is very profitable, there is little reason to expect that any of the corporation's other business- units will be performing at other than the norms set by industry, year, and industry-year effects" (Rumelt 1991, p 182).

These studies suggest that corporate strategy has largely been a misuse of time, since it has not helped explain a firm's profitability. The finance literature supports this general line of argument, but is a) generally restricted to research on the corporate strategy of business portfolio management, and b) usually finds agency problems to be the culprit. Ahihud, and Lev (1981) found significant negative effect of corporate portfolio restructuring and development strategies. They found that as long as firm specific risk is reduced, managers continue to engage in mergers and acquisitions even when they are negative NPV projects, and even when the projects do not create obvious synergies. Corporate portfolio risk reduction turns out not to be dollar value maximizing, but rather helps managers stave off difficult and risky projects, failure and job loss. The study makes clear the agency conflict between managers and shareholders, as risk reduction comes at the cost of profitability to owners.

Morck Shieifer and Vishny (1990) found significant negative returns following management announcements of three types of acquisitions: rapidly growing targets, unrelated diversifications, and acquisitions by poorly performing organizations. Chatterjee and

Wernerfelt (1991) also found that the further a firm is diversified from its core business, the more likely its diversification program produces low returns.

Brush and Bromiley (1996) offer a cogent response. Their examination of Rumelt's (1991) findings found Rumelt's model specified in such a way "that only if corporate strategy has an equal impact ... on the returns for each business-unit in the corporation, will a strong corporate effect be identified." It is possible, then, that there has been an ongoing misrepresentation of corporate strategy when researchers have operationalized the theoretical construct.

Despite this possibility of institutionalized measurement error, the amassed findings do cast doubt on the extent to which a corporate-level knowledge strategies have in the past accounted for increased overall business unit performance. We find that negative returns are associated with unrelated diversification (except for a short period of time during the 1980's), and that the more unrelated, the more deeper the losses. My interpretation is that knowledge transfer problems are underestimated in diversification strategies. Knowledge synergies are not realized, because of various barriers to knowledge transfer that have as yet to be made explicit.

The findings seems to point management toward development of firm and industry level knowledge integration strategies. However, the studies can be seen as a clear failure of previous implicit or *laissez-faire* corporate knowledge integration strategies and models, such as the M-form (Chandler, 1962; Williamson, 1975), making way for more explicit knowledge-based corporate strategies such as Hamel and Prahalad's (1994) corporate core competency model, or for the development of corporate/enterprise wide knowledge

management systems. It is also important to note that no business or corporate effect will likely be identified when all companies in a industry are managing knowledge equally well, or poorly as the case may be.

2.2.5 Levels of strategic analysis and embedded organization theory

Strategic analysis can occur at a number of levels, spanning individual, functional department, business unit, corporate, industry, national, international and global levels. Mainstream strategic management textbooks typically contain chapters on business level strategy, functional (department) level strategy, corporate strategy, industry strategy, global strategy, and other levels of analysis. Research streams crossing from industrial economics to strategic management developed debating whether the business, corporation or industry are all important focuses of strategic analysis. A general consensus exists that both industry and business unit analysis are useful and important.

For example, Porter's (1980) conception of competitive strategy concerns a firm's interactions within a specific industrial environment. Porter's (1985) work on competitive advantage centers on the value adding functions performed by departments within the firm.. Porter describes the strategic functions in terms of the different departments involved in a value chain, some departments performing core functions, and other performing support functions. According to Porter, competitive advantage is built as each department finds ways to add value to the companies products or services. Given the impact of functional level strategy upon competitive advantage, this dissertation investigates (among other things) how a department's strategic orientation influences knowledge transfer performance.

Strategic analysis is very much concerned which interactions between different

organizations, organizational levels, departments, processes and environments. This brings organization theory very much to bear upon the strategic theory of the firm. Depending upon the theoretical view one adopts concerning the nature of organization, different strategic perspectives will make more or less rational sense. If we understand the organization as a quasi-natural system (McKelvey, 1997) than efficiency and effectiveness will be related to the integrated functioning of organizational subsystems and sub-structures as resources are ingested and digested to create economic rents. Furthermore, ongoing efficiency and effectiveness in a changing environment will depend upon the organization's ability to learn. Departments are perhaps the most obvious and significant functional sub-structures within a business firm. The integration across departments depends at least partly, perhaps greatly, upon the transfer of knowledge across departmental boundaries. From an organizational perspective, as discussed by Porter (1985) it makes sense to examine strategy at the departmental, and inter-departmental level when discussing the creation of value and competitive advantage.

2.3 Knowledge Management

2.3.1 What is knowledge management?

A significant amount of recent organizational research describes the firm as a distributed knowledge system (for example: Conner and Prahalad, 1996, Grant 1996, Spender, 1996, Tsoukas, 1996). Quinn (1992) points out that the capacity to manage knowledge based intellect is the critical skill of a newly begun era. This perspective raises questions about the nature of the distribution: how is knowledge physically distributed? Is the distribution effective? By what processes do organizations integrate dispersed knowledge? How may it be redistributed as environmental forces and organizational needs change? (Grant, 1996; Lessard and Zaheer; 1996; Nonaka and Takeuchi, 1995). The impetus for these questions lies in the belief that firms which can develop effective knowledge distribution processes are likely to gain a competitive advantage (Brown and Duguid, 1998, Garvin, 1993, Spender, 1996)

The resource-based approach to strategy suggests that idiosyncratic patterns of learning and knowledge asset accumulation affect the firm's ability to develop new products and processes. These same patterns of learning and knowledge assets define firm heterogeneity through differences in strategy potential. Therefore, the success with which a firm develops its inimitable set of knowledge resources and skills is significant in determining future strategies (Lei, Hitt and Bettis, 1996). Thus, a firm's competitive advantage is derived from its unique knowledge (Spender, 1993, 1996). Strategic knowledge management is a strategy in which the firm engages to leverage their knowledge assets.

For example, Texas Instruments reports that it has been generating the equivalent of

one integrated circuit manufacturing plant (wafer fab) per year since 1996 without spending the $500 million to $1 billion it normally takes to build one (Ostro, 1997). TI has done this by creating a virtual factory out of its existing 13 "real" wafer fabs, and promoting knowledge-transfer among managers across plant and departmental boundaries. Texas Instruments is generating virtually cost-free additional capacity in a competitive and expensive market, expanding market share and winning the approval of customers (Ostro, 1997). According to TI's office of best practices representative, nearly 75% of the ability to generate additional capacity is directly linked to sharing the knowledge they already possessed.

Other companies are realizing significant new rents through attention to knowledge resources within the corporation. At Chevron Corporation, knowledge management initiatives have been rendering direct savings of $140 million a year and aiding decision making and implementation of corporate-wide capital project initiatives. Dow Chemical reports that knowledge management (KM) projects have yielded $40 million in either savings or additional capital and are helping the firm revalue and enhance the profitability of its patents (Ostro, 1997).

Knowledge Management (KM) is a new field of organizational study emerging at the confluence of organization theory, strategic management strategy and management information systems (Malhotra, 1997). A number of definitions have appeared in research and the press over the last few years. According to Malhotra (1997) knowledge management "caters to the critical issues of organizational adaption, survival and competence in the face of increasingly discontinuous environmental change. Essentially, it embodies organizational

processes that seek synergistic combinations of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings."

Some of the older uses of knowledge management keep the term tightly bound to computer information systems. Chorafas (1987) explains that KM is ensuring a complete development and implementation environment designed for use in a specific function requiring expert systems support. In a similar vein, Strapko (1990) uses the term for understanding the relationships of data, identifying and documenting rules for managing data and assuring that data are accurate and maintain integrity (Strapko 1990). Anthes (1991) describes KM as policies, procedures and technologies that are employed for operating a continuously updated linked pair of networked databases (Anthes 1991). This description might be generalized via metaphor to mutually dependent (networked) organizational groups (the databases).

However, other initial uses are more general and useful for organization studies. Zeleny (1987) uses systems language defining KM as the directed facilitation of autonomous "coordinability" of decentralized subsystems that can state and adapt their own objectives (Zeleny 1987). Davenport (1994) states that KM is the processes of capturing, distributing, and effectively using knowledge (Davenport 1994). This is similar to Garvin's (1994) construction of KM as the creation, acquisition and transfer of knowledge and modification of organizational behavior to reflect new knowledge and insights (Garvin 1994).

Birkett (1995) offers a description more in line with the work of Polanyi (1962), Nonaka (1994), and Spender (1993, 1996). Knowledge management is described as an organizational process, bringing tacit knowledge to the surface, consolidating it in forms in

which the knowledge becomes more widely accessible, and promoting continuing creation of knowledge (Birkett 1995).

Gopal and Gagnon (1995) take a more strategic stance. For them KM is the identification of categories of knowledge needed to support the overall business strategy. This includes an ongoing assessment of the current state of the firm's knowledge and transformation of the current knowledge base into a new and more powerful knowledge base by filling knowledge gaps (Gopal & Gagnon 1995).

Some uses are too general to be useful. Hanabuss (1987) seems to equate KM with all of individual cognition, stating that knowledge management is finding out how and why information users think, what they know about the things they do, the knowledge and attitudes they possess, and the decisions they make when interacting with others (Hannabuss 1987).

2.3.2 What is organizational learning?

Knowledge management draws largely upon organizational learning as a theoretical base and for support of its various core assumptions. Therefore, understanding organizational learning helps make explicit the reasons why knowledge management is becoming a priority in so many businesses. Organizational learning has been one of the hottest management topics of the 1990's. For example, Crossan and Guatto's (1996) review indicates that more research papers on organizational learning were published in 1993 alone than in the whole decade of the 1980s.

Chris Argyris has been one of the leaders of organizational learning research over the years (Argyris, 1974; Argyris 1977; Argyris, 1982; Argyris, 1991; Argyris 1994; Argyris and

Schon, 1996). Argyris (1977) tells us that organizational learning is a process of "detection and correction of errors" and that "individual's learning activities, in turn, are facilitated or inhibited by ecological system of factors that may be called an organizational learning system" (p.117).

Ruber (1991) discussed knowledge acquisition, information interpretation information distribution and organizational memory as the four primary pillars of organizational learning. According to Huber (1991) learning does not always increase the learner's effectiveness, nor is learning necessarily a conscious activity or process. Learning may not even result in observable changes in behaviors. An organizational member learns if the range of potential behaviors changes.

Weick (1991), citing Duncan and Weiss (1979) states that organizational learning has generally been understood as "the process within the organization by which knowledge about action-outcome relationships and the effect of the environment on these relationships is developed." Weick proposes that organizations are not really built to learn. He views learning as the combination of similar stimulus and different responses. "Perhaps organizations are not built to learn. Instead, they are patterns of means-ends relations deliberately designed to make the same routine response to different stimuli, a pattern which is antithetical to learning in the traditional sense" (p.119).

In a like manner, Thompson (1967) describes how organizations protect their cores so that standard routines can be maintained despite irregular and varying inputs. Weick's (1991) view of learning as the combination of similar stimulus and different responses, is just the opposite process of what Thompson (1967) proposes for the rational/natural organization.

Weick argues that organizational learning may involve a different type of learning than has been described in the past: "a more radical approach would take the position that individual learning occurs when people give a different response to the same stimulus, but Organizational Learning occurs when groups of people give the same response to different stimuli" (p.119).

If most organizations are not designed for organizational learning, it follows that only some organizations are designed for learning. Senge (1990) specifically discusses the *learning organization* defining the 'learning organization' as one in which learning is so deeply embedded in organizational life that this learning culture continually enhances organizational member's capacities to create what they want to create. According to Senge (1990) this specially constructed learning organization is increasingly appropriate as environmental complexity and uncertainty increases. From a strategic perspective, and working from the assumption that the business environment will continue this trend, Senge proposes that the rate at which organizations learn may become the only sustainable source of competitive advantage.

McGill et al. (1992) define the learning organization as one that can react to new information by altering the routines by which information is processed and evaluated. Argyris (1977) refers to this type of cognition as 'double-loop learning.'

Ang & Joseph (1996) distinguish between 'organizational learning' as a process and 'learning organization' as a structure issue. While McGill et al. (1992) do not explicitly distinguish between the two, they go on to define organizational learning as the ability of an organization to gain insight and understanding from experience through experimentation,

observation, analysis, and a willingness to examine both successes and failures. We find, then, general support for differences between "organizational learning" and a "learning organization."

This distinction has impact as it implies a demonstrable structural, or design difference between learning and non-learning organizations. Certainly Weick (1991) and Thompson (1967) imply that a 'learning organization' might have an alternative and distinguishable form.

2.3.2.1 Adaptive learning vs. Generative learning

One view of organizations is based on adaptive learning, which is about *reacting* to altered inputs through continuous adjustments to organizational processes and characteristics. Adaptive learning or single-loop learning (Argyris, 1977) focuses on solving problems within the present paradigm, without examining the appropriateness of that paradigm. They do not generally question the fundamental assumptions underlying the existing ways of doing work. Adaptive organizations focus on incremental improvements benchmarked primarily against past success. The essential difference is between being adaptive and having adaptability. Senge (1990) notes that increasing adaptiveness is only the first stage of dealing with a changing environment; companies also need to focus on generative learning or double-loop learning (Argyris 1977).

Generative learning is *proactive* emphasizing continuous examination of the way in which the firm goes about defining its world and solving its problems. In Senge's (1990) view, generative learning is about creating - it requires systemic thinking, shared vision, team learning, encouraging a creative tension between organizational goals and the current reality.

Generative learning, unlike adaptive learning, requires new ways of looking at the world.

The 'learning organization' is continuously adapting to its environment. Learning organizations may be understood as open, interactive and self-designing systems (Scott 1998; van Gigch, 1991). Such a firm is continuously experimenting and frequently changing structures, processes, domains, goals, etc., even in the face of apparently optimal adaption to the current environment (Hedberg et al. 1976; Starbuck 1983, Hedberg, 1981). Hedberg et al. (1976) argue that operating in this mode is efficacious, perhaps even required, for survival in fast changing and unpredictable environments. They reason that ongoing experimentation helps organizations generate processing and design alternatives to remain flexible,

2.3.3 Knowledge management: moving from a learning organization to an intelligent Organization

Senge (1990) argues that the leader's role in the learning organization is that of a designer, teacher, and steward who can build shared vision and challenge prevailing mental models, pushing double loop learning. Ashkenas et. al. (1995) generally support this sentiment describing a management responsible for building a firm in which organizational members are continually expanding their capabilities to shape their futures and bridge intra and extra-organizational

boundaries. Mintzberg and Quinn (1991) remind us that the key to effectiveness is not so much in picking the right strategy but rather in fostering strategic thinking.

Knowledge Management is partly the explicit and organized fashion in which corporations attempt to become smarter. Learning is not enough to offer the firm increased

performance, since organizations learn the wrong as well as the right things (March, 1998). The intelligent organization demonstrates favorable results over the long run (March, 1998). In order for this to occur, knowledge needs to be managed and put to use. On the one hand, knowledge must be unbounded (Ashkenas et al. 1995) and unconstrained so that it flows into the firm and across internal boundaries. On the other hand, it must be constrained to create boundaries of rationality for decision making, and controlled enough to avoid it falling into the wrong hands, or spoiling core processes with ill-advised experimentation. Knowledge management's critical task in the organization may be understood as controlling the inputs and outputs of the organizational learning process to optimize the efficiency and effectiveness of the learning organization over the long run. Resulting improvements in decision making, effective behaviors and successful (or desirable) outcomes defines the intelligent organization. (March, 1998).

2.3.4 Definition of organizational knowledge management for this study

For the purpose of the current research, I draw from the middle ground of the reported definitions. *I define organizational knowledge management as the collection of processes that govern the ingestion, creation, dissemination, and utilization of organizational knowledge.* Efficient and effective knowledge management can lead to increased organizational profits, much like efficient and effective management of other critical resources.

In one form or another, knowledge management has been around for a very long time. Practitioners have included philosophers, priests, teachers, politicians, scribes, librarians, etc.. Knowledge management is not a "technology thing" or a "computer thing." If we accept

the premise that knowledge management is concerned with the entire administration of a critical organizational resource which possesses high levels of fungibility (Teece, 1982) then we are strongly driven to accept that knowledge management is much more than a computer manipulation of data.

2.3.5 The growing importance of knowledge management

D'Aveni (1994) has pointed out that the pace of change in the environment has substantially increased. Strategic planning has failed us in the current environment. We are realizing how difficult traditional strategic planning has become (e.g. Ansoff, 1965). Companies have a difficult time planning five or ten years out because of the volatility of the environment, and instead have begun to look at their distinctive capabilities (Barney, 1995; Hamel and Prahal ad, 1990) as important assets to be mined for new strategic directions. If a company cannot strategically plan well ahead for changes in the environment, it has to be able to mine its more fungible (Teece, 1982) current resources and add new elements brought in from the outside so that it can maintain a competitive advantage in the marketplace. The concept of a firm having distinctive capabilities goes back a long way, perhaps even to Chamberlin (1933), but recently it has become increasingly important to build on them to compete in the future (Hamel and Prahalad, 1994).

This emphasis on fungibility and innovation is due to the prevailing fusion of technologies. Technologies are coming together in many different ways -- communications and personal computers, database software and biotechnology, agriculture and genetic engineering. Companies have begun to compete with each other on the basis of who can be the fastest at realizing the benefits of these technologies. Innovation has become an important

competitive tool, both in the way technologies are put together into products and services and in the way business firms are organized to realize profits.

2.3.6 Strategic knowledge management

The organizations that can move most quickly are those with slack in fungible resources from which they can draw (Prahalad and Hamel, 1990; D'Aveni, 1994). These organizations know how to create and leverage knowledge, channeling it to those organizational members who need it in a form they can easily digest. The most agile companies are able to build upon their knowledge assets- both the tacit knowledge in organizational routines (Nelson and Winter, 1982) and the explicit organizational knowledge in work processes and skills-to redirect themselves toward products or new markets.

By developing and maintaining a strong knowledge base and treating that knowledge as an important fungible resource, organizations can realize gains in both efficiency (Williamson, 1995; Teece, 1982) and effectiveness through increased innovation (Fiol, 1994).

Business firms are beginning to adopt high technology enabled knowledge management strategies. Documentum, a knowledge management software development company, announced in Janurary of 1999, that revenues for the fourth quarter of 1998 were $36.4 million, a 54 percent increase over revenues of $23.6 million for the same period of 1997. Net income for the quarter increased to $4.2 million compared with net income of $2.8 million reported for the same period of 1997. The CEO of the company credited their internal knowledge management strategy for the abnormal improvement. "Our performance is a direct result of the steady execution of our strategy to automate the knowledge-based

processes that are critical to global organizations' success." (KMWorld 1999, article four).

Scudder Kemper Investments, Inc., a $230 billion global investment management firm has chosen Documentum's Enterprise Document Management System 98 (EDMS 98) and Art Technology Group's (ATG's) Dynamo Relationship Commerce suite to provide a Web-centric personalization server and "e-commerce" capability. Scudder claims that the integration of ATG and Documentum products effectively delivers the benefits of powerful enterprise-level content management to the end user. This combination of products is reported to help business by automating the processes that ensure content integrity, reuse and customization to match individual end-user needs (KMWorld, 1999).

2.3.7 Information technology and strategy

In the language of strategic management, capturing "economic rents" is a key performance objective. Economic rents are excess profits or abnormal returns that do not immediately induce a competitive response (see Alchian, 1991). One way in which new technology may generate economic rents for a firm is through monopoly, as with patented drugs. Even though competitors might observe and understand why the firm is successful, they are prevented from being able to mount an effective attack by a formal legal structure.

More common perhaps are situations in which perfect competition is frustrated by the use of firm-specific routines (see Nelson & Winter, 1982, and Peteraf, 1993). Productive routines in technology are sometimes lucky accidents (Barney, 1986), but they also can reflect purposeful acquisitions and integrations of new knowledge, which lead organizational members to alter action-outcome relationships (Cheng & Van de Ven, 1996). In either case, knowledge asymmetries can develop through internal technological development processes

(Dierickx & Cool, 1989). Investments in information and communication technology development are therefore attractive when, by implication, results seem to have a good chance to idiosyncratically improve both critical routines and reduce the relative uncertainty a firm faces in ways that can remain firm specific over extended periods of time (Amit & Schoemaker, 1993).

According to Malone and Crowston (1991) information technologies facilitate the standardization of coordination. If sources of meaning are likened to coordinating mechanisms (Smith and Peterson, 1988), it follows that standardization of coordination might improve discernment of knowledge by providing a common framing of organizational communications, i.e. a shared language (Fiol, 1994).

The Fiol (1994) study exposed important aspects of the links between organizational members' understanding of each other. Fiol suggests that the project "captures the convergence of the language used to construct group-wide meanings." (Fiol, 1994: 417). Communication style and shared language are critical elements in reaching what Huber (1991:30) calls a shared understanding or "common mind." These communications elements enable the organizational members to collaborate and reach a consensus that leads to innovative actions.

However, while information technology is an important organizational aid, investments in its development with disregard to human idiosyncracies may not yield increased economic rents. As Hedberg and Jonsson (1978) warned, many modern information systems dysfunctionally add to organizations' inertia. They emphasize that increased access to more information and more advanced decision aids does not necessarily

make decision makers better informed or more able to decide.

A key issue then, is the power of communications technologies to synchronize and coordinate meaning, without losing the human aspects of communication such as emotion and diversity of opinion. While fulfilling one organizational task of uncertainty reduction, one does not want to suffocate innovation and creation. As Seely-Brown state (1 997;66) "The technologies that will be most successful will resonate with human behaviour instead of working against it. In fact, to solve the problems of delivering and assimilating new technology into the workplace, we must look to the way humans act and react.... In the last 20 years, US industry has invested more than $1 trillion in technology, but has realized little improvement in the efficiency of its knowledge workers - and virtually none in their effectiveness. If we could solve the problems of the assimilation of new technology, the potential would be enormous".

2.3.8 Communication media and emotional content

Hall and Hall (1990) explain that a very large content of the information transmitted in a communication may be contained in non-verbal cues. Facial expression, tone of voice, physical proximity, speed and rhythm all contain emotional information about how a certain linguistic statement is meant to be perceived. Unfortunately, these cues are easily mis-interpreted when organizational members interact less frequently. A revealing result of the Fiol (1994) study is the importance of communication time spent together so that heterogeneous organizational members do in fact begin to accurately interpret each others' messages, including the emotional content. Meyer-Kress (1998) argues that when the delay between sending and receiving is very long, the emotion of the sender while the message is

written plays a diminished role in the content.

Therefore, when written messages are restricted to paper -either in the form of letters,' memos, books or journal articles, much of the emotional content is lost, diminishing the capacity for coordination and synchronization of organizational members (Meyer-Kress, 1998). However, with the advent of global e-mail, intranets, bulletin boards, etc. we have the possibility of much shorter turn-around times with the written word. Now, rapid response feedback loops can be created that can quickly amplify the emotional content of a message, creating a richer media (Daft and Lengle, 1984) than is frequently associated with written text.

2.3.9 Communication as synchronization/coordination events

From the communications literature, Mayer-Kress (1998) offers a related complexity theory point of view of communication technologies, describing how certain technologies, such as video conferencing, may outperform others. Communication technologies act as the coordinating mechanisms in complex open systems. Important to human organizations are what Mayer-Kress terms "synchronization events." Synchronization events are those in which social group members (societies, organizations, professional associations, etc) go into a "strong interaction" mode to update the common "morphogenetic field" (Sheldrake, 1988) or order parameter (Mayer-Kress, 1998). Common expressions like 'session' or 'conference' describe common events targeted at updating the community about developments that have occurred among organizational members since the last synchronization event.

Meyer-Kress (1998) offer the highly appropriate example of scientific conferences. In the management sciences, for example, our professional societies meet once or twice a

year in Summer and Winter meetings. "Although the majority of conferences are organized around a carefully planned schedule (representing a filtering mechanism according to quality of the talks and/or influence of the speaker) it is not so much the content of the presentations that will impact the society most but the interactive nature of the face to face interactions of its members" (MeyerKress, 1988:3).

Each organizational member serves three main functions involving memory, communication and action. First, an organizational member holds the memory of the work that has been done in the group that he/she represents. Second, an organizational member is communicating the information with representatives of other groups either in broad discussions, in restricted interest-groups, or in personal discussions outside of the scheduled programs. The last function is initiating new projects as a result of the interactions during the conference.

No one doubts that such coordination/synchronization events hold an important place in our organizational communities. And yet, Mayer-Kress (1998) explains that the second function is the only one that requires fast, interactive communication, where a delay that is significantly longer than 3OOms (normal human conversational feedback time) would be perceived as "not natural" and would create obstacles to the synchronization phenomenon.

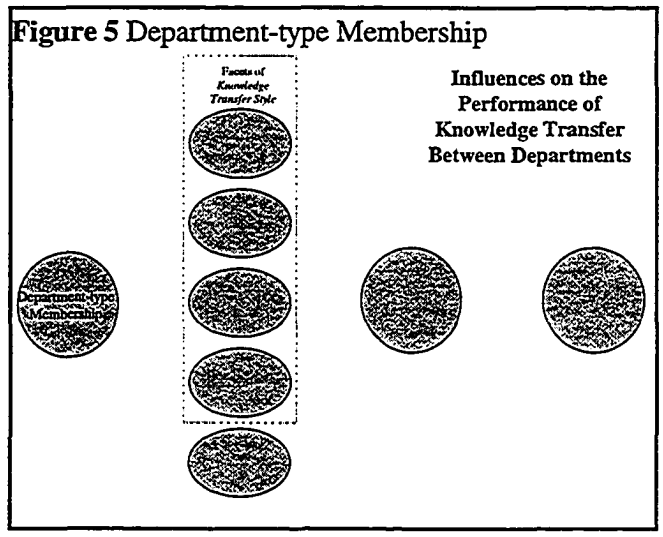
Under these assumptions, electronic video conferencing may then be an effective alternative since it satisfies some essential features of "real" conferences: the communication response time is <300ms, participants can see each others' facial expressions and hear each others' voices, and the communication media is highly interactive. A major task in the communication sciences and information technology is creating electronic video

conferencing systems that can be made widely available and still retain these important functions of a synchronization/coordination event communication. One approach taken has been to reduce image size and depth and develop fast compression algorithms such as 'mpeg' and wavelet-based alternatives to develop Internet video-conferencing tools such as CU-SeeMe, ICQ, Netmeeting, etc. Unfortunately, as of this date, even on relative fast connections the images are small and of poor quality. Additionally, because of the packet switched nature of Internet transmissions, there are frequent interruptions in the image-stream (as well as in digital audio transmissions) that are triggered by events on the net and are not related to the communication. That makes them quite disturbing at times. The current challenge in electronic video communication is to provide a technology in which all of the emotional content contained in facial expression and tone of voice is transmitted allowing the receiver to accurately 'read between the lines' of a transmitted message.

This ends the second section of the literature review. I have by now covered general areas of organization theory and strategic management theory that may pertain to the need for knowledge management systems. The review continues in Section 2.4 by discussing specific research streams that offer advise on how a knowledge management system may be designed to account for human cognitive and behavioral idiosyncracies and also provide economic rents through enhanced efficiency and effectiveness.

2.4 Department Types, Rational Boundaries and Knowledge Transfer Styles

2.4.0 Section overview and core concepts



This section takes on four important tasks. The most critical task is describing why similar functional departments across firms within an industry create similar rational boundaries for their individual members. Second is to show how these rational boundaries in individuals may be observed in terms of *five overlapping categories:* perceived strategic orientation, locus of attention profiles, sources of meaning profiles, and communication media preferences, and three partially exogenous impedance factors (perceived importance, simplicity and explicitness).

The third task is describing how and why the discernment process depends upon rational boundaries. I call the rational boundary described by this overlapping set of perceptions and preferences 'an individual's knowledge transfer style.' One of the things knowledge transfer style helps to predict is the level of discernment of organizational knowledge by the members of different types of departments. The fourth task of this section is to define each of these constructs in terms that are at least potentially amenable to empirical observation and measurement. During the course of this discussion a number of hypotheses will be developed designed to test the degree to which these core propositions

are true. In this section you will notice a path diagram that is constructed along with the discussion. Each stage of the diagram indicates what has yet to be discussed and what has gone before. The treatment begins by introducing the idea of department types as one of the setters of rational boundaries in organizations.

2.4.0.1 Department types and rational boundaries

Specialization within business firms allows them to take advantage of experience curves, helping them profit and survive in competitive markets (Barney, 1996). Departments are one of the structural mechanisms used to promote specialization in the work roles within an organization. By dividing up firms into departments, work groups and jobs, rational boundaries are created (Simon, 1957; March and Simon, 1958). Simon's (1957) and March and Simon's (1958) discussions of individual decision making offer a perspective on why constraints on strategy and process arise. The conversation has progressed over the years to the point where we understand that there are differences in the way individuals in business organizations cognize that can be predicted by group membership. The bookend on where the field has come might be Fernandes and Simon's (1999) problem solving mapping of the human mind. They demonstrate the technique using lawyers, medical doctors, engineers and architects, with members each profession showing distinctly different patterns of thought from members of the other professions.

But let's get back to the beginning. The general idea of bounded rationality when it was first proposed was that most if not all attempts by social actors to be rational are limited by imperfect and incomplete information, complexity of problems, limits on information processing capacity, the time available for decision making and conflicts among decision

makers about organizational goals (Simon, 1957). March and Simon (1958) reasoned that because humans are restricted in their ability to make entirely rational decisions, organizational structures and processes develop so as to preclude uncertainty from overwhelming these bounded capacities. The evolution of policies, procedures, work habits, programs (Nelson and Winter, 1982) recipes (Spender, 1989), characteristic sources of meaning (Smith and Peterson, 1988), shared schemas (Berger and Luckman, 1966) and other patterns of action and thought serve to decompose complex events into more manageable units for human sensemaking (Weick, 1996) and decision making (Fernandes and Simon, 1999).

There is also a long running literature on specialization and the impact its impact on organizational structures. In many firms, especially the those that are more bureaucratic and institutionalized, the nature of the decomposition of work is described by the departments, work groups, boundaries and coordinating mechanisms that can be observed. Specialization and institutional forces (Selznick, 1957; DiMaggio and Powell, 1983) have led to a number of typical department-types within firms, each type of department specializing in one (or more) of the value-chain functions (Porter, 1985). Accounting and finance departments source, document and control the flow of monetary resources, marketing departments bring together products/services and customer markets, operations departments fulfill the manufacturing/production functions, purchasing departments fulfill the purchasing function, compliance departments fulfill the legal functions, and so on.

There is still more evidence that there are forces that make a department performing a particular function in one firm similar to a department in another firm that is fulfilling a

similar function, especially when these firms are in the same industry or field. Categorical conformity (Berger and Luckmann, 1967; Meyer and Rowan, 1977) is a process through which institutional rules and distinctions dictate organizational structure. Scott (1998, p213) gives the example of colleges and universities containing the same or very similar schools and departments. The forces for homogeneity among department-type across firms are well documented and include standardization of norms, goals, processes and inputs (Mintzberg, 1979), the coercive, mimetic and normative institutional forces (DiMaggio and Powell, 1983), forces for legitimacy (Scott, 1995), industry recipes (Spender, 1989), common technological implementations (Barley, 1990) and other macro and micro social forces (Barley,1990; Scott, 1990).

As noted above, forces for isomorphism are strongest within an industry or institutional field (DiMaggio and Powell, 1983). For example, in the computer and communications field, members of research and development departments will likely have similar educational backgrounds, face similar work tasks, use similar technology, earn similar pay, have membership in similar professional organizations, publish in similar journals, have similar job descriptions and will likely move between firms within the field during their careers.

Another strong source of support for my argument rests in early work on contingency theory. Both structural contingency theory and socio-technical systems theory have supported the contention that department types will influence the behaviors of their members in characteristic ways. The root of the theory is that different core technologies and different levels of uncertainty across types of departments results in the emergence of systematically

different social coordination systems. Both Thompson (1967) and Lawrence and Lorsch (1967) wanted to better understand the details of departmental differentiation and process integration withing firms. Lawrence and Lorsch (1967) in their pioneering contingency theory study, observed typical department types within firms in the plastics industry, noting that each department type faced alternative levels of environmental uncertainty. Because of the variance in external environmental conditions, each department type were expected to vary internally on (at least) four social dimensions: formality of structure, interpersonal orientation goal orientation and time orientation. After accessing the levels of environmental uncertainty faced by each department type, they demonstrated a relationship between deviation from ideal configuration on each dimension for each department type, and overall firm performance. Another result was an inverse relationship between degree of differentiation between department types and success of subsequent integration. However, overall performance was best in firms that had substantial differentiation, but figured out how solve the integration difficulties. This study included four department types that they could examine across the firms: sales, production, applied research and fundamental research.

Thompson (1967) argued that the operating core ought to be buffered from variation so that manufacturing processes could be routinized as completely as possible. However complete routinization has proven less than efficient or effective. Machinists and other technicians hold tacit understanding of important knowledge, and pride themselves in their technical prowess. By taking control of machining processes away from the operational employees, programmable automation attempted to pry knowledge and pride from the

technician. However, as management tried to "de-skill" the workforce (Buchanan & Boddy1983; Noble, 1984) to lower costs, they found the strategy limited by managements inability to create machining processes entirely free from dependency on operating technicians' knowledge base (Fadem, 1984). Automation technology has since been generally redesigned to allow broader and broader degrees of operator input/control (Clark, McLoughlin, Rose, and King, 1988; Kelly, 1990; Zetka, 1991). These results are further evidence of the resiliency of department-centric processes, behaviors and beliefs, even in the face of contrary firm-level strategies and directives.

Van de Ven et al. (1976) explains why team work flow has the highest level of interdependence why it therefore requires it's own kind of coordination mechanism. Following Van de Ven et al's (1976) line of thought, and working off of Thompson (1967), Mintzberg (1979) made a major contribution toward resolving the differentiation and integration problem. While Mintzberg (1979) does not for the most part speak of 'departments' and 'types of departments,' his main thesis is an argument that organizations will tend to differentiate into five sub-structures, defined by the tasks and coordinating mechanisms used by individual members. These structural areas are the strategic apex, middle line and operating core, supported by the techno-structure and the support staff. Different industries will likely demand somewhat different organizational forms, but in general, the basic sub-structures usually continue to be represented to a greater or lesser extent. The operating core contains four primary functions: secure inputs, transform inputs, distribute inputs and provide direct support for the input-transformation-output process. These roughly translate to purchasing, manufacturing/operations, delivery, maintenance and

inventory control/receiving departments. Standardization is typically highest in these portions of the firm, with the goal of reduced uncertainty.

The strategic apex has much uncertainty as it manages the firm's relationship with the task environment, offers direct supervision and develops the organizations strategy. The middle line managers help with these tasks as direct intermediaries, growing in number with the firm to account for span of control requirements. The techno-structure contains analysts do not directly participate in the operational work flow, but test it, redesign it and help implement alterations all of which impact the degree of standardization. The support staff is the final general type. It includes functions that might be outsourced, but are conducted in-house in an effort by the firm to increase control and reduce uncertainties. These support activities include public relations, research and development, food services, payroll, legal counsel and the like.

After arguing that differentiation and coordination possibilities are the essence of organizational structure, Mintzberg (1979) notes that the coordinating mechanisms that will be used are a function of a task complexity continuum. "As organizational work becomes more complicated, the favored means of coordination seems to shift... from mutual adjustment to direct supervision to standardization, preferably of work processes, otherwise of outputs, or else of skills, finally reverting back to mutual adjustment" (Mintzberg, 1979, p7). In general, the more stable and repetitive are the tasks, the more programmed the work becomes and the more bureaucratic that part of the firm becomes (p91). Therefore different department types will be expected to utilize different coordinating mechanisms. The one constant for coordination, according to Mintzberg, is informal communication, without

which much work cannot get done.

Barley (1990) studied two radiology departments in different firms, and put forth a strong theoretical argument for why one would expect the department members (sub-groups and individuals) to operate in a similar fashion across firms. The paper draws upon both macro social theory (eg. institutional theory) and micro-social theory (eg. Trist and Bamforth, 1951; Zubuff, 1988), noting Scott's (1990) suggestion that both macro and micro level forces are influential upon department member behaviors. Barley, however, goes on to investigate the relationship between micro level changes (in technological implementations) and emergent socio-structural differences between subgroups within a department type.

Bloor and Dawson (1994) studied the impact of professional values and behaviors upon organizations. They found that in stable operating environments, professional cultures had limited ability to impact the behavior of organizational members. However, during unsettled periods, the dominant cultural values are called into question, allowing more cosmopolitan (Gouldner, 1957) organizational members to import the values and behaviors of their professional group. Fernandes and Simon (1999) provide some new insight into the impact of professional group membership upon subsequent individual decision making behavior. They demonstrate that members of a profession tend to think in similar ways when problem solving, and members of different professions tend to think in different ways during problem solving. Fernandes and Simon (1999) take explain shared decision making behaviors with group identification theory rather than with socio-technical systems theory or with institutional theory. While the identification argument has some merits, it does not seem to carry the weight of the arguments I've already presented. For example, the identity

theory move requires that social actors are behaving according to likely consequences their actions will have for a group with which they identify (Simon, 1997; Fernandes and Simon, 1999). It is probably true that 'my group as a source of meaning' may sometimes drive decision making and behavior in some circumstances, and perhaps often in certain cultures. However, many individual behaviors are enacted in the complete absence of any group identification thoughts, references, or considerations. That is, our behavior more frequently stems from habits acquired via institutional and micro social mechanisms.

Zetka's (1998) discussion of the impact of video technology on surgical work contains a recent update on the socio-technical systems and task coordination literature. While technology continues to play an important role in the determination of appropriate coordinating mechanisms, there is evidence of additional sub-contingencies. Zetka (1998) finds two distinct coordinating mechanisms in decentralized work units using video technology for surgery: authoritarian control and group-based coordination. Contingent upon the situation within the department, one coordinating mechanism will be adopted rather than the other. That is, a *set* of appropriate coordinating mechanisms may define a department or work group type. While it is easy to see the that these forms do not diverge from Mintzberg's "direct supervision" and "mutual adjustment," Zetkas paper reminds us that choice of coordinating mechanism is highly context sensitive. Furthermore, from a methodological standpoint, a study that hopes to describe this characteristic set of coordinating mechanisms should will need to observe department or work group types across multiple situations.

Zetka notes that the impact of work roles, technology and the like on task

interdependence and coordination has been largely neglected in the recent literature. I browsed through fifteen years worth of the major organizational theory research journals, and second his opinion. For that reason, I feel that the classical or seminal sources from the 1960's and 1970's still contain the most comprehensive specification of the relationship between differentiation and coordination.

However, work on the importance of functional departments has not ceased. The strategy literature moved this conversation forward quite a bit with Porter's seminal contribution in 1985. Crossing into business strategy from the industrial economics arena, Porter (1985) specified and organized the value-adding functions, the intra-firm value chain, and the 'primary' and 'support' functions. The value-chain functions are common across firms, and departmental differentiation based upon these functions is likely to be similar, especially within an industry. Department types like after sales support, purchasing, information systems and human resources (among others) are additional areas of task differentiation that must be integrated into the system to gain the potential value that they add.

A close reading of these previous works, some of them recognized as seminal, reveals two points critical to this dissertation. First of all, specific discussion and examination of departmental integration requires observation of the social behavior of departmental members, preferably across a set of normally occurring work situations/events. Previous studies have examined the specific technologies members use, their tasks, how they communicate, the kinds of previous training and acculturation processes to which they have been exposed, their perceptions of the level of complexity of the task environment, and so

on. Previous studies have not systematically examined these variables across within group work situations. A strength of this dissertation is that knowledge transfer styles are accessed by observing department type members across a number of common knowledge transfer situations.

The previous works also support my contention that the department-type influences the behaviors of it's members, each department type in a slightly different way. A department type, through it's characteristic technologies, particular coordinating mechanisms (by supervision, standardization of skills, processes, outputs, and mutual adjustment) and impact of professional cultures, reduces uncertainty by standardizing the way departmental processes are engaged, including the way knowledge is transferred. Furthermore, these same forces will ensure that members of other department types will behave in alternative ways, given the different tasks at hand.

It is difficult to say which of these forces impacts department types and their members most. While some might argue that the core technology within a department type is the driving force, others will complain that this is pre-determined by institutional mimetics, or largely constrained by professional cultures or overwhelmed by the primary coordinating mechanism. The point here, however, is that specific rational boundaries are drawn, by department types around the members of those departments, that impact the way members transfer knowledge. This style is distinct, observable, measurable and can be used to help manage the flow of organizational knowledge.

There has been a limited amount of other empirical work on the effect of department type membership upon behaviors of individuals. Landy and Farr (1983) looked for an

individual, group and functional department effect upon performance ratings, but found that ratings were primarily individually based, slightly group based, but found no functional department effect. Markham (1988) revisited the issue and found that there are significant group level effects upon performance evaluations. However, more recent work (e.g. Yammarino, Dubinsky and Hartley, 1987; Waldman, Yammarino and Avolio, 1990) show no evidence of group of functional department effects on performance ratings.

It makes sense to speak of a *type*, or *kind* of department. A department-type may be found multiple times within a single firm as well as in other firms within the institutional field. Furthermore, many department-types are found across institutional fields, although similarities among members of those department across such boundaries will likely decrease.

2.4.0.2 Departmental culture

These common rationality-binding forces produce some very apparent artifacts and effects. Take a long walk around during operational hours in any mid to large sized firm, and one finds that different department-types within that firm operate in fundamentally different ways. Perhaps there are certain company wide policies, programs and procedures, but much of the real work is designed and carried out in departments. Remember Edgar Schien's terse explanation of organizational culture: someone very much like Dilbert taking the new employee good naturedly aside and saying "the way things are around here is...."

A recent study by Earley and Mosakowski (2000) draws upon earlier theoretical work by Hambrick, Davison, Snell and Snow (1998), Klimoski and Mohammed (1994) and Casmir (1992) to explain that new hybrid cultures are created when groups/teams are formed from members of otherwise different cultures. Earley and Masakowski (2000) are

demonstrating that successful heterogeneous teams create hybrid team cultures over time. This hybrid culture is "a simplified set of rules, norms, expectations and roles that team members share and 'enact.' This emergent culture offers a common sense of identity that becomes group-specific, provides a basis for member self-evaluation and facilitates team interaction and performance" (pp 26). Although the work by Earley and Mosakowski (2000) is focused upon transnational team dynamics, the root theory is applicable to all sorts of work-related groups, including departments, professional groups, cross-functional teams and other groups.

Differences exist between the programmers, the finance folks, the customer service line employees, administrative assistants, the help desk gang, the manufacturing engineers, the hardware designers, the human resources group, the mail room, and those in the executive suites. Within each group, it is easy to imagine that it is your first day at work, and some new colleague comes along, gives your hand a shake, and starts to say "... the way things are around here is...."

Department cultures are strengthened by the truths and beliefs about the past, the present and the future. *A priori* similarities and differences between the department members that might exist in personality, skills, culture and education each affect the construction of the departmental culture. Mimetic and normative institutional forces also influence the construction of the group culture. Current conditions like: the organizational culture; organizationally dictated departmental policies and procedures; the requirements of the set of tasks at hand; and the knowledge, human, financial, natural and temporal resources made available to that group. Goals, dreams, missions and targets also pull the development of a

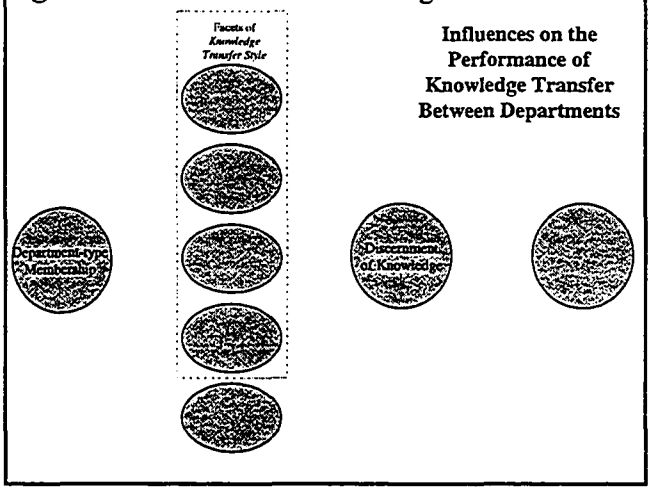
departmental culture along.

I have argued that strong institutional forces create department types that exist across firms. I have also argued that there are still other influences that come to bear upon departmental culture. Therefore, although we will find strong similarities within types of departments across firms in a field, there is also reason to expect differences among those same departments that are caused by firm specific context.

2.4.0.3 Discernment of knowledge

Social actors engage in the process of discernment. The discernment process links distinct behaviors like attention, observation, analysis and synthesis. Attention includes focusing attention and observation includes noticing events. Analysis presupposes attention and observations, and establishes current relationships between any observed event and other events in the current situation or the broader current process. Synthesis creates hypothetical cross-classifications of this event with other events, other situations and other processes, either past, present or future. *Sensemaking* (Weick, 1995) provides a sociological discussion of analysis and synthesis, while *recontextualization* (Brannen, Liker and Fruin (1998), focuses mostly on synthesis. I have chosen to work with a construct called *discernment* that covers the process of knowledge building. This construct

Figure 6 Discernment of Knowledge



is more fully discussed in Section 2.4.0.3. Knowledge discernment remains distinct from knowledge transfer performance. Knowledge transfer performance involves putting discerned knowledge into *action.*

Discernment of knowledge is more specific than discernment in that it is concerned with processing knowledge rather than processing information or data alone. "Discernment of knowledge" refers to a process of gaining an explicit understanding of some bit of knowledge. "Discerned" knowledge refers to a successful outcome, evidenced by acknowledging the presence and explaining the specific knowledge that was perhaps only implicitly understood, or not even noticed at all. Not all events or objects of knowledge are discerned or will be discerned. Ocasio (1997) points out that this is partly due to strategic selective focusing of organizational attention. Simon (1947) speaking about the general function of social organization states that "Organizations and institutions provide the general stimuli and attention-directors that channelize the behaviors of the members of the group, and that provide the members with the intermediate objectives that stimulate action." (Simon 1957 pp 100).

Others argue that this organizational behavior is not completely a result of free choice, but also a path dependent result of socially constructed routines. By reducing uncertainty through routines (Nelson and Winter, 1982) and general orientations (Miles and Snow, 1978), firms implicitly encourage their subunits to be insular in their perceptions and work behaviors. Cyert and March (1963) concluded that managers only search in a "neighborhood" of well-worn alternatives when formulating solutions to the firm's problems. The structure and the processes of the organization, the standard routines (Nelson and

Winter, 1982), recipes and coordinating mechanisms, directly inhibit the scope of the scanning mechanisms available to management. Over time, this narrowed search activity becomes routinized, so that the organization may notice some things very well (such as a way to control production costs) but lack discernment capabilities in other areas (such as ideas for developing new products). Fiske and Taylor (1984) describe how situated attention occurs on the group and organizational levels.

An interesting and related finding by Levitt and Nass (1989) describes how an institutional environment constrains – or "puts the lid on" – Cohen, March and Olsen's (1972) garbage can processes. To the extent that institutional forces within the firm are strong, Thompson's (1967) model of the protected technological core need not always be followed. That is, by *not* sealing off the technical core from the external environment, organizations many derive orderliness in outputs from constraints imposed by the institutional parts of that environment. However, this Levitt and Nass (1989) model is limited to firms or industries with an ambiguous core technology. At any rate, the net effect is within group consistency (if not rationality) of norms, habits, routines and styles.

Peterson, Elliott, Bliese and Radford (1996) and Peterson (1998) discuss at length the process of giving events meaning. They speak of a "noticing phase" and an "interpreting phase." The first postulate offered by Peterson et al. (1996) is : "objectifying events by abstracting them from context is an inherent aspect of social construction. All social actors find regularities in experience, such that some social things become specifyable" (p97). Discernment is both an extension and a more detailed specification of what Peterson et. al. (1996) and Peterson (1998) are talking about.

Ocasio (1997) argues that the firm's behavior can be explained in terms of where organizational attention is directed. An attention based theory is offered which views the entire firm as a system of distributed attention in which individual and sub-group actions are derived from organizational structures and situational contexts. Social actors are selective in the issues they attend to at any one time. Ocasio (1997) also points out that "focused attention facilitates perception and action towards those issues, and inhibits perception and action towards those that are not" (p 190) and that social, economic and cultural structures in the firm channel and distribute the firm's attention.

Thompson's (1967) contingency approach combined with the findings of Levitt and Nass (1989) indicate that in more stable environments, or when a core technology is well defined, a firm may desire to be more closed. In this type of case, discerning and implementing new knowledge becomes less important. Thompson (1967) also discusses the desirability of closing and protecting certain sub-structural areas of the firm, so that the efficiencies of rote processes can be gained. Again, the environment external to a particular sub-group is not changing, it may be inefficient to work as an open system.

This contingency theory offers a reasonable basis for buffering and closing certain sub-groups off from new knowledge transfers. For example, it would usually be ill advised to allow new knowledge transfers to surgical units during surgery. Units gaining new knowledge may be tempted to alter established routines before techniques have been mastered or the broader system effects are identified. New procedures in any production core should occur during down times, not when the patient is on the table.

Thompson's (1967) work on closed/buffered sub-structures and processes is a

fundamental result of Simon's (1959) bounded rationality principle of organization. Organizations, through structures, roles and processes, control the information that is available, thereby setting rational boundaries for social actors. Goehle (1984) explains the continued importance of Thompson's work, emphasizing the usefulness of these buffers, but does note the discernment weaknesses it may create. Leavitt & Nass (1989) support the claim that protection of the core can be a weakness. An important question is when do these buffers lead to positive outcomes, and when do they lead to negative outcomes?

Thompson's common sense answer is that highly programmed core processes should be protected so that inputs keep turning into outputs at an acceptable rate and quality without distraction. In these cases, ongoing high levels of discernment of knowledge may be discouraged so that knowledge does not transfer and disrupt delicate processes. For example, critical medical procedures, or critical accounting processes should not be experimented upon in real time. We would prefer knowledge to transfer only in infrequent and tightly planned and controlled bursts. During such a planned transfer, management should take the system offline, open it up, make necessary and sufficient changes to the processes, close up the system again, make sure it runs properly, then move it back online.

In other organizational situations, prudence dictates keeping a continuously open approach, promoting ongoing discernment and knowledge transfer. This is particularly true for the boundary spanning functions.

2.4.0.4 The range of discernment

Ocasio (1997) describes attention as encompassing "the noticing, encoding, interpreting, and focusing of time and effort..." (Ocasio, 1997 p 189). This is a major

expansion of the construct from general uses of the word. Attention is more ordinarily differentiated from retrieval organization, and interpretation (Lord, 1985; Schiffmann, 1990). The word 'discernment' has been chosen in order to better represent these individual behaviors as part of a cognitive process.

Discernment of knowledge ranges on a cumulative low to high scale from 0) not discerned at all, 1) focusing attention, 2) noticing, 3) understanding 4) extracting, 5) recontextualizing and 6) objectifying. Discernment occurs each time knowledge is transferred, externally from environment to organization, or internally between members of different departments.

Figure 7 Stages of Discernment

Focusing attention
Noticing
Understanding
Extracting
Recontextualizing
Objectifying

Here is a simple example. The top-management team at Officenet Equipment, Inc. rides only black Lincoln sedans when going to and from the office. A regional sales manager purchases a new car for his personal use, a black Lincoln. Now that he is *attending* to his black Lincoln, the sales manager starts to *notice* the many other shiny black sedans on the roads and highways that he had not noticed before, although they'd been there all along. When discussing this with a co-worker in the department, the co-worker *observes* that the top management's vehicles are shiny black Lincolns as well. The sales team then observes that the shiny black sedans seem to look important and official. They also *observe* that while shiny black sedans look official and important, there are many dirty black sedans on the road, and they do not look important. The sales team *understand* that this is part of a greater situation: many important cars are black. Their *analysis* is that a least one reason top management rides shiny black sedans is because they convey a message that the rider is

involved in an important task, event or situation. They then *synthesize* this analysis, forming the hypothesis that if the sales team used shiny black sedans, the sales team would be perceived as more important and official by customers than the competition's sales force. The group discusses it among themselves, and regional sales director *objectifies* this synthesized hypothesis by writing a memo to the chief operating officer (COO) explaining that the sales force will appear more important and official at sales calls and meetings if they show up in black sedans that are always clean and shiny, and suggests that the company can act upon this knowledge over the next year as auto leases expire.

On one dimension, this scale moves from 'direct experience' to 'rational process' then back toward 'direct experience' and the end of the scale. Another dimension of the scale is the sequential track of a common rational sensemaking process. That is, the scales moves from a steady state of predisposed beliefs and opinions, to (a) new data appearance, to (b) data collection, to (c) formulating reasonable propositions, to (d) formulating empirical hypotheses that may be (e) objectified, i.e. put to trial in the form of a new program or process. Because communication of knowledge is a largely experiential phenomenon, experiential components at each end of the scale facilitate communication of the knowledge. 'Observing,' 'understanding,' and 'synthesizing' require more rational possibility processing than either 'getting one's attention,' or 'getting one to notice.' It is important to get as far toward (e) the experiential end of the discernment scale, so that the knowledge being will communicate well to the next recipient down the line. This is not to say that (e), the experiential component at the end of the scale is purely explicit. Some knowledge likely remains embedded and will need to be tacitly understood by those receiving the

communication. The low end of the discernment scale is experiential, allowing recipients to gain some immediate tacit understanding (an impression) when 'giving attention' and when 'noticing.' As the action plan is recontextualized, recipients slowly uncover additional knowledge embedded within the architecture of the plan. In a very general sense, I argue that during the initial experiential portion(s) of discernment, a loose knowledge structure is tacitly understood by the recipient, resembling an intuitive understanding or an immediate impression.

I propose five general hurdles to knowledge discernment. First and most obviously, knowledge is often not found because the organization is not specifically looking for it. Organizational knowledge may not be discerned if it resides in another department, or plant, or country - or anywhere beyond a group member's normal rational boundaries (Simon, 1957). Knowledge also cannot be rationally discerned if it is not directly available. When another organization's knowledge is protected and unavailable on the open market, the only choices may be dependence upon intuition, or purchasing another business in order to bring the knowledge into the company and make it available to the employees. Still, a merger or acquisition does not guarantee knowledge discernment or use. It may not exist in an explicit manner.

Organizational knowledge may, thirdly, go un-discerned if it is what Polanyi (1962) refers to as "implicit" and "in use" (Polanyi, 1962), or as I prefer, "embedded" in "high context" (Hall and Hall, 1990).[1] Knowledge may also be overlooked even if it exists

[1]As has already been stated, I prefer to think of implicit as a function of the understanding, of the knowing (Cook and Brown, 1999), not the knowledge itself, while the use of "embedded" frees the issue from those ontological problems.

explicitly, in an operating manual for example, but the knowledge is not in use. Fourth, discernment difficulties may occur when social actors access alternative sources of meaning (Smith and Peterson, 1988) when as they attempt to make sense/recontextualize (Weick, 1979, 1995; Brannen, Liker and Fruin, 1998) messages and events. The use of alternative sources of meaning will also likely disrupt the formation of group consensus during the understanding and recontextualizing stages of the discernment process.

It is individuals that make sense of events, discern knowledge, and propose new value-adding products and processes. It is organizations that make reap the benefits of knowledge through aggregates of individual events, innovations and interdepartmental processes. Useful knowledge may be outside of the firm in the task or general environment, or within the internal environment. No matter where knowledge is, if it doesn't move, if it doesn't flow, knowledge becomes an inefficiently utilized resource.

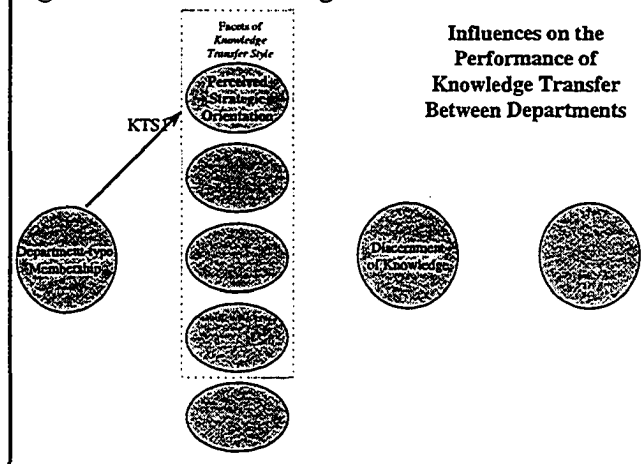
Combining the basic tenants of bounded rationality (Simon, 1957; March and Simon,1958; Cyert and March 1963) and institutional constraints (Levitt and Nass, 1989) with the general implications of Thompson's (1967) work offers us insight into the strategic implications of Occasio's (1997) line of work on organizational level attention. The selective focus of organizational level attention, and the ability to discern relevant knowledge facilitates the firm's strategic actions.

2.4.1 Strategic orientation, departments, and perceived strategic orientation

2.4.1.1 strategic orientation of the firm

Various theoreticians have argued that a small number of generic strategic orientations exist, within which more numerous combinations and permutations emerge (Williamson, 1975; Miles and Snow, 1978; Porter, 1980). A strategic management perspective paints an enactive/pro-active view of management as the firm interacts with various facets of the environment. Under such a view, managers either freely or contingently enact (Miles and Snow, 1978, Weick, 1979) a general strategic mode of operation.

Figure 8 Perceived Strategic Orientation 1



Rational management carefully attends to the most heavily weighted issues in that general strategic mode, and constructs tactical, functional and operational goals and strategies around the dictates of the selected mode (Mintzberg and Quinn, 1991). The work of Miles and Snow (1978) is familiar to most strategists. Following Weick's work on *environmental enactment* (1969, 1979) they extend Thompson's work in contingency theory, examining "how organizations develop means for consistently responding to the environments which they have enacted." (Miles and Snow, 1978 p7.) Three stable "strategic types" are reported (and one non-stable type) which describe general alternative patterns of an efficient firm's adaptive cycle.

Viewing the organization as an organic form, Miles and Snow (1978) emphasize that management's strategic choices shape that organization's structure and process. Miles and

Snow hypothesized that organizations enact their environments and become dominated by the adaptive decision patterns they employ. They adopt Andrews (1965, 1980) and Mintzberg's (1978) view of strategy as a pattern of decisions which reveals underlying goals and objectives. These decisions take on meaning as they are implemented through organizational processes, projects and structures. An organizational strategic orientation is a social construction born of the interaction between the organization, it's task environment, the goals of the firm, and patterns of management decisions and actions. As long as efficiency and effectiveness remain important for organizational survival, consistent patterns of actions that fit with the demands of the task environment have been linked to superior long term performance.

Firms enact their environments as they encounter events and situations (Weick, 1979). Over time they come to be dominated by the decision patterns they employ (Miles and Snow, 1978; Nelson and Winter, 1982). Miles and Snow(1978) propose a contingency/configuration model suggesting that in different industrial and market circumstances, firms can best choose among three principle strategic modes.

After analysis of empirical measures derived from their theory, Miles and Snow found that they could classify organizations according to their strategic orientation and that they could forecast some structural and process attributes associated with each general strategic orientation. They also proposed a contingency model in which some types of organizations require very specific "styles of management" while other strategic types permit a broad band of managerial discretion.

The strategic types are the analyzer, the prospector, the defender and the reactor. The

adaptive decision patterns that tended to lead to long term survival and high performance range from aggressive "prospectors" to pensive "analyzers" to strong willed "defenders." Those with non-stable patterns over time are referred to as "reactors," and tended not to survive or perform adequately within an industry environment. Miles and Snow (1978) also found the following contingencies. The prospector is most efficient in a turbulent, less predictable environment, or in an industry in the earlier stages of the life cycle. The analyzer mode tends to be efficient, or is best employed, in circumstances under which the competitive and general environment is somewhat stable, allowing time for analysis without significant changes in the task environment by the time action is taken. A defender mode is most useful under conditions of market leadership and relative stability in the environment.

2.4.1.2 Empirical studies concerning strategic orientation

A number of empirical studies have been worked with and tested the typology hypothesized by the Miles and Snow theory of environmental enactment and adaptation. Miles and Snow (1978) contended that the environmental scanning activity varied according to the organization's strategic orientation. This notion was tested empirically by Hambrick (1982) who found limited support for such a relationship. Using the Miles and Snow (1978) typology, Hambrick (1982) examined the linkage between the business-level strategy of an organization and its scanning emphasis. Based on a sample of executive responses from 17 organizations, the study found only limited indications of a strategy-scanning relationship.

Hambrick (1983) tested and explored how the industry environment affects the effectiveness of the different strategic types and how the strategic types differ in their functional tendencies. Using the Profit Impact of Market Strategies (PIMS) database, his

findings were somewhat contrary to Miles and Snow (1978), revealing that defenders and prospectors differed in their performance according to the nature of the environment and the performance measures used. In every type of environment studied, defenders outperformed prospectors in both current profitability and cash flow. Prospectors consistently outperformed defenders in terms of market share gains, but only in innovative industries.

Submariarian et al (1993) used empirical data from 68 Fortune *500* manufacturing firms to examine the relationship between organizational strategy and the firm's environmental scanning focus. The study examined the scope and breadth of environmental information that the scanning unit attempts to gather. Using the Miles and Snow (1978) typology, the study found that prospectors had the most advanced scanning systems, followed by analyzers and finally, defenders. This study's results differed from those of Hambrick's (1982) study. The empirical sample of Hambrick's (1982) study is drawn from three service industries and as Hambrick (1982) observes, none of the three industries is known for sophisticated strategic planning. The Submariarian et al (1993) study used a sample of manufacturing organizations from the Fortune 500 list--organizations that could be expected to have sophisticated planning systems because of their size and the nature of their environments. Furthermore, while Hambrick (1982) only surveyed scanning patterns of top executives, Submariarian et al. examine the scanning function of the organization rather than select individuals.

Work done by Teng, Cheon & Grover (1995) regarding decisions to outsource information systems functions, tried and failed to provide a bridge between the Miles and Snow typology and organizational information needs. In their study which examines reasons

for outsourcing of IS functions, cost effectiveness, information quality, and financial performance are juxtaposed to the strategic orientation of the organization *a la* Miles and Snow. No evidence here was found to support the hypothesis that the knowledge resource is more heavily weighted under different strategic modes.

Perhaps, although the Miles and Snow modes were insignificant discriminants, the authors might better have looked to transaction cost economics for theoretical support. Issues of outsourcing are issues of internal and external contracting in transaction cost theory. An economizing mode and an asset utilization mode might better have been described as the active strategic forces affecting information systems outsourcing decisions.

Byles (1996) study compares the manner in which hospitals handle certain administrative practices with the assertions made by Miles and Snow (1978). Data gathered from interviews with hospital CEOs and COOs indicate that performance criteria and reward allocation do not vary by strategic type. In addition, the study examines the relationship between intended strategy and financial performance and confirms the Miles and Snow proposition no strategic orientation is inherently better than another, even within a single industry.

In an important empirical study, Doty, Glick and Huber (1993) test both Mintzberg's and Miles and Snow's configurational theories. Mintzberg's five structural configurations (simple, machine, professional, divisionalized, adhocracy) were tested and were not supported by the findings. Miles and Snow's strategic orientations were tested and were strongly supported. "Configurational fit based on Miles and Snow's theory predicted 24 percent of the variance in overall organizational effectiveness" (Doty, Glick, Huber, 1993,

p 1196).

Thomas and Ramaswamy (1996) use the Miles and Snow typology as a theoretical framework to integrate previous research on strategic leadership by building on the concept of alignment to explain the performance impact of top managers. Their results show that organizations that achieve an alignment between managerial characteristics and strategic direction perform better than organizations where an alignment is absent. The strategy-manager 'match' was found to explain a higher proportion of variance in performance than industry membership, organizational age, and firm size. They assert that these results offer evidence for the direct impact an organization's leaders have upon performance outcomes and demonstrates the validity of the administrative dimension of the Miles and Snow typology.

In all, these studies confirm, at least, that Miles and Snow's 1978 concept of strategic orientation is still considered a valid construct and an active research topic that can be attached to multiple cognitive and behavioral processes. There is a full and active stream of literature attached to the concept that has stood the test of time. Furthermore, strategic orientation holds a lot of explanatory power. It is one good tool for explaining differences between social actors in their outlooks and behaviors, including their scanning and knowledge discernment behaviors.

2.4.1.3 Assessing strategic orientation

On assessing strategic orientation, Shortell and Zajac (1990) and James and Hatten (1995) emphasize that despite both the longevity and popularity of the Miles and Snow (1978) typology in strategy research there have not been many attempts to validate the classification scales. The most popular measurement instrument used in research on strategic

adaptations is the self typing paragraph approach in which respondents read short unlabeled paragraphs and identify the paragraph which best identifies the target firm. James and Hatten's (1995) study expands upon the convergent validity investigations of Shortell and Zajac (1990) by using the original self-typing approach rather than Shortell and Zajac's modified approach and used a different industry (banking) providing further evidence of the self typing scale's general applicability. Doty, Glick and Huber (1993) tested the Miles and Snow typology using three different interpretations of the strategic orientation theory. One interpretation includes three canonical ideal types, another interpretation add the reactor type as a fourth category, and a third interpretation interprets the three ideal types as a continuum from defender to analyzer to prospector. The results of their study revealed that a superior amount of the variance in effectiveness is explained using the three type continuum interpretation. This continuum from defender to analyzer to prospector will be adopted in this study.

2.4.1.4 Departmental strategic orientation

As stated in section 2.0.0, Thompson's (1967) work, Ocassio's (1997) organizational attention theory and work on bounded rationality (for example: Simon, 1957; March and Simon,1958; Cyert and March 1963) indicate that discernment is an important strategic factor. Moreover, in order to dissect the roots of competitive advantage, it is important to understand functional strategies within the firm's value chain (Porter, 1985). Not only do different functional departments have different strategies, the departments also enact their own strategic orientations. This is especially likely in more complex organizations where the various sub-systems tend to be more loosely coupled.

As discussed above, organizational strategic orientation is socially constructed from the interaction of the firm's environment, the goals of the firm, and the routines of firm members to deal with events in the task environment. Similarly, departmental strategic orientation is a social construction resulting from the interaction of the department's environment, the functional goals of the department, and the actions of department members enacting processes to deal with the firm environment. Departmental strategic orientation is fundamentally a general description about the adaptive routines of department members. Firm strategic orientation, on the other hand, will tend to describe cross boundary routines, that is, routines that link the firm to elements of the external task environment, like customer markets, suppliers and regulators.

Miles and Snow's (1978) firm level theory is a contingency/configuration theory. What about department strategic orientation? Recall Thompson's (1967) general perspective that well-constructed organizations balance internal requirements of coordinating technical activity with external requirements of adjusting boundary spanning units to deal with the contingencies and constraints of the task environment. Protecting programmed routines from change at the organizational core, and exposing other non-core routines to change are both important administrative tasks. In terms of strategic orientation then, it would make sense that periphery departments or groups engaging in boundary spanning routines will act more as open systems and prospectors, while core operational groups will act more as closed systems in the way of analyzers and very protective defenders.

2.4.1.5 Perceived strategic orientation

Individual organizational members are the ones who do the majority of the thinking,

discerning, deciding and acting in the firm. Furthermore, while departments may be understood as members of firms, individuals are the primary members of departments. It is individuals who enact the department's strategic orientation. Therefore it is primarily the individual's perception of the department's strategic orientation that will drive their strategy-related behaviors and actions. Membership in a type of department impacts each individual member's perception of departmental strategic orientation. An individual may perceive their department as a prospector, an analyzer, a defender or a reactor.

It is certainly possible, though probably unlikely, that members of the same type of department have very different perceptions of their department's strategic orientation. If the strategic orientation types are adequately described, departmental members should be able to say with relative consistency, 'yes, my department is like that" or 'no, my department is not like that." Therefore, by questioning department members about the strategic orientation of their department, one should be able to make a good guess about the type of department to which they belong. That is, if an employee responded that their department rarely searches for alternative uses for their outputs, and encourages consistency over innovation, it would be pretty easy to guess that they were not members of a research and development department, and a good guess that they are members of an accounting department.

Hypothesis KTS1.1: Organizational members meaningfully distinguish the strategic orientation of their department from the strategic orientation of their firm.

Hypothesis KTS1.2: There is a significant difference between the perceived strategic orientation of the firm and the perceived strategic

orientation of the department.

Hypothesis KTS1.3: We can accurately predict what type of department an employee belongs to by observing how they perceive their department's strategic orientation.

Following the work of Thompson (1967), Lawrence and Lorsch (1967), and Perrow (1977) one would expect that in the ideal differentiation situation, department types facing higher uncertainty should be more experimental and less structured and routinized, whiles department types facing lower uncertainty should be less experimental, more structures and more routinized.

Hypothesis KTS1.4: In a relatively high performance firm, research and development and sales and marketing department types will be perceived as prospectors, and manufacturing operations departments will be perceived as defenders or analyzers. In lower performance firms, perception of department type as prospector will not predict membership in research and development or marketing and sales department type, and perception of department type as defender will not predict membership in production operations department type.

2.4.1.6 Other strategic modes

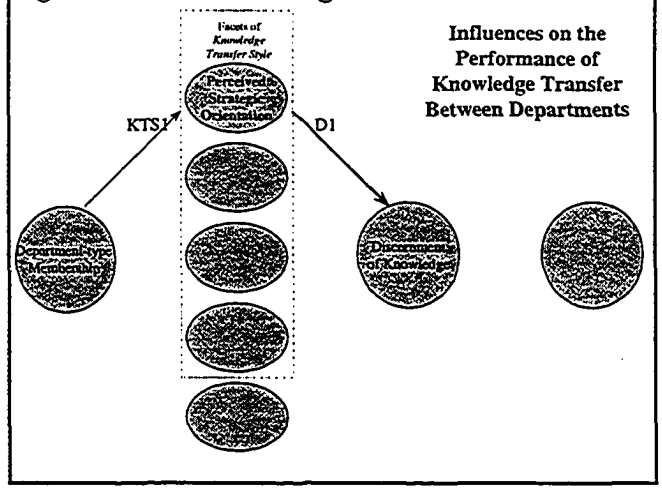
Michael Porter (1980) discusses three categories of strategic mode. A firm can be successful by engaging in either cost leadership or differentiation, and focus. That is, a firm can be a broad differentiator, a focused differentiator, a broad cost leader or a focused cost leader. A study by Segev (1989) showed a general congruence between Miles and Snow's categories and Porter's (1985) cost leader and differentiation orientations. However, unlike

Miles and Snow, there are no explicit contingencies in Porter's model. Porter implies that managers may successfully employ a relatively unconstrained set of strategic and tactical choices as they direct their firms. Within a firm, none or all of these strategies may be found in various combinations and levels of detail. As with the Miles and Snow typology, this stream does not indicate that specific combinations of modes would lead to more or less strategic attention to knowledge assets in general. However, research, development, marketing and sales knowledge are relatively more critical to differentiators, while manufacturing and supply chain management knowledge are relatively more critical to cost leaders.

2.4.1.7 Impact of perceived strategic orientation on the discernment of knowledge

The topic thus framed implies that there are different types of departments with different strategic orientations. A department's strategic orientation affects the performance of organizational knowledge transfer by altering the likelihood of departmental members paying attention to and noticing organizational knowledge.

Figure 9 Perceived Strategic Orientation 2



The discernment likelihood is partially determined by the member's perception of their department's strategic orientation. That is, department members perceive the strategic

orientation of their department and the perception in turn influences that member's propensity for discernment of knowledge. For example, an individual who perceives their department as a prospector will likely give greater effort to sifting through all sorts of knowledge external to the department to find new uses for that knowledge, and will likely act upon newly noticed knowledge even before fully discerning it. An employee who perceives their department as an analyzer will generally take time before turning newly noticed knowledge into action, preferring to wait until all of the potential consequences of the implementation of the knowledge are well documented. One who perceives their department as a defender will likely discern only external knowledge salient to the current way things are done in the department.

Strategic Orientation is both a theoretically and empirically viable construct which fits into the broader bounded rationality framework adopted in this project. In effect, organizations and departments within organizations, impose boundaries to reduce sensemaking time and increase productive time. These evolving patterns of organizational behavior – the processes, programs and structures of organization – form as an organization enacts its environment. Miles and Snow (1978) proposed that depending upon the strategic orientation of the firm, certain processes are a better "fit." That is, will be more or less efficient in achieving strategic goals.

Performance Related Results. Looking to transaction cost economic theory helps to express the economic value of a strategic mode selection. Strategic modes are determined by repeated organizational patterns of action (Miles and Snow, 1978) in response to ongoing events and situations. Costs are minimized when activities become efficient, revenues are

maximized when activities become effective. Williamson's (1979) transaction cost economics (TCE) implies that where each transaction in a process occurs, a potential transaction cost exists. Less negotiating time, less misunderstanding, and less overall effort at any transaction leads to increased efficiency in the form of lower costs associated with negotiation, misunderstanding and effort. These are the transaction costs. Strategic orientations are defined by the repetition of responses, patterns of action and routines (Miles and Snow, 1978, Nelson and Winter, 1982). Therefore, because strategic orientations are defined by routines, they increase internal efficiencies and reduce transaction costs. From another (related) perspective, the reduction of negotiated non-routine transactions results in a reduction of agency costs (Jenson and Meckling, 1976). When departmental members are sufficiently focusing attention, noticing, understanding, recontextualizing and objectifying organizational knowledge, the discernment process is effective. Those departments with a strategic orientation will have a routine in place for this knowledge discernment process, increasing its tendency to work efficiently and effectively.

Social actors scan according to their perception of the necessity for information (Pfeffer and Salancik, 1978). This necessity is a function of strategic orientation. The prospector's need is for knowledge about specific aspects of the environment (Daft, Sormunen, and Parks, 1988). A prospector's strategic orientation makes it imperative for its members to discern knowledge of new product breakthroughs, new technologies, new markets. For the prospector, such an imperative necessitates the need for employees with broad and effective discernment abilities.

Hypothesis D1.1: Those who perceive their department toward the

prospector end of the scale will have a higher average level of organizational knowledge discernment than those who describe their department toward the middle (analyzer) or the opposite end (defender) of the scale.

According to Cyert and March (1963), managers search only in the "neighborhood" of familiar alternatives in attempting to develop solutions to the organization's problems. Based on their empirical research, Miles and Snow (1978) observed that defenders did very little scanning of the environment beyond the organization's familiar domain. The defender's main need is for knowledge concerning improvement of its current domain. The technological sectors of the environment may be scanned, but only concerning their narrow range of interest. A defender is likely interested in knowledge on matters such as new plant layout within the industry, and new inventory control techniques, focusing on increased operating efficiencies and effective delivery to narrow market sectors.

An analyzer's strategy is to maintain a relatively stable base of products/services while selectively moving into new areas that show promise (Shortell and Zajac, 1990). Thus, they exhibit characteristics of both prospectors and defenders. However, in their description of analyzers, Miles and Snow (1978) contend that such organizations are seldom "first in" with new products or services. By carefully monitoring the actions of major competitors, analyzers can frequently be "second-in" with a more cost- efficient or quality-effective product or service (Snow and Hrebiniak, 1980). Zahra and Pearce (1990) point out that reactors have been ignored in almost half the studies on the Miles and Snow typology. Because reactors do not have deeply embedded adaptive routines, it will be difficult to predict the effect of this 'reactor' mode upon the discernment of knowledge and the transfer

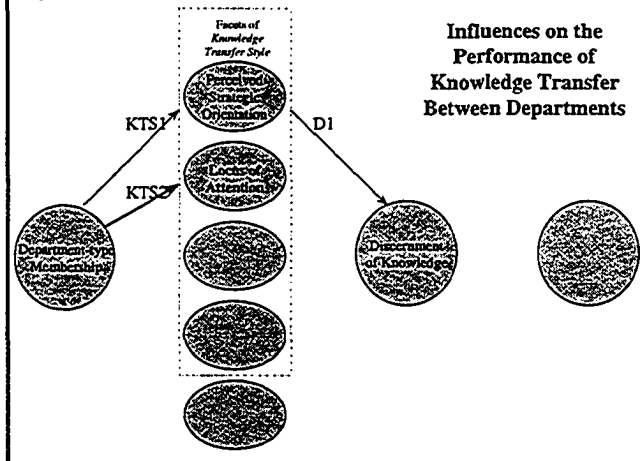
of knowledge.

Hypothesis D1.2: Those who score their department toward the "prospector" end of the scale will have a higher average level of organizational knowledge discernment than those who score their department toward the middle (analyzer) of the scale, who will have a higher average level of organizational knowledge discernment than those scoring their department toward the "defender" end of the scale.

2.4.2 Locus of attention

2.4.2.1 Locus of attention in departments

Figure 10 Locus of Attention 1



A simple yet important question to ask is "where do firms and department members look for knowledge?" Organizational members generally conduct "environmental scanning" for the firm to seek important knowledge in the internal, task and general environments. Organizational members do the scanning, and different members adopt different scanning tasks.

Decision makers scan according to their perceptions about the necessity for information (Pfeffer and Salancik, 1978), and their sensemaking habits (Thomas Clark and Gioia, 1993). Social actors may pay more or less attention to internal versus external sources

of knowledge and information. Duton and Duncan (1987) demonstrate that if they give unequal emphasis to the locations available to them, organizational members are likely to differ in their interpretations of events and information, and in their responses to them. *Locus of attention* is a combination of *where* departmental members tend to pay attention and *how* departmental members tend to pay attention. To put it simply, locus of attention is the characteristic location and the logic pattern of attention.

Organizational attention is a distributed phenomenon (Simon, 1957, Ocasio 1997), with rational boundaries differing depending upon the local context. To the extent that different departments have different norms, tasks and priorities, attention patterns will differ between departments.

I find it useful to introduce the terms 'hunting,' 'gathering' and 'farming,' (borrowed from social anthropology) to aid the discussion of the strategic issue related to attention patterns. When *hunting* for knowledge, scanners may attend to a number of different locations, looking far beyond their own borders. Kobrin (1991) showed that companies with integrated international strategies held a competitive advantage because they could gather information about new markets very easily. Likewise, departments dealing frequently with other departments, with strategic alliance partners, and other members of the task environment likely enjoy competitive advantages attributed to an enhanced ability to easily *gather* new knowledge. Others may focus their attention at internally, building competitive advantage by growing and cultivating knowledge from the inside. The net of the argument is that different departments can have very different attention patterns.

I also observe that there are strong similarities between Miles and Snow's (1978)

strategic orientation typology and this hunter, gatherer, farmer typology introduced for the sake of demonstration. A prospector/hunter, analyzer/gatherer, defender/farmer typology has a good degree of face validity. At any rate, they are similar enough that I expect a generally high degree of correspondence between departmental strategic orientation and departmental locus of attention. That is, prospectors will tend to have a very broad set of locations to which they pay close attention followed by analyzers with a somewhat narrower set, and finally defenders, which will have the narrowest range of attention.

Hambrick (1982) was the first to check for this type of relationship. Using the Miles and Snow (1978) typology, the study checked for any linkage between business-level strategy of a firm and its scanning emphasis. Based on a small(ish) sample of executives from 17 organizations, very limited evidence of a relationship was found between strategic orientation and scanning behavior.

Subramanian et al (1993) checked again for this relationship, hypothesizing that "the scanning system used by an organization would vary depending on its strategic orientation" (p319); for example, a pro-active scanning system will more likely be found prospector firms and than in analyzer and defenders type firms. The study indicated that a large percentage (39%) of the prospectors which were sampled exhibited scanning systems that were either reactive or proactive. Analyzers predominantly had reactive systems (42%), consistent with the research hypothesis, and the majority of defenders exhibited ad hoc scanning systems (44%). In contrast to Hambrick's (1982) research, the Subramanian et al (1993) study offered empirical support for a strategy-scanning relationship. Because the locus of attention construct to some extent includes scanning behaviors and biases, the current model predicts

that there will be significant correlation between strategic orientation and locus of attention. Miles and Snow (1978) observed that defenders did very little scanning of the environment beyond the organization's familiar domain where it has tended to be successful in the past. There is a story told among scientists about the stodgy old professor searching unsuccessfully one night for his keys on the ground underneath a street lamp. When a friend asks him where he lost them, he points to a dark alley, "over there," he responds. When the friend wonders why he would be looking here when he lost them over there, the professor replies, "I can't see in the dark." Hypothesis KTS 2.1 addresses the issue of correlation between strategic orientation and locus of attention.

> **Hypothesis KTS2.1:** On a continuous defender (low) to analyzer to prospector (high) scale, there will be positive correlation between perceived department strategic orientation and the use and breadth of loci of attention.

Aharoni (1991) tells us that technological knowledge can be bought on the open market, borrowed, stolen or developed internally. Hamel and Prahalad (1990) discuss at length the acquisition of knowledge through partnering relationships, but it is not clear whether this fits into Aharoni's categories of borrowed or stolen (or both). Rogers and Valente (1991) add that firms also look to government agencies, research institutions such as universities, and personal networks for knowledge. Spender (1996) indicates that competitive advantage is most likely gained from internally generated knowledge and related capabilities.

In general, social actors may look internally for knowledge or externally (Thomas, Clark and Gioia, 1993). Internal focus may perhaps fall upon research and development

functions, other specialized departments, or the mining of individual employees' knowledge. External focus for knowledge acquisition most commonly includes competitors, partners, the open market, new media, professional networks, government agencies and research institutions.

The open market: Social actors may purchase knowledge on the open market through, consultants, out sourcing or corporate acquisition of an entire firm (Ramel and Prahalad, 1994). However, the knowledge may not be available on the open market, or it may be prohibitively expensive. Efficient markets rapidly integrate the value of organizational assets, including intellectual capital. If contracted out on the open market, transaction costs may be high. Information impactedness and opportunism (Williamson, 1975) may be costly when dealing with the transfer of knowledge. Markets are superior to hierarchies when information impactedness is not a significant issue. When acquiring knowledge, however, the transaction is all about the flow of relevant information. Risk can be great if the knowledge does not provide results. In order to avoid these economic costs, the firm may choose a more cost-efficient alternative.

Internalization: The classic alternative is internalization (Williamson, 1975). The firm can diversify into the business of producing the needed resource. Despite reduced transaction costs, acquisition is often very costly and disruptive without the certainty of a positive return on investment. Disparate organizational cultures (Chatman and Jehn, 1994) and inconsistencies in organizational identity (Bouchikhi, 1997) may add to integration expenses.

Cooperative Relationships: Because of these drawbacks, a firm may enter into joint

ventures or strategic alliances to mimic the internalization process without exposing itself to all the associated risks and costs (Ernst and Bleeke, 1993). The firm may partner with an organization which is holding the knowledge in order to make up for its own deficiencies. It seems that the knowledge transfer process should be especially effective in such situations where extensive time is spent understanding the context within which the other operates.

Joint ventures and alliances are excellent environments for knowledge acquisition, since they are typically formed specifically because one firm has knowledge and [access to] resources the other does not, and visa-versa. Prahalad and Hamel (1990) stressed the strategic importance of knowledge acquisition, and the use of partnering relationships for the acquisition and development of competencies.

The general argument concerning cooperative relationships across group and organizational boundaries is that in addition to markets and hierarchies, there are alternative forms of governance when two or more groups cooperate time after time. The main criteria for choice of type of governance are level of risk and level of trust. The transaction cost discussion (Coase 1937; Williamson 1975, 1981) does not adequately cover the ground between market transactions and bureaucratic hierarchies. Ring and Van de Ven (1992) describe additional types of relationships including recurrent and relational contracts involving mid to long-term investments, all stemming from bargaining on the production and transfer of property rights among parties. Recurrent contracts involve repeated exchanges with some idea that there still may be future interactions, but with no certainty of this ongoing relationship.

By employing the behavioral assumption of trust rather than opportunism, they show

how firms can build trust through recurrent contracts and better govern long term relational contracts at lower costs. These research findings confirm Axelrod's (1984) demonstration of a rational base for the establishment of cooperation.

Given this line of thought, it makes sense that departments may look to acquire knowledge through their cooperative relationships with business partners, or even other departments. As such behavior becomes routinized (Nelson and Winter, 1982) and as trust is employed (Axelrod, 1984) or developed (Ring and Van de Ven, 1992), this may become an efficient mechanism of knowledge acquisition as governance and other transactions costs are reduced (Williamson, 1981).

Departments cause members to develop common attention patterns. Theories that promote social construction (e.g. Salancik and Pfeffer, 1978; Bandura, 1986) inform us that shared social processes produce patterns of shared cognitions and behaviors. In addition, empirical studies by Thomas, Clark and Gioia (1993), Duton and Duncan (1987), all indicate that different social actors pay more or less attention to different sources of knowledge and information. Maier, Rainer and Snyder (1997) find that different types of organizations do in fact tend to differ in the environmental sources of information they tend to scan. In each case, the bounded rationality argument (Simon, 1959, Cyert and March, 1963), the organizational routines argument (Miles and Snow, 1978, Nelson and Winter, 1982), or the social construction argument is applied. There is consistent theoretical and empirical evidence that different social units will attend in differing degrees to different sources or locations of information.

Departments then, likely cause members to develop routine attention patterns

(Ocasio, 1997). These patterns are dependent upon rational boundaries imposed by their common work and organization context. The pattern of attention can consist of any combination of the likely locations of attention: internal to the department, outside the department but within the firm, to different members of the task environment like suppliers, customer, competitors and business partners, and even to a shared professional community. Therefore:

> **Hypothesis KTS 2.2:** Members of different department types will utilize different loci of attention. Members of the same department type will use similar loci of attention.

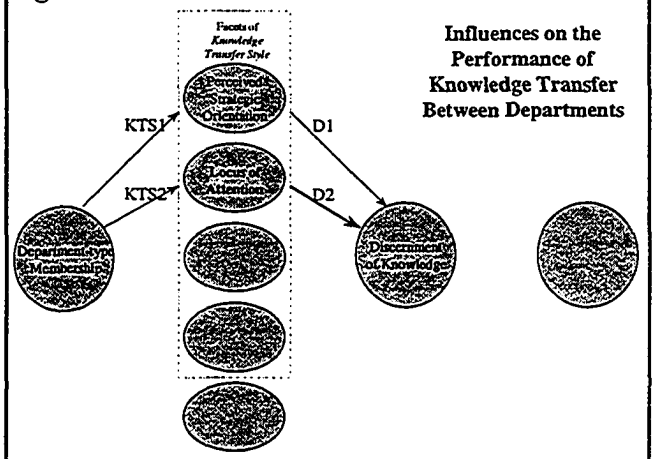
Furthermore, if departments' rational boundaries cause department members to have different loci of attention, then:

> **Hypothesis KTS2.3:** We can accurately predict what department type an employee belongs to by observing their loci of attention.

2.4.2.2 Effects of locus of attention upon knowledge discernment

Many scholars have heard the story of the professor searching unsuccessfully one night for his keys on the ground underneath a street lamp. When a friend asks him where he lost them, he points to a dark area in the alleyway. "Over there," he responds. When the friend wonders why he would be looking here when he lost them over there, the professor replies that "it's light over here."

Figure 11 Locus of Attention 2



Given the prevalence of routines and emergent modes of action, organizations may tend to look where they are accustomed to looking for knowledge, thereby failing to notice or find knowledge which may be attainable but hidden beyond their rational boundaries (Simon, 1957). Because organizational knowledge is stored within the firm, the locus of attention of departmental members is critical to discernment of this knowledge. Those who tend to look within the firm, will tend notice organizational knowledge. If Spender (1996) is right that internal knowledge is the primary source of competitive advantage, then attending to internal (organizational) knowledge is a critical ingredient to competitive advantage. Those types of departments whose members do not tend to direct their attention to other areas within the firm, perhaps looking outside of the firm, will not tend to discern organizational knowledge. Perhaps, they will tend to discern non-organizational knowledge

-- important, but not the focus of this study.[2]

Hypothesis D2.1 : A broader physical and logical range of attention predicts a higher average level of organizational knowledge discernment by department members.

Hypothesis D2.2: Focusing more attention upon other departments within the firm will lead to a higher average level of organizational knowledge discernment by department members.

As discussed at length in the earlier section on the definition of knowledge and the later section on knowledge impedance, the assignment of a 'truth-value' is the primary distinguishing factor between information and knowledge (including inbetween steps like beliefs and desires.) It may be important to understand in what manner that truth value has been assigned, or the method of validating the truth value of the knowledge. Attention to the repetition of the same events or ideas is the inductive logic for noticing knowledge. The apprentice bread baker "knows" because he has seen the task repeated a thousand times. Attending to the relations between different events or ideas is the deductive logic for noticing knowledge. Members of different types of departments may have more or less of a preference or propensity to attend and discern via induction or deduction. Social actors, as in the baking example, are commonly comfortable with inducing knowledge from examples and practice. This inductive propensity comes in handy since critical organizational

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[2]For example, when the marketing department gains knowledge from customers, that is the discernment of non-organizational knowledge, but when operations discerns this marketing knowledge (from marketing) and puts it to use, that is a transfer of organizational knowledge.

knowledge is often embedded in some context, like a routine, or implicitly communicated rather than made explicit.

Hypothesis D2.3a: Stronger inductive propensity predicts a higher average level of organizational knowledge discernment by department members.

Comfort and ability in deducing knowledge from theory is less common, but important trait applying explicit general principles to specific events. Those who pay attention to knowledge that resides in theoretical/deductive formats will more likely discern that knowledge more fully than those who shy away from deduction and theory.

Hypothesis D2.3b: Stronger deductive propensity predicts a higher average level of organizational knowledge discernment by department members.

Inductive ability and deductive ability are not mutually exclusive. While less common, some organizational members may be poor at induction. So the inductive and deductive constructs might not necessarily anchor opposite ends a single scale, but they might instead form two distinct scales: like 'high inductive' vs 'low inductive' and so on. If they do form two distinct scales then:

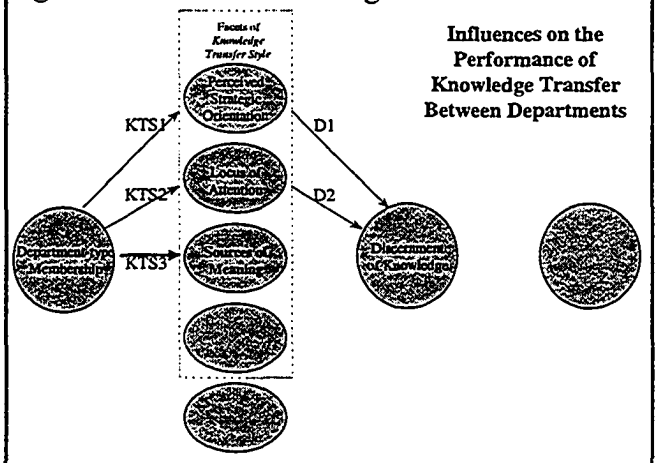
Hypothesis D2.3c: Strong inductive propensity and strong deductive propensity predicts a higher average level of organizational knowledge discernment by department members.

2.4.3 Sources of meaning

2.4.3.1 Departmental membership and characteristic sources of meaning

Theory proposed and tested by Smith and Peterson (1988) in the international and leadership literature suggests that group membership and event context have a strong influence on how organizational members make sense or recontextualize knowledge. Different cultural groups have propensities to look to alternative sources of meaning to make sense out of very similar events. Smith and Peterson (Smith, Peterson, Wang, and Zhong, 1996; Peterson, Smith et al, 1995; Smith, Peterson, and Misumi, 1994; Peterson, Smith, Bond, and Misumi, 1990; Smith and Peterson, 1988) argue that this effect varies with national cultural.

Figure 12 Sources of Meaning 1



Wittgenstein (1969) provides one of the most powerful theories on the development of culturally bounded world views. He emphasizes the socio-linguistic creation of meaning and world view. Assumptions (i.e. opinions) become social *a prori* truths that shape mental schemas for viewing (and speaking of) the world. These assumed truths develop as we acquire our language, -- through the social act of learning how to speak of the world when we are children. Wittgenstein (1969) writes about "belief that is not founded" (para 253) and "in the entire system of our language-games belongs to the foundations" (para 411). There are propositions which belong to our "frame of reference" (para 83) which "stand fast or solid" (para 151) which constitute the "world picture" which is "the substratum of all my

enquiring and asserting" (para 162) or "the scaffolding of our thoughts" (para 211) or "the element in which arguments have their life" (para 105). This world-picture is not something one has because one is satisfied of its logic. "No: it is the inherited background against which I distinguish between true and false" (para 94).

There is, then, a strong philosophical foundation to Dougherty's (1992) and Fiol's (1995) idea of "thoughtworlds" though which social actors unwittingly cognize phenomenon. But neither Wittgenstien's "frame of reference" nor Dougherty's thoughtworlds are context sensitive variables as are Smith and Peterson's sources of meaning. That is, Wittgenstein is describing the application of a culture-wide perspective that encompasses all of life's events. Thoughtworlds also dominate the application of meaning across situations, though perhaps not as broadly as in the Wittgensteinian case, and certainly more directed at the individual that society as a whole. On the other hand, different and sometimes multiple sources of meaning, may be applied by social actors (or accessed by their minds) for sensemaking in different situations. Furthermore, sources of meaning are not necessarily embedded in the mind as are thoughtworlds, schemas, or world pictures, but are generally external (embodied or disembodied) sets of beliefs, theories, feelings, behaviors and opinions. One might argue that sources of meaning are in fact internal and not external, by taking the position that they are memories or recollections of sets of beliefs, theories, feeling, opinions and the like.

Harris (1994) brings this discussion to the organizational level, suggesting that schemas vary with organizational culture. Schemas are cognitive structures utilized by social actors to store and organize knowledge, and to make sense of events (Neisser, 1976; Markus,

1977; Weick, 1979; Louis, 1983; Lord and Foti, 1986). Furthermore, Harris explicitly argues across levels of aggregation, explaining that organizational culture influences individual sensemaking. Furthermore, there is good argument that unique cultures exist at other levels, like within types of departments and other kinds of formal or informal groups (Louis, 1985, Van Maanen and Barley, 1985). Nelson and Winter (1982) argue that cognition in organizations is a distributed phenomenon and knowledge and memory are organizational phenomenon, not individual. I therefore expect these "sources of meaning" biases to occur in a distributed nature within any organizational sub-cultures.

I reprint here in **Figure 14** a list of sources of meaning found in section 2.1.3 of this chapter. Since the research stream of Smith and Peterson indicates that characteristic sources of meaning are consequences or elements of culture, than characteristic sources of meaning ought to be evident at any level that distinct cultures form. Characteristic sources of meaning play the role of culture-based schema's, and schemas impose rational boundaries upon social actors (Taylor and Crocker, 1981; Lord and Foti, 1986). If a department's rational boundaries cause the department's members to have a common and characteristic sources of meaning, it follows that:

Figure 13 Sources of Meaning Examples

Organizational culture
Unwritten rules embedded in the sub-culture
Subordinates
Specialists Outside specialists
Co-workers
Superior(s)
Internal financial reports
Ones own experiences and training
National Culture
Religions
Family
Customers
Norms/knowledge specific to a professional field
Suppliers

Hypothesis KTS3.1: We can accurately predict what type of department an employee belongs to by observing their sources of meaning.

Due to the nature of their work and the situations they face, members of different department types will likely utilize specific sources of meaning more than others. For example, members of accounting/finance department types will likely use formal rules and financial statements to make sense out of events. Members of research and development will likely use sources of meaning typical to the research profession, i.e. discussing events with professional colleagues and specialists. Due to the typically strong chain of command observed in most operating divisions, members of operations type departments will likely look to their superiors frequently to help them make sense and make decisions. After sales support member frequently interact with customer and with component suppliers. It is likely that they also look to these sources to make sense of typical work events.

Hypothesis KTS3.2: Members of different types of departments will draw from different characteristic sources of meaning.

Hypothesis KTS3.2a: Members of Accounting/Finance department types will make strong use explicit internal sources of meaning, (financial reports and formal rules), and of secondary socialization sources of meaning (professional associations and experience).

Hypothesis KTS3.2b: Members of Research/Development department types will make strong use of social collaboration sources, such as coworkers, experts outside of their department and subordinates.

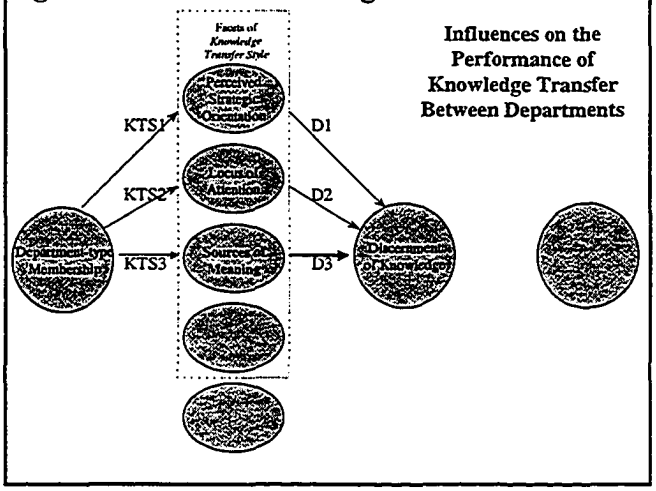
Hypothesis KTS3.2c: Members of Operations department types will make strong use of superiors as a source of meaning.

Hypothesis KTS3.2d: Members of after sales support department types will make strong use of the external task environment as a source of meaning.

2.4.3.2 Effects of sources of meaning on discernment

Attention only takes the discernment process to the very first stages. For organizational knowledge to be properly understood and correctly recontextualized, the area of organizational knowledge should in some way match a source of meaning commonly accessed by the receiving department's members.

Figure 14 Sources of Meaning 2



Strawson (1985) refers to the stream of social process epistemological research originating in Wittgenstein (1958) as collectivist subjectivism. Collectivist subjectivism generally refers to the hypotheses that members of social groups make sense of the world in common ways, and have very strong conventions about assigning truth to root assumptions. Quine (1951, 1991) points out our socially subjective and practical nature, demonstrating that when new knowledge is inconsistent with old, we focus our revisions more upon empirical references than upon highly theoretical statements. That is, we tend to keep our deeply help theories with which we make sense of the world, and throw out empirical evidence to the contrary. Thus the scientists' exclamation: "the data are wrong!"

A compatibility exists between Weick's (1979, 1995) and Peterson's (Smith and Peterson, 1988; Peterson, 1997) sensemaking perspectives. Yet Smith and Peterson's work

is more compatible with Quine's (1951) perspective that the social actor has a tendency to recount the empirical world from the perspective of deeply embedded theories.

Mintzberg (1979, 1991) Smith and Peterson (1988) and Peterson (1998) are concerned with how mangers handle different events in the organization. Both are also concerned with leading and coordinating people and organizational tasks. Mintzberg refers to coordinating mechanisms as "...the most basic elements of structure - the glue that holds the organization together" (Mintzberg and Quinn 1991, p 334). Yet managers do not draw from mechanisms to make sense of observations, managers draw from sources of meaning (Peterson 1988, Weick 1993). Peterson explicitly distinguishes between means and sources of meaning.

Figure 15 Comparison of Sources of Meaning and Coordinating Mechanisms

Coodinating Mechanism	Source of Meaning	Event Types
Coordination	Coworkers	very simple - very complex
Direct Supervision	Superior(s)	timing of multiple tasks
Standardization-Process	Job Specifications	maximize efficiency
Standardization-Outputs	Product Specifications	just get it done
Standardization-Skills	Self, Academics, Trainers	institutionalized tasks
Standardization-Norms	Org. Culture, Rules, Values	decentralized tasks

A comparison, shown in **Figure 15**, shows the relationship between the two theories. "Coordinating mechanisms" in Mintzberg's theory, are similar to "means" as described in my discussion of Peterson's (1988, 1997) event management theory. The sources of meaning are *theories, feelings and schemas linked to social actors, institutions or objects* that managers reference in order to gain understanding of different types of events.

Direct supervision for example, is a means through which management tries to see to it that subordinates access a superior's set of theories about how things should be done.

Subordinates and superiors may use this means to access that particular source of meaning when faced with events that require precise timing. Mintzberg's example is fifteen people in a war canoe who need a leader to coordinate their efforts.

Management's task is to make sure that the means they use in different situations do in fact cause employees to access the same sources of meaning at the same time. If employees react to the same event, or the same means by looking to different sources of meaning, coordination will not be achieved. However, innovation is a possible benefit from employees looking to different sources of meaning given the same event.

Because knowledge is embedded within schemas (Markus, 1977; Lord and Foti, 1986), if employees do not commonly access a particular of meaning as they deal with daily work events, they will not likely discern knowledge embedded in that source of meaning. There is an interaction between sources of meaning and discernment of different areas of organizational knowledge. For example, formal policies and procedures are a common source of meaning (Smith and Peterson, 1988) and coordinating mechanism (Mintzberg 1979, 1991). A goodly amount of stored organizational knowledge is embedded within this source of meaning. If a particular department tends not to use policies and procedures to make sense and decisions in the face of work events, it is very unlikely that they will discern the knowledge embedded in organizational policies and procedures. A solution to this would be for leadership to actively focus the department's members' attention upon policies and procedures until it becomes a habit for them to do so.

Hypothesis D3.1: Organizational knowledge clearly related to department members' frequently accessed sources of meaning will be associated with

better discernment of that topic of organizational knowledge.

Hypothesis D3.1a: Frequently use of customers as a source of meaning is associated with a higher level of discernment of organizational knowledge about customers.

Hypothesis D3.1b: Frequently use of internal financial reports as a source of meaning is associated with a higher level of discernment of organizational knowledge in financial reports.

Hypothesis D3.1c: Frequently use of organizational culture as a source of meaning will be associated with a higher level of discernment of organizational knowledge about management practices.

Hypothesis D3.1d: Frequently use of specialists from outside the department as a source of meaning will be associated with a higher level of discernment of organizational knowledge about management practices.

2.4.3.3 Communication theory and sources of meaning

Boland (1994) emphasizes that coordinated outcomes occur when individuals think and act in ways that take others in the organization and the host of interdependencies into account, and feels that most communication and information system design does not take into account the distributed nature of cognition. He propose that distributed cognition be viewed as a hermeneutic process. The 'hermeneutic circle' is the process of understanding and interpreting communications, then reflecting, understanding and interpreting again.

This portrayal of organizational cognition is similar to Weick's (1979, 1995) sensemaking process, elevated to the organizational level. According to Weick (1990), because managers are not so good at reflecting upon their own situations and understandings,

they operate from smaller and smaller views of the world. This then limits the degree to which individuals take other groups in the organization and the mass of interdependencies into account.

A communications content analysis study on management decision situations by Fiol (1994) helped to expose the role of consensus on meaning and its effect upon organizational innovation and learning. Fiol's paper breaks consensus into two parts, consensus on interpretations of content and consensus in how communications should be framed. Communication content is the labels people use to convey meaning of thoughts, or "pictures" of reality. Framing is the form used to construct the labels and meanings, like a strict or a flexible format. Successful innovation was linked to consensus of frame and diversity of content. Consensus occurs as a change in cognitive frame of reference through which people understand an idea. Collective learning occurs through contradiction by generating diversity, then building consensus.

Fiol's study in organizational communications indicates that both the content of a communication and the framing of a communication play a critical role in giving impetus to action. When consensus fails to develop around one the dimensions of meaning and not the other, a decision stalemate does not necessarily persist, and the group is not paralyzed A state of "unified diversity" develops when communications are framed in a consistent manner across social actors, but when disagreement remains over what the content means. Fiol found that it is this odd state of unified diversity that led to successful innovation and organizational learning.

For example, in 1997, one of the participating software companies in the study was

not sure what direction to take in the development of a new product. They might have made the product a server-based internet application, or they might have made it a standard database program meant to run on the customers' hardware. The programmers were split on the issue, and even those that argued for the standard database application disagreed about what computer language to use to write the code. At first, the internet experts were using terms the non-internet programmers did not understand correctly, because the two groups were utilizing different sources of meaning. No consensus could be reached, and tempers flared.

Over time, however, the various groups began to frame their communications in a similar fashion, and reference the same sources of meaning, so that everyone understood the other's point of view. There was still disagreement about the content of what should be done, but now new ideas combining the alternate perspectives began to emerge. With this state of unified diversity, organizational action was taken. The internet group was disappointed that their model for the product was not chosen, but they participated in the subsequent project. That is, the programmers reached consensus without agreeing about what should be done, and in the process, a few key innovations were developed. The internet group continued to feel that the wrong action was taken, but they agreed to help work on the standard database application, being largely responsible for those programming innovations that had emerged.

Again, the theme is stressed that meaning is neither a unidimensional quality nor is it consistent across organizational members. With consensus around only one of the dimensions of meaning, knowledge transfers can and do still turn into action. It is just difficult to forecast what the action will be. Absolutely pure transfer of *meaning* through the

discernment process may not be a critical for the *knowledge* to transfer. As social actors recontextualize the knowledge, the particular sources of meaning they use alter the objectification outcome. It seems likely that this point of uncertainty, or irrationality, is where many innovations are born.

In fact, Fiol (1994) claims that firms feed upon a degree of uncertainty of meanings across members. "Managers must actively encourage the development of different and conflicting views of what is thought to be true, while striving for a shared framing of the issues that is broad enough to encompass those differences" (Fiol 1994, p 403). If groups do not communicate frequently, idiosyncracies in preferred sources of meaning may be detrimental to both knowledge transfer and innovation.

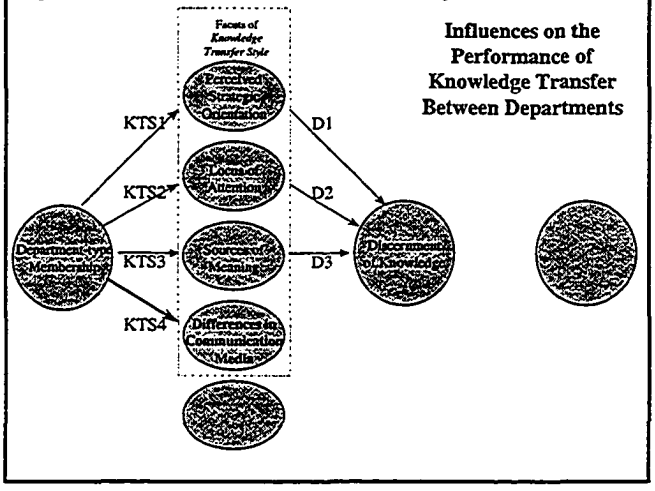
2.4.4 Communication media

2.4.4.1 Departmental communication media preferences

Gorry & Scott Morton (1971) were among the first to argue for the importance in organization science of an understanding of alternative qualities of information. They proposed describing information in terms of seven general dimensions (source, scope, level

of aggregation, time horizon, currency, required accuracy and frequency of use). Nonaka's (1994) recent use of Machlup's (1983) description of information as "a flow of messages or meanings which might add to, restructure or change knowledge" (Nonaka, 1994, p15) underscores the importance of communication media in the study of organizational knowledge. If information flows affect knowledge, then the media that the information travels in becomes an important variable.

Figure 16 Communication Media Dysfunction 1



Daft and Lengel (1984) forcefully argued that efficient and effective organization is largely based upon communication (of information/knowledge and so on). They advise that further analysis of their perspective be based in an examination of the nature of the information itself and its interaction with varying media types and organizational information needs. Daft and Lengel themself leave us with a contingency/fit model, proscribing richer media for descriptions high in equivocality.

Boland (1994) emphasizes that all is not as clear cut as classical information richness theory (Daft and Lengle, 1984) would have us believe. Boland argues correctly that 'understandings,' 'meanings,' 'contexts' and other cognitive events are highly complex and interactive issues. Boland argues that "viewing cognition in an organization as a hermeneutic

process of inquiry provides a theoretical basis for designing systems that support interpretation and sense making." That is, by conceiving of communication as a complex, not entirely linear process, future information system designs will be created that better deal with the complex reality of the situation. For example, Boland demonstrates that certain media considered very rich by some people are not considered such by others. It all depends upon how one enacts meaning to the data that is extracted from the media. Even numerical reports, which are considered relatively weak human media by media richness theory, can be rich carriers depending upon who is the reader, what is the context, and other emergent situations (Boland 1994). Boland's findings imply that there are work-cultural discriminants influencing perceived richness, such as professional memberships or functional group memberships. If departments' rational boundaries cause members of that department type to have a preferred communication media then:

Hypothesis KTS4.1: We can accurately predict what department type an employee belongs to by observing their communication media preferences.

Members of accounting/finance type departments use a lot of number and spreadsheets, and create formal financial reports. It is even likely that these media are considered rich by them. One would therefore expect that they prefer the use of numbers and of formal reports, since they are accustomed to using them. Information support department type members spend a lot of time using the internet to create web pages and help files for members of other department to use. Furthermore, given the "techy" nature of their jobs, it is likely that they prefer to use the internet for communication.

Hypothesis KTS4.1a: Members of accounting departments will report a

communication media preference for spreadsheets and numbers, and for memos and formal reports

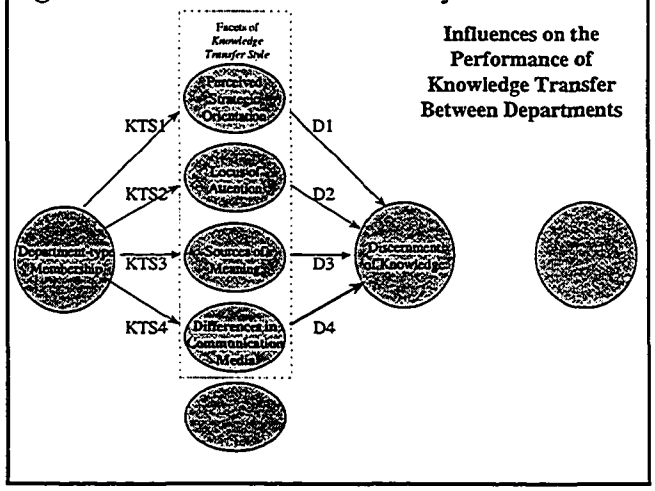
Hypothesis KTS4.1b: Members of research and development departments will report a communication media preference for informal meetings.

Hypothesis KTS4.1c: Members of IT support will report a communication media preference for the internet and video conferencing.

2.4.4.2 The effect of communication media discrepancy on knowledge discernment

Based on the work of Emery & Trist (1965), and Lengel (1983), Daft and Lengel's (1984) information richness theory proposes a useful explanation of both inter and intra-firm communication difficulties which function as impediments to knowledge transfer.

Figure 17 Communication Media Dysfunction 2



In a two-by-two richness analysis matrix, Weick's (1979) equivocality reduction theory is used as the vertical dimension of media richness analysis, and Galbraith's (1973) information quantity is offered as the horizontal dimension. The vertical complexity dimension is based on Weick's proposition that organizations are designed to reduce equivocality from the environment. "Organizing is the construction of a consensually validated grammar for reducing equivocality" (Weick, 1979, p3). In general

from this perspective, vertical information processing fulfills the function of interpreting the environment and reducing equivocality and horizontal information processing coordinates internal elements of the organization.

At the 'top' of the organization, then, the manager's world is subjective and complex calling for rich media. At the 'bottom' (technical core), the world is more objective, calling for less rich media. However, the use of such a model may lead to discernment problems as knowledge flows vertically through the firm. If complex knowledge emanating from upper levels of the organization is communicated using less rich media types, the levels of discernment will drop off, because communication media should fit the information task.

Although an older essay, Gorry and Scott Morton (1971) is still considered a seminar article with ongoing relevance. As pointed out by Gorry and Scott Morton (1971) information systems tend to serve the lower levels of the organization (operating core) and only support the standardized decision making processes. They called for more effort into the development of Decision Support Systems (DSS) that serve top management in planning, innovating etc. etc. Leavitt and Whisler (1958) did not foresee the evolutionary path that information technology would take, and the difficulty of producing information systems that can support the more complex, "unstructured" (Simon, 1991) decisions, and handle the highly "equivocal" (Weick, 1979) information at the strategic levels of the organization. An understanding of how to encode knowledge so that it may be used in decision support and knowledge management systems is an important venue of investigation, but is not pursued in the current project. Despite improving technologies, our current state of affairs continues to call for use of richer communication media, such as face to face meetings, to transfer

complex and equivocal messages.

The theory is also speaking about horizontal information and knowledge flows. Horizontal communication media must be rich when there are different frames of reference across departments, groups or across organizational boundaries. The greater the differences and the more complex the coordination task, the greater the necessary richness of the media need be (Daft and Lengel, 1984).

Hypothesis D4.1: A preference for richer communication media predicts higher levels of knowledge discernment.

In essence, for inter-departmental knowledge transfer processes where there is suspicion of cultural dissimilarities, or dissimilarities in rational boundaries, the communication media which are used should be especially rich. Rich media or means are a necessity on all levels of interaction until clear evidence of a common frame of reference between organizations or groups exists. Once this stage is reached, communication media can be adjusted to fit the characteristics of the knowledge (embeddedness, complexity, importance) being transferred.

Other research in communications theory suggests that the mis-communication and misunderstanding effects will be further attenuated as the cultural distance between individuals increases (Hall and Hall, 1990; Fiol, 1995). An experiment by Bavelas (1950) demonstrated that different structures of communication among subjects influenced both the number of errors (performance) and subjects' morale. The experiment also showed that the distribution of communication structures greatly affected the ability to arrive at an optimal solution. I expect that cultural differences at departmental level cause similar frustrations

and sub-optimal performance of knowledge discernment and knowledge transfer performance.

Hypothesis D4.2: Larger discrepancies between the communication media used by the sender(s) and the preferred communication media of the receiver(s), lead to lower levels of knowledge discernment. Smaller discrepancies lead to higher levels of discernment.

Moreover, in situations when differences are acute and interaction time is short, it is likely that there is insufficient time for a common frame of reference to develop. While this should hold true for both intra-organizational and inter-organizational communications, I imagine that the effects will be more pronounced in inter-firm cases. Sub-groups within firms typically do have the ongoing relationships that help common languages emerge, even if they do not interact on a very regular basis.

2.4.4.3 Effects of communication media on knowledge transfer performance

The simple possibility that certain media are faster and are more likely to get to proper addresses will affect the level of discernment. There are two different physical/technological issues. The first is pure delivery speed, and there is really not much to debate. Studies concerning email as a media often cite the attribute that the messages get delivered very quickly. Certainly email is quicker than ocean freight or "snail mail" yet is slower than the telephone. We will simply suppose that alternate communication media can affect the level of discernment and the knowledge transfer performance simply because of the speed at which messages may travel.

A second issue is whether some media are more likely to be delivered to the location

which needs the knowledge. This issue is somewhat more intriguing. The possibility exists that the sender has little idea, or is confused about the proper target(s) for the knowledge that has been found. The current model proposes that alternative media types might directly aid or inhibit the knowledge from ending up in the laps of those who might use it best.

A research base from which such a question may be posed can be found in both the strategy and the information technology/technology in management literature. More recently this line of inquiry, which includes research in strategy, OT and IT, has been termed "knowledge management." A detailed discussion of knowledge management is offered in section 2.3 of this chapter.

Ackoff's (1967) seminal paper on "misinformation systems" suggests that five common inaccurate assumptions lead to improper system design. Four of these are important relative to the knowledge transfer issues. Tbe assumption that managers have a lack of relevant information is untrue. The problem is rather too much irrelevant information. (Ackoff 1969). Managers don't need more, they need less. Thus filtration and condensation of information are the two most important functions of an information system. This calls for knowledge transfer rather than information or data transfer.

The second assumption, that managers know what information they need, is not true. Managers do not often know what information they need, especially concerning complex issues, and thus they tend to ask for "everything." Ackoff asserts that information systems are subsystems of control systems, thus they cannot be designed without first defining the decision making models. Ackoff's second misinformation assumption suggests that there is possible ambiguity on both ends of the transfer process. Without an appropriate knowledge

dissemination model and system in place, users are likely unsure about what they need to receive and senders likely unaware of to whom it should be sent. Computer-aided knowledge management systems may help with these difficulties.

A third assumption exposed by Ackoff(1989) is that manager's decisions will improve if they are given the information they need. This is not true, he claims, because many management decisions are too complex to evaluate well even with perfect information. When faced with complexity such that information cannot be easily formulated into optimal decisions, managers should be provided with either decision rules or performance feed-back so they can identify and learn from mistakes.

Another mistaken assumption is that more communication media better performance Ackoff (1967). If sub-groups have differing measures of performance, different goals or different incentives, increased intergroup communication may actually hurt overall organizational performance. Ackoff (1969) thus implies that the knowledge transfer process should route knowledge packets to the most appropriate users in an efficient and controlled manner.

Galbraith (1973) argues that the amount of information processed should increase with amount of uncertainty. Diversity, task variability and interdependence lead to differing degrees of uncertainty in an organization. Different organization forms can be constructed to put the information where it is needed most by diagnosing points of uncertainty. Structure and mechanisms should be designed to encourage appropriate information exchanges. Galbraith's (1973) arguments lead us to believe that communication media and systems can have an important affect upon organizational efficiency and effectiveness not so much

because of alternate of media richness qualities, but because of proper dissemination of information.

Weick (1979), explains organizations as patterns of meaning, values and behavior. Weick demonstrates how the design of organizations and the process of organizing itself may be understood as ways of handling a variety of complex information. Weick proposes that organizations are designed to reduce equivocality from the environment. Equivocality is that circumstance when the meaning of events is unclear or ambiguous, leaving managers uncertain how to interpret the information. Organizing itself can be construed as the construction of a shared grammar for reducing equivocality (Weick 1979).

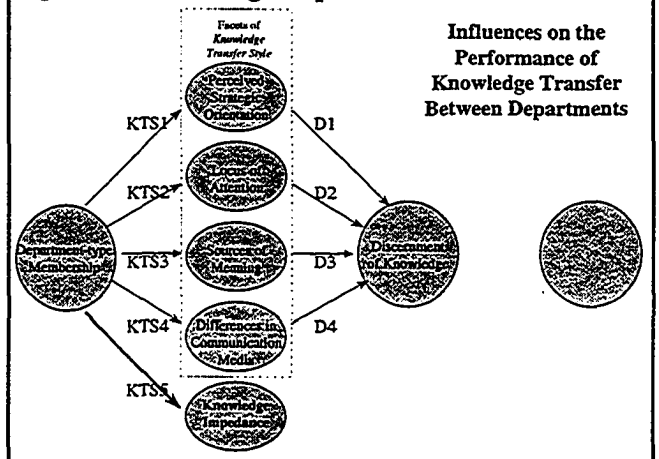
The organization itself according to Weick (1 979) and Galbraith (1973) is a digestion mechanism for assorted information, tuning it into knowledge and both controlling and disseminating it as needed. Thus the organization itself can be seen as integral to the knowledge management system. The organization is itself, at least in part, a communication media.

Finally, it may be implied from Ackoff(1967), Galbraith (1973), Weick (1979), Saunders and Jones (1992), Kraemer et al (1993), and Teng et al (1995), that knowledge users are best served by a knowledge dissemination system. The implication is that some combinations of structure, social actors and technologies do a better job than others at the process of gathering, sorting and disseminating knowledge which has been ingested by the firm. By "doing a better job" I mean getting the knowledge to perform to the extent that it provides increased economic returns.

2.4.5 Knowledge impedance

2.4.5.1 Introduction to knowledge impedance

Figure 18 Knowledge Impedance 1



The next construct to discuss involves organizational knowledge and characteristics of assorted organizational knowledge that is transferred between departments within the firm. While a pluralistic (different *kinds* of knowledge) understanding of knowledge (Spender, 1996; Blackler, 1995) was earlier rejected (see section 1.4) in favor of a single perspective, different *areas* (topics) of knowledge may have varying associated qualities or characteristics. The above discussion on the multiple perspective on knowledge helps to lay out context sensitive characteristics of knowledge. Depending upon a department's rational boundaries, different knowledge may appear to departmental members to have different characteristics.

Hamel, Doz and Prahalad (1989) explain that the potential for transfer of organizational knowledge is highest when the knowledge is simple and explicit. Comparative characteristics such as unimportant/important, complex/simple, or embedded/explicit are at least partly subjective -- that is, these assessments may vary according to whom you ask. One department may perceive technological knowledge as very important, while another may not. Accountants may find financial knowledge simple, while

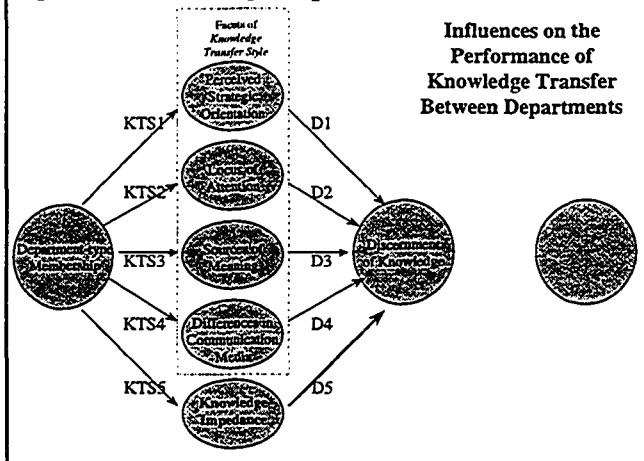
members of other department may find in quite complex. It is likely that within different departments member have characteristic perceptions about the complexity, importance and embeddedness of organizational knowledge. I follows that if a department's rational boundaries cause the department's members to have a common perception of knowledge impedance, then:

Hypothesis KTS5.1: We can accurately predict what type of department an employee belongs to by observing their perceptions of knowledge impedance.

2.4.5.2 The impact of organizational knowledge impedance upon discernment of organizational knowledge.

Zander and Kogut (1995) found that for important capabilities, the complexity, the system dependence (embeddedness), and especially the codifyability (explicitness) and the teachability (simplicity), affect transfer rates across organizational boundaries to other firms. There is no reason to expect that this should be much different for transfers between departments within firms. That study seemed to take for granted that the capabilities were important. However, importance is also at least somewhat relative to the subjects. The (perceived) importance/unimportance, explicitness/embeddedness and

Figure 19 Knowledge Impedance 2



simplicity/complexity of the knowledge will combine together to influence the discernment of organizational knowledge.

Very important knowledge will likely be noticed and transferred more quickly than low priority knowledge. Uncovering and gaining an understanding of deeply embedded knowledge is more difficult than doing the same for knowledge that is explicit. When knowledge is deeply embedded in some context it will be more difficult to notice, to extract and to understand than explicit knowledge. Finally, complex knowledge requires increased or richer context to make it clear, and organizational members without such context may shy away or fail at discerning such knowledge. Each of these facets are discussed in greater detail below.

2.4.5.3 Contextual embeddedness of knowledge

Summarizing from the previous discussion, there exist broad areas of knowledge which may not be deduced from other facts. As described by Wittgenstein (1961), knowledge of this type is acquired through direct participation in the social paradigm. Taken together with Hume's (1948) notion, we have a strong relationship described between what Polanyi (1966), Nonaka (1991), and Blackler (1995) describe as tacit knowledge (or "tacit understanding" as I prefer), and that which may be known via the process of induction. In general, scholars agree that some knowledge may not be easily deduced, or deduced at all. On the contrary, it is described by Polanyi (1962) as tacitly understood and "unspecifiable." The bread baker cannot pinpoint exactly how he knows the dough is ready to take off the mixer. The individual details and specifics are perhaps too many, or the inter-relationships and contingencies too complex to make explicit. Nonaka (1994) refers to this type of

knowledge as "know-how." Such knowledge is so deeply embedded and widely distributed in it's context, that explicit references to its theoretical part, pieces and relationships becomes difficult. Therefor such knowledge tends to transfer through practice, which takes time and effort.

As discussed above, Peterson (1998) asserts that events occur in context, and also specifies the five non-linear contextual levels of particle, wave, field, perspective and potential. An event is specified if it is offered in the context of the next higher level. For example, a particle within a wave is a specified event. A wave within a field is a specified event. However, a particle within a perspective is not well specified. An event that is not well specified within the proper context becomes equivocal.

In Text and Tagmeme (Pike and Pike, 1983), basic principles extracted from a lifetime of work in social anthropology and linguistics are offered. Pike and Pike explain that life requires context. All events, the world, objects, actions and meanings exist within context and can be comprehended from particle, wave or field perspectives. That is, an observer can choose to adopt a static view of a situation, a dynamic one or a relational one. They are strong proponents of a the theory that context is shown in terms of units within units, arranged in hierarchical levels.

> "Units are not all limited to the sentence or below, but extend upwards to discourses and conversations - which in turn are embedded in still larger units of nonverbal behavior. The emphasis on context has led to calling the tagmeme itself a kind of unit which is a 'unit in context.'" (Pike and Pike, 1983:1)

Like Quine's web of belief (Quine, 1969), Pike and Pike (1983) demonstrate how units with their contexts comprise and create patterns. The presentation of such a pattern is a variety of theory. Weick's sensemaking work (1995), and Smith and Peterson's (1995) sources of meaning projects, and Pike and Pike (1983) each see the person as more important than the thing. Speaker and the listener, with their biases and intents and other characteristics have dominant relevance to language above and beyond that of the objects, classes, rules and patterns which compose the language. Finding a way to describe and symbolize expressed relations among the encoders and decoders (usually people) and the data is critical.

Context for Pike and Pike then becomes a critical element of truth. Explanation itself involves truth. "Truth involves the relation of units to patterns, and pattern involves the integration of data and of observer within a larger system. Explanation in isolation is therefore invalid" (Pike and Pike, 1983, p2). It follows that knowledge since it carries a truth value by definition, always exits within some context. Since we are concerned with discerning and transferring knowledge, the level of embeddedness becomes an important issue.

> **Hypothesis D5.1:** More explicit organizational knowledge predicts higher levels of discernment of organizational knowledge, more embedded organizational knowledge predicts lower levels of discernment of organizational knowledge.

Furthermore, Nonaka (1991) speaks about tacit understanding being related to "know how," which is learned mostly via practice. Learning by trying something a number of times is an inductive process. It therefore follows that if the literature on "know-how" is correct,

then:

Hypothesis D5.2: A propensity or preference for induction predicts a higher level of discernment of organizational knowledge that is perceived as deeply embedded.

Knowledge That Is Ignored. Quine (1951) asserts that our natural tendency is to disturb the total system of beliefs as little as possible, especially deeply held theoretical propositions. This leads us to focus our revisions more upon specific statements and events of empirical reference than highly theoretical statements. (Quine 1951, 1991). Thus the social actor has a tendency to recount the empirical world from the perspective of theories. Recall the inability of General Motors to see that smaller efficient automobiles were desirable. They were stuck in a theoretical paradigm, ignoring empirical events in favor of their own deeply help theory.

There is some compatibility with this discussion and Weick's (1995) and Peterson's (1998) sensemaking perspectives. Putting them together, I would predict that social actors will likely alter or revise empirical events while engaging in sensemaking (Weick 1995), rather than revise deeply held abstract beliefs and opinions. What I see here is a contrary proposition that *despite successfully discerning* organizational knowledge, organizational members *still* will not tend to put the knowledge into action. That is, even when the knowledge may be useful, they will not change their routines and processes.

Hypothesis D5.3: Organizational members more likely ignore discerned-as-useful knowledge rather than putting it to use to revise existing routines and processes.

Even Thompson's (1967) discussion about protecting the operational core follows a similar structuring of the organization as this discussion of the structuring of knowledge. Thompson emphasizes the organizations rational desire to protect core operations from revision in favor of alterations in other organizational functions and routines. Thus organizations, as they rationalize to protect core functions will alter or reconstruct discerned knowledge to make it fit within the current schema. Which exactly are the departments that are more closed to change? Are they closed *because* of discernment difficulties or *regardless* of discernment difficulties? Hopefully Thompson (1967), has provided the solution. If we can operationalize members of the organizational core as 'line,' and members of the support areas as 'staff,' then the following two hypotheses make the general resistence to change hypotheses (offered above) more interesting.

Hypothesis D5.4a: Line department members are less likely to put discerned knowledge to use than members of staff departments.

Hypothesis D5.4b: Line department members are less likely than staff members to fully discern organizational knowledge

2.4.5.4 Perceived importance of knowledge

It would seem that some knowledge is simply too important to be ignored. Other things equal, knowledge that has been specifically targeted for acquisition by management will probably be noticed by organizational members if the importance is communicated to them. However, if the knowledge is not perceived as important, it may also be ignored, even if it truly is important. Recall IBM Corporations failure in the 1980's to perceive growth in the personal computer market as an important factor in their industry. Sub-Groups within

the company had indicated to top management that it was important for IBM to reorient itself to account for the growing demand for personal computers. Top management clearly *noticed*, but failed to place any importance on this knowledge they received, and little or no significant action was taken. Organizational members therefore failed to discern internally transferred knowledge much beyond the noticing stage.

> **Hypothesis D5.5:** Organizational knowledge that is perceived as more important by organizational members leads to a higher level of discernment than organizational knowledge that is perceived as less important by organizational members.

Complex knowledge requires increased or richer context to make it clear, and, other things equal, will suffer from weaker levels of discernment. Therefore, another primary effect complexity has upon knowledge transfer performance is confusion in sensemaking recontextualization of the knowledge. Recontextualization occurs in the later stages of discernment. Complex knowledge requires increased or richer context to make it clear. This leaves the knowledge itself more deeply embedded in its accompanying context. Confusion will reduce the likelihood that the discernment process concludes with objectified statements of how the knowledge may be turned into action to improve the members efficiency or effectiveness.

> **Hypothesis D5.6:** Organizational knowledge that is perceived as more complex will more likely be ignored or avoided (not discerned at all) while organizational knowledge that is perceived as less complex will more likely be fully discerned by organizational members.

2.4.5.5 General knowledge impedance

The characteristics of knowledge in which we are most interested can be covered by three facets of the construct. Consider the following questions: How important is the knowledge? Is the knowledge hidden, or explicit? Of what complexity is the knowledge? The first question concerning the value of knowledge is dealt with by literature the resource based view of the firm (Barney, 1991), and by the Teece's (1982) idea of value embedded in fungible slack resources. Concerns about hidden knowledge are addressed by determining if the knowledge is deeply embedded in contextual levels or made explicit on the surface. The perceived importance, the level of embeddedness, and the complexity of knowledge are the key facets of the knowledge impedance construct.

Very important knowledge will likely be noticed and transferred more quickly than low priority knowledge. Uncovering and explaining tacit knowledge is more difficult than doing the same for explicit knowledge. When knowledge is deeply embedded in some context it will be more difficult to notice, to extract and to understand than explicit knowledge, which is on the surface. The complexity of the knowledge affects knowledge transfer performance in two primary ways. The most basic is an organizational member's propensity to avoid very complex knowledge transfer. Organizational members may have a not-so-irrational fear of new knowledge that is deemed as complex. If the member does not understand, they run the risk of appearing foolish, incompetent or outdated. Research in the diffusion of information technology indicates that this is very much the case.

While each of these dimensions of knowledge impedance is different, taken together they should describe a general level of difficultly or ease with which the knowledge will be

discerned and put to use. It makes sense to look at the resultant force of the three vectors -- percieved importance, embeddedness and complexity of the knowledge describe the level of impedance. The sum of the vectors can be taken as a measure of knowledge impedance. Gold and currency, although they are different, can be added to together to calculate wealth. In a similar fashion, degrees of complexity, importance and embeddedness can be concatenated to describe one effect, the knowledge impedance. Unimportant, deeply embedded, highly complex organizational knowledge will have the highest impedance, while important, highly explicit, very simple organizational knowledge will have the lowest impedance.

Hypothesis D5.7: There is an inverse causal relationship between the level of impedance perceived by a department member, and the member's level of organizational knowledge discernment.

Hypothesis D5.8: There is an inverse causal relationship between the level of impedance perceived by a department member, and the frequently that discerned organizational knowledge is put to use.

2.4.6. General conclusions concerning the knowledge transfer style variables

Because of the various rational boundaries imposed by departmental context, cognitive and behavioral similarities emerge within department types, and idiosyncracies develop between department types. I have indicated how each of the five knowledge transfer style variables are affected. This leads to the first Grand Hypotheses of the dissertation:

Hypothesis Grand$_A$: If a department type's rational boundaries lead that department type's members to have a common and characteristic knowledge

transfer style, then we can accurately predict what department type an employee belongs to by observing their knowledge transfer style.

Because we also know that there are organizational cultures, and firm-wide boundaries on rationality, it makes sense that firms also cause firm members to have similar knowledge transfer styles.

Hypothesis Grand$_B$: If a firm's rational boundaries cause the firm's members to have a common and characteristic knowledge transfer style, then we can accurately predict what firm an employee belongs to by observing their knowledge transfer style.

By discussing each of the constructs and relationships in the left-hand portion of the model individually, it is also clear that the sources variance in the discernment of organizational knowledge are many. Each of the independent variables helps explain some portion of that variance, and together I believe they explain a great deal of the variance. One of the grand hypotheses of this project then, is:

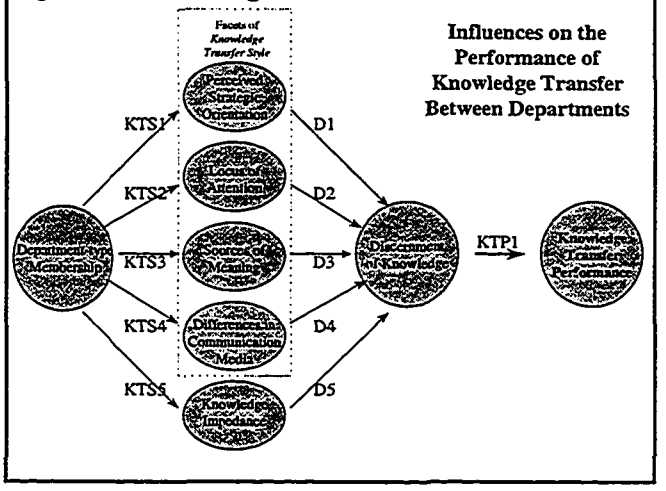
Hypothesis Grand$_C$: The perceived strategic orientation, locus of attention, characteristic sources of meaning, difference in communication media and knowledge impedance together predict a significant portion of the variance in an organizational member's knowledge discerning behavior.

2.4.7 Organizational knowledge transfer performance

Knowledge transfer performance is composed of sending knowledge to an

appropriate target after discernment, and evidence that the firm is using the knowledge. Knowledge is said to be useful if it is used to improve or create new processes, products, or procedures. Knowledge transfer performance must be weighted by the usefulness of the knowledge in terms of improved organizational rents through the creation of value. Organizational knowledge may not be immediately useful, but may have future value in terms of future usefulness.

Figure 20 Knowledge Transfer Performance



As products are moving down values chains (Porter, 1980) capital, temporal, human and knowledge resources are applied. Prahalad and Hamel (1991) suggest that important costs and significant value-added is related specifically to knowledge resources, and Zander and Kogut (1995) imply that this can be seen in the efficiency and effectiveness of their transfer.

Not all junctures in a process are equally pertinent to the transfer of organizational knowledge. There may be interactions critical to the transfer of raw materials, but insignificant in terms of potential knowledge related costs and value added. Other events are hotbeds for knowledge resources. There are knowledge supply centers and knowledge user centers. When the cost accountants create managerial accounting reports a wealth of potentially useful knowledge passes hands. In this case operations is the user and cost-

accounting is the supplier.

Organizational knowledge flows between organizational groups, across those sub-cultural boundaries which form in any organization over time as practices and routines become institutionalized (Selznick, 1957). It is the boundary spanning knowledge flows that will be examined, and which are organizationally important. In a well settled institution, less knowledge is expected to transfer across group boundaries to or from the organizational core. Only in purposely flexible "learning organizations" or in situations where there is a significant internal or external environmental conflict or change should significant amounts of knowledge be found to flow between core and non-core areas of the business. In most firms, this core should remain well protected and closed, as predicted by Thompson (1 967).

However, in any organization, when there is an environmental change or circumstance encountered by one group that could or should significantly impact the processes of another group, then it would be useful and important for knowledge to be sent, transferred across boundaries from group to group, and for that knowledge to be fully discerned so that adjustments can be made. Lindsay and Rue (1980) found that top management engages in more complete planning as the complexity and dynamism of the business environment increases. This is similar to saying that top management makes sure to move all the way to the last step of the discernment process (create an explicit action plan) in order to better insure that their knowledge will turn into useful action. There is an implicit rational hypothesis here that the more completely organizational knowledge is discerned, the better the chance of it performing for the betterment of the firm. Since modern organizational environments are typically complex and and dynamic (Thomas, Clark and

Gioia, 1993) it follows that this principle should apply to the majority of contemporary firms.

Open systems depend upon feedback from external environments in order to survive (Scott, 1998). At technical, managerial and institutional levels of the organization (Parsons, 1960; Thompson 1967) different emphasis for boundary spanning knowledge transfers are likely found. The technical level will operate primarily as closed rational system, resisting knowledge transfer, while the institutional level will operate as an open system, facilitating knowledge transfer. Even the technical level, buffered and bounded as it is, needs to open itself from time to time for maintenance of routines if the external environment changes. Feedback is necessary to survival. It makes theoretical sense that new knowledge transfers to the technical core are significant, since transaction costs are incurred in the form of the extra managerial time and other resources needed to clear buffers and open up an otherwise closed system.

It is the managerial level (Parsons 1960, Scott 1998) that must negotiate between these two different worlds. This study will focuses on how management can design processes, called knowledge management systems, that efficiently and effectively control and optimize the flow of knowledge both between technical, managerial and institutional levels, and horizontally across sub-groups within levels.

2.4.7.1 Efficiency, the transaction costs of the transfer

The cost of knowledge transfer will be partially a result of the time taken by the transfer. Managerial time is costly. Slack managerial time, is a strategic resource due to it's fungible nature (Teece, 1982). If resources used for knowledge transfer are not fungible resources, then there is no strategic cost to the use of these assets. It is assets that could have

been utilized in other ways that impact the strategic costs.

Teece, Pisano and Shuen (1997) define strategic resources as a "firm specific assets that are difficult if not impossible to imitate. Trade secrets and certain specialized production facilities and engineering experience are examples such assets are difficult to transfer among firms because of transaction costs and transfer costs and because the assets may contain tacit knowledge" (pg 516).

Slack is not much of a concern in a firm's computer information systems. Even though these systems may be highly fungible, no choice must be made between using a firm's computer information systems for knowledge transfer or some other important function. The marginal cost of using existing information system assets for knowledge transfer purposes is very small.

2.4.7.2 Effectiveness: the use of transferred knowledge

As discussed above, is important that knowledge is transferred on time, on budget, and with satisfied recipient. The cost of the transfer concerns the budget. The effectiveness concerns the timeliness, the satisfaction of the recipient, and the general benefit to the user. Szulanski (1996) used these so-called technical success indicators of a project (Randolph and Posner; 1988; Pinto and Matel, 1990) to measure the stickiness of internal transfer of best practice within the firm. Deviation in timing was measured as a departure from the expected schedule of key milestones. Following Szulanski's (1996) example, milestones can be seen as the start of the transfer, the first day the knowledge arrives in a useful form, and the achievement of satisfactory performance of the transferred knowledge.

Cohen an Levinthal (1990) suggest that knowledge transfer success depends a great

deal on absorptive capacity of the receiving party, largely focusing on organizational flexibility and creative interactions between the parties that will transfer the knowledge. Other studies have concurred with this viewpoint associating flexibility in organizational structure and management policy with the ability to learn new knowledge (Dodgson, 1993; Lyles and Baird, 1994). A study of joint ventures by Lyles and Salk (1996) indicates that capacity to learn in the form of creativity, flexibility and knowledge about individuals are significant factors to knowledge transfer success.

Kogut 1991 found that "the country that innovates in best practices eventually loses leadership, but not before increasing its wealth and claims on foreign assets and investments." Zander and Kogut (1995) demonstrate, through an empirical test, that the codifiability and the teachability of knowledge have a strong influence on the speed of transfer of organizational capabilities. The measures seem to indicate that knowledge complexity and equivocality have a strong affect upon transfer velocity.

Rational planning models suggest that full discernment, -- when the knowledge is made explicit in terms of an action plan or "how to" report -- will lead to better performance results (Andrews, 1965/1980/1987). Less rational models suggest that action is often taken without an explicit plan in place (Mintzberg, 1978). However, all things being equal, we would expect that knowledge which is not fully discerned, perhaps just reaching Brannen's (1991) "recontextualization" stage, has less likelihood of performing as well as a fully planned strategic operation.

Hypothesis Grand$_D$: Higher knowledge discernment behavior leads to higher performance of knowledge transferred.

Finally, there is a general hypothesis implicit in this discussion about organizational knowledge transfer performance. This research is important because of a purported problem: that much of the knowledge within an organization that *could* be put to use does not *actually* get put to use. This is a problem of actualized potential, of utilizing the slack in a highly fungible asset. In general, I have assumed that there is a significant difference between the potential and actual usage of organizational knowledge. Therefore, an very important hypothesis to test is:

Hypothesis $Grand_E$: A significant portion of organizational knowledge that is identified as potentially useful is not actually put to use.

2.4.8 Conclusions related to review of literature

Different organizational members, be they departments, work groups, informal lunch companions, even the company softball team, develop and institutionalize both physical and cognitive norms, routines and a other characteristics. These qualities often differ across groups but tend to be similar across the same types of groups (company softball teams, accounting and finance departments). Differences are most likely the case where areas of functional specialization differ to a large degree. These differences can work to impede the transfer of important knowledge, and the potential performance of the knowledge if it were put to use efficiently and effectively.

For example, at one research cite, a group of software development members working on the 'Felix' project, wear t-shirts which say "Giving birth to Felix" and pick up programming tips from a web-site known to C++ programers. The group norms are unusual compared to the rest of the company, but not strange. In fact, the development programmers

at another research site were oddly similar. On the other hand the members of the accounting departments would not be seen at work in any sort of t-shirt, and they look to the AICPA (American Institute of Certified Public Accountants) for new knowledge.

However, the two groups do have to interact. Knowledge passes from the programming group to the accounting and finance department concerning the integration of the back office accounting information system. Accounts receivable issues knowledge about client payment status so that programmers do not spend valuable time writing code for customers who do not pay.

These are very typical organizational routines. Due to the vast internal differences in character of these two organizational members, there is no guarantee that the knowledge transfer is either efficient or effective. It may be ineffective if programmers continue to write code for slow or non-paying clients, or if accounts receivable continue to make use of the accounting information system with less expertise than the information technology group. The transfer may be inefficient if any non necessary resources are used up in order to gain an effective knowledge transfer.

Because of the basic principles of group behavior, we find less-than-perfect compatibility in knowledge transfer. Because of the incompatibilities, performance suffers. However, if we could measure and identify the key aspects, or 'facets' of each group that effects its knowledge transfer performance, we can work to improve compatibility. Just the awareness that the IT folks have a deductive bias, tend to look to some website for new knowledge, and use 'cleanliness of code' rather than the mission statement as a source of meaning might help the organization. Perhaps a posting late payment messages on an intranet

web page that would not be missed by the IT folks would be a better way to manage the knowledge. But that is only the tip of the iceberg.

In the previous sections I have described how the discernment of knowledge is affected by at lease five different constructs. By looking into the organization and at the cognitive biases of its sub-groups, the varied organizational members, we might better understand how to improve the efficiency and effectiveness of organizational knowledge transfer.

CHAPTER 3 RESEARCH METHOD AND DESIGN

3.0 Introduction

This chapter reports pertinent information about the research sites and samples, presents the measures used to operationalize the constructs, and explains the data analysis techniques used for hypothesis testing. The chapter is divided into five primary sections.

In section 3.1 the most general issues regarding the research design are discussed. In order to quickly review the research question, I reintroduce the overall theoretical path model, explaining how it can be broken down into three sets of questions addressed by the main hypotheses of the study.

In section 3.2, the research sites and samples are reported. Information is offered pertaining to the organizations studied, the sample used to represent the target population, the types of departments represented and the pretest sites used to develop the scales and measurement instruments.

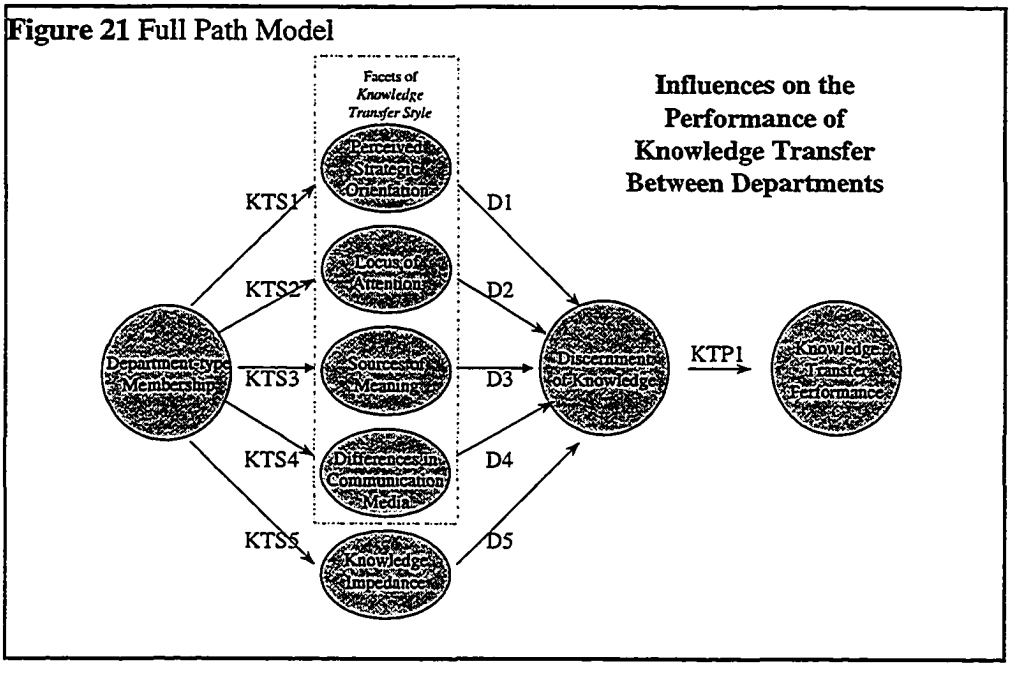
Section 3.3 and 3.4 address measurement issues. Section 3.3 states general measurement conventions and perspectives used to construct questionnaire items and measurement scales. Section 3.4 is a long section that deals with the measurement techniques used to objectify the theoretical constructs and gather the data for empirical analysis. I first describe the level of analysis of the study and the ontology of events (including organizational knowledge transfer events). Following a description of the general style of questionnaire items, including scaling conventions and the complexity and difficulty of the items, data acquisition methods are reported. I then disclose my measurement strategy for each of the variables in the hypotheses that will be tested. For each variable, I present a rationale for the related measurement technique, discuss any prior research that has measured

these relationships, offer examples of measurement items, present the reliability statistic(s) of the scale, factor analysis where necessary, present any other evidence of validity, discuss special issues such as aggregation of measures and discrepancy scales, and finally present some conclusions about the overall adequacy of the measurements. At the end of this section, descriptive statistics are reported for all of the variables measured.

Section 3.5 reports and defends the data analysis methods used to test the Grand Hypotheses. Some tests of the sub-hypotheses demand different treatment than the Grand Hypotheses. Therefore a section is included disclosing any analysis techniques used for specific hypotheses that were not used for other hypotheses. Unless noted in this subsection, specific hypotheses use the same analysis techniques as the Grand Hypotheses.

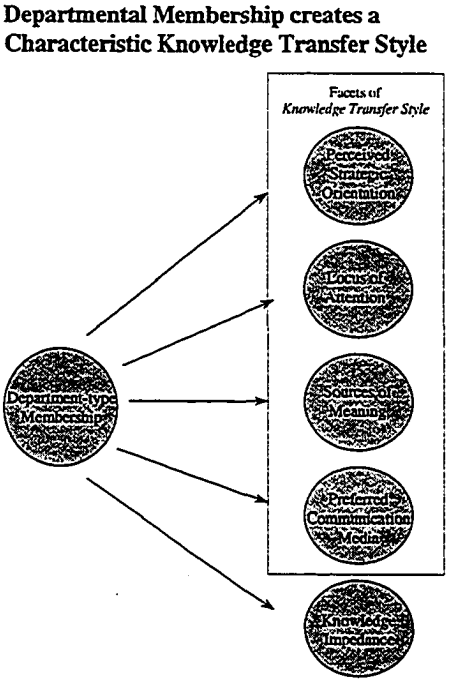
3.1 General Design Parameters

Figure 21 Full Path Model



The general design of the project revolves around the theoretical model depicted in **Figure 21.** This main path model can be broken down into three sub-models. The first column of relationships depicted identifies what I call an organizational member's 'knowledge transfer style' (KTS1-KTS5).

Figure 22 Knowledge Transfer Style



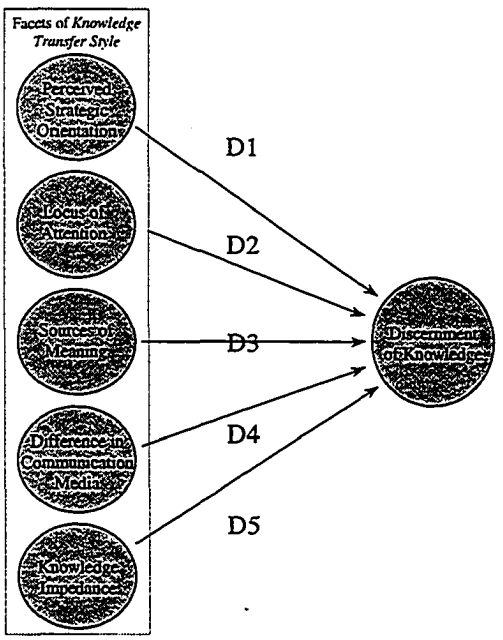
The first order of business (see **Figure 23**) is determining if department

(and/or firm) membership leads to a characteristic knowledge transfer style (KTS) among members. That is, are members of accounting departments, members of operations departments, members of research and development departments, and so on, different from each other in terms of the knowledge transfer style facets mentioned above?

Furthermore, I test for evidence that department membership helps cause the impedance characteristics of organizational knowledge. The measurable facets of organizational knowledge impedance are importance, complexity and embeddedness.

The second sub-model (see **Figure 23**) tests if the five exogenous variables – *the four facets of knowledge transfer style,* plus *knowledge impedance* – effect the discernment of organizational knowledge, indirectly effecting knowledge transfer performance. Note that "preferred communication media" is replaced in this model by "difference in communication media." This is a measure of the discrepancy between the preferred communication media of the department members sensing the knowledge, and the preferred communication media of the members of the other department doing the receiving. The construction of this difference scale is discussed below.

Figure 23 KTS Influences Discernment

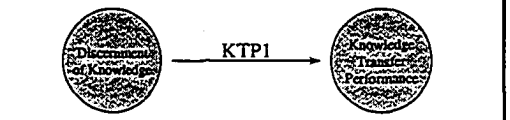


The third issue (see **Figure 24**)

involves analyzing the measures of three variables, *discernment of knowledge, knowledge transfer performance, and Knowledge Impedance,* discovering to what extent the level of the discernment of organizational knowledge impacts knowledge transfer performance, and finding out if knowledge impedance moderates this effect. Together, these three sub-models test the full path model offered in **Figure 21.**

Finally, while measures for strategic orientation, between group knowledge transfer performance and sources of meaning have previously been developed, measures and scales for impedance, locus of attention, communication media discrepancy and discernment have not been developed. It is therefore also a goal of this project to create and validate measures and scales for these constructs.

Figure 24 Discernment Impacts Transfer Performance



3.2 Sample and Research Sites

3.2.1 Sample

Analyzing the relationships in the theoretical model require gathering data from multiple sources, including members of different firms and different kinds of departments. This is required so that meaningful comparisons of means can be made, as well as generalizations of findings from the sample to the broader population. The sampling strategy of including representatives from different departments in different firms increases the variance needed to create scales and conduct statistical analysis.

In order to test the relationships depicted in the set of path models just described, employees from United States based high technology companies were targeted. This population was chosen because of the importance of innovation and change in high-tech industry environments. Given their need to innovate and improve, I hoped to find an adequate number of situations in which knowledge had transferred well, so that I could get at causes and effects. Furthermore, it is considered common knowledge that computer programmers are different from other employees, such as accounts and customer service employees, in many respects. Because hi-tech companies tend to employ many programmers in research and development departments, the potential for contrast between members of different departments is enhanced.

The general sampling strategy of the study was to gain high quality data from skilled members of as many different department-types as possible. The different department types I desired to measure were those that are commonly identified in a value chain analysis as either primary or support areas (Porter, 1985).

The full sample is a cross section of members working in similar divisions of two well known major high technology corporations. One corporation is a German multinational, but the sampled division is based and run entirely in the United States with an American CEO. The proper participants to target were identified as those employees that might be placed in roles directly related to project planning, coordination, knowledge transfer and/or implementation of new programs, products or procedures. This interpretation qualified a very broad range of employees to participate in the study. The standards were operationalized as managers, group leaders, functional experts, those whom would likely be included in

important project meetings, those that would likely be assigned to carry out important functional roles.

Seventy Five employees from Siemens ICN were sampled (73 usable). The participant's departments included Research and Development, Operations, Information Systems Support, After Sales Support/Customer Service, Human Resources, Marketing and Sales, and Accounting/Finance. These participants were scheduled to attend an assortment of career development courses provided on site by the firm during the collection period for this study. All managerial and supervisory employees are required to participate in these training courses at Siemens ICN. Therefore, the sample is a good representation of the firm.

A closely matching sample from Intel Corporation was gathered, but differences do exist. There were 45 usable surveys from Intel. The administration of the survey instrument was conducted during project group and department meetings on the work site. Responses from this firm were also gained from a number of departments types. Departments represented here include Accounting, Finance, Information Systems Support, Purchasing, Research and Development, Operations, and Marketing & Sales. The number of department members surveyed in each firm do not exactly match up, but they are relatively similar. A

summary of the sample gained from these two firms is presented in **Figure 25**. Because of the 'captive audience' collection environment, response rate from these subjects was greater than 90% (118 completed surveys out of 125 sampled).

Figure 25 Initial Categorization of Sample

Department	Name of Firm		Total
	Siemans Telecom Networks	Intel	
Accounting	9		9
Finance		8	8
Information Systems Support	7	5	12
Human Resources	4		4
Purchasing/Rec/Inventory Mgt.	1	2	3
Research and Development	19	14	33
Business Operations	14	10	24
Marketing and Sales	4	1	5
Delivery/Logistics	1		1
After Sales Support	12	6	18
General Management		1	1
Total	73	45	118

It was clear that some of the cell sizes were too small to provide adequate degrees of freedom for the planned hypothesis tests. Therefore, departments containing less than 11 cases were collapsed into more general categories. Specifically, accounting and finance were collapsed into a category named "accounting/finance." All other departments with insufficient cell sizes were collapsed into a group called "other" and were generally omitted from any analysis beyond validation of the measurement tools. **Figure26** is a department by firm cross-tabulation of the final sample used for hypothesis testing.

Figure 26 Final Categorization of Sample

Department	Name of Firm		Total
	Siemans Telecom Networks	Intel	
Information Systems Support	7	5	12
Research and Development	19	14	33
Business Operations	14	10	24
After Sales Support	12	6	18
Accounting/Finance	9	8	17
Other	10	4	14
Total	*73*	*45*	*118*

Most, but not every questionnaire survey returned passed basic

quality control. Each survey was fully reviewed by eye for correctness, completeness and clarity prior to any data entry. By *'correctness'* I mean no evidence that the participant did not follow the directions correctly. By *'completeness'* I mean that critical portions of the survey that make it useful were completed by the participant. By *'clarity'* I mean that the responses were directly comprehensible and could be recorded without interpretation. I believe that looking at the data and applying these three preliminary qualitative tests eliminated a large portion of systematic measurement error that might otherwise not have been found before detailed quantitative measures sorting out systematic from random error. Furthermore, error was minimized by carefully monitoring survey administration.

Data acquired from 118 respondents (members of Intel and Siemens) were used in the study. Participants are identified by firm/business unit, and by functional department membership.

The measurement instrument was tested on a convenience sample of 3rd year undergraduate students taking sections of the introductory course in the college of business at a large state university in South Florida. The majority of the testing was conducted in evening classes in which the average age of participants in the pilot sample was 27 years old, almost all of whom were holding regular daytime jobs. The pilot sample contained a high level of cultural diversity. Pilot surveys were controlled for those who indicated they were currently employed or had until recently been employed. Because these students were generally older than average undergraduates, were largely members of the local workforce and were not yet well versed in the academic language of business, they provided an adequate test of how well other members of the workforce would make sense of the

questionnaire items. Secondly, because they were just beginning academic training in business, they would tend to have some difficulty with items and language that were complex. This provided an opportunity to examine what items might be misunderstood, and to discuss how these items should be reworked so that they would make better sense to the 'average employee.'

Determining Appropriate Sample Size. In general, even with smaller sample sizes, researchers can comfortably conduct tests of hypotheses about population means, and differences in the means of two or more paired or independent samples (Snedecor and Cochran, 1989). However, variance-covariance analyses of scales become less powerful and accurate as the sample size shrinks. Appropriate sample size is determined by three main factors: the *desired level of confidence*, the *allowable margin of error* and the *variability in the population* from which I am sampling (Mason, Lind and Marchal, 1998). The higher the desired level of confidence, the larger the necessary size of the sample. In this case, the level of confidence is generally fixed at a minimum of 95% by the social norms of management science.

The absolute margin of error I can tolerate is context sensitive. With unstandardized measures, the units of measure matter a lot. Generally, the broader the scale the less any one unit of error matters. For example, On a ten point scales the real difference between a five and a six and a five and a seven may not be very important, while on a five-point scale the difference between a three and a five matters a great deal more.

Furthermore, if the primary issue is whether or not a significant effect exists, it is sufficient to limit the margin of error so that the confidence intervals do not cross zero. This

way, one can say that exogenous variables have a (positive or a negative) significant effect. However, as the exact degree of the effects become more important, confidence intervals must be smaller. Other things equal, larger sample sizes offer tighter margins of error. In this research project, the degree of the relationship is far less important than simply identifying some degree of significant relationship between constructs. This requirement then alleviates some of the pressure for a large sample.

The third factor in determining the size for a sample is the population standard deviation (and the actual standard deviation of the sample). In general, the larger the standard deviation of the population, the larger the sample that is required to make valid generalizations. The population in this study is organizational members in high technology computer and information technology firms. To some extent, staying within an industry and within a "technology culture" helps to limit the population dispersion within each of the constructs in the model. This, at least theoretically, takes some pressure off of sample size.

On the other hand, because of a competing need to construct reliable scales, variance remains a necessity. So although dispersion is confined by industry and high tech intensity, it is extended by purposely sampling very different organizational members within this industry.

Range based approximation of population variance. Two ways to estimate standard deviation are using range-based approximation and using results from pilot studies conducted during the creation of the measurement scales (Mason, Lind and Marchal, 1998). The range based approximation utilizes straightforward statistical logic. In any population, virtually all observations are expected to be within plus or minus three standard deviations

of the mean, assuming that the distributions are at least somewhat bell-shaped. The distance between the smallest and the largest measure is therefore around six standard deviations, and one standard deviation can be estimated at 1/6 of the range. Since the scales I have used have a range of five, one estimated standard deviation is (1/6)(5), or 0.833 units.

The standard deviations of responses from the pilot data were close to 1, indicating that the standard deviation of 0.833 offered by the "range" method may be liberal. This put pressure on increasing the sample size to control for random error. However, standard deviations for the final sample were on average less than the range-based estimates, alleviating this pressure on sample size.

Since I am using mostly 5-point scales, I decided to set an allowable error of less than 0.5 in either direction on the scale. My reasoning is that the difference between a unit on a five point scale is likely to have practical significance, unlike one point on a ten or a one hundred point scale. By using <0 .5 as a limit, I can be assured that my measures are not incorrect by more than half a unit, or 10%, in either direction. For managers developing a knowledge management system, it is unlikely that a 5% difference in knowledge transfer style or in knowledge transfer performance would be practically important. However a 20% difference would begin to create quite some concern.

Most of my hypotheses require more complex statistical manipulation than simple univariate t-tests. Snedecor and Cochran (1994) offer a method for estimating the sample size needed for comparative studies of independent samples. Applying my restrictions on allowable error to Snedecor and Cochran's technique indicates that sample sizes should be at least 10 per department/firm with an average standard deviation of no more than .75 (or

15%) to provide meaningful multivariate statistical comparisons that keep type I error limited to .05 and type II error limited to 20%. Actual average standard deviation was .79 for all five point scales in the research sample.

Finally, there are an assortment of "rules of thumb" offered by various authors concerning appropriate sample sizes for various statistical methods. Factor Analysis is one of the more demanding analytic techniques on sample size. For example, a 30-variable study begins analysis with 435 covariance measures ([30x29]/2) and an unknown number of factors (≤30). It is easy for situations to arise in which the number of parameters to be estimated exceeds the number of responses in the sample, thereby invalidating the results. Rules of thumb for this intensive multivariate technique range from 4 to 1 ratio of subjects to variables up to more recent demands for a 10 to 1 ratio (Newton & Rudestam, 1999). In this study usually no more than 20 variables are tested together at one time, yielding a suggested sample size of 80 to 200. The sample size of 118 for this study is therefore adequate for even the most demanding of the multivariate analytic techniques with up to 29 variables entered together at one time.

However there are one or two instances when as many as 30 variables are entered together (i.e. all the sources of meaning and all the communication media preferences together with locus of attention, strategic orientation, impedance and department membership). This yields a suggested sample size of 120 to 300 respondents. In cases when the actual sample may be somewhat smaller than that recommended by the rules of thumb, the more detailed sample size analysis is recommended concerning adequate power and allowable error within a particular study. This exact analysis has already been presented

above.

3.3 General Measurement Conventions and Techniques

3.3.1 Data acquisition strategy at point of contact

The general data collection strategy is using a detailed questionnaire survey to measure attitudes and behaviors of members of multiple departments in two high technology firms operating in similar markets. By comparing and contrasting the members of different departments within firms, different departments across firms, and members of different firms on measures of the knowledge transfer style variables, the various hypotheses are tested.

The data collection instrument (the Knowledge Transfer Style Survey) was designed to be used in a supervised setting. The questionnaire surveys were administered during on-site sessions at which respondents heard a detailed explanation by an assigned administrator, then immediately filled out pencil and paper surveys. Surveys were collected on the spot. The survey administrator remained among the respondents to clear up any confusion the respondents may have had about questionnaire items.

This method has significant cost advantages over mailing surveys, and the added advantage of direct contact with the respondents, strengthening the likelihood that the questionnaires will be properly understood, completed and returned. Although the Knowledge Transfer Style Survey is relatively long and complex, response rate and data quality using this method was extremely high.

The key to gathering high-quality data appeared to be a thorough explanation of the terms on the front page of the survey, the availability of a trained administrator, and getting to the respondents in a closed, controlled space. See the front page of the survey (in

appendix) for the material explained to each respondent. The discussion by the administrator included information about knowledge transfer, discernment, organizational knowledge, groups and departments, and customers. The text was designed to give respondents enough context to accurately complete the survey, without overwhelming them with theory.

3.3.2 Interpretation of constructs and dimensions

Constructs and dimensions are different objects of measurement. According to James Muliak and Brett (1982), constructs are "abstract...associated and presumed but not directly observable events" (55) and dimensions are "manifest variables that are indicators of latent variables" (109). That is, constructs are latent variables that are abstract and associated with events that are not directly observable, while dimensions (also called 'facets') are the observable variables that are used to indirectly measure constructs. Sharfman and Dean (1991b) explain that "several dimensions may be necessary to fully represent any given construct," and that "dimensions may be perfectly reliable but not strongly correlated.... If two or more variables are intended to measure the same dimension of a construct, it is reasonable to expect them to be correlated. This does not hold, however, when measuring different dimensions of a construct" (Sharfman and Dean, 1991b:712). In other words, when different variables are used to measure a single dimension of a construct, it is reasonable for them to be somewhat correlated, for they are constructed to measure the same thing. However, different dimensions of the same construct should be correlated as little as possible.

For example, there are two dimensions to the 'locus of attention' construct. One has to do with the *location* of attention, and the other with the *logic* of attention. The two

dimensions (or facets) are uncorrelated. Location deals with where a social actor tends to look, and logic deals with a social actor's propensity to attend to inductive cues or deductive cues. There is no reason that these should be correlated without including some other moderating contingency. To validate constructs, internal reliability analysis of each dimensional scale is employed, followed by a factor analysis to confirm the dimensional structure of each construct.

3.3.3 Level of analysis of social actors: departmental members

It is important that the level of analysis is related to the level of theory. The following discussion provides a basis for observing and measuring departmental members when studying knowledge transfer from department to department within organizations.

Social Actors and Organizational Members. Smith and Peterson's stream of event research, starting with Smith and Peterson (1988), through Peterson (1998) and Smith, Peterson and Schwartz's (1995) and Smith, Peterson and Schwartz's work in progress, speaks of 'social actors' when analyzing data collected from different groups. I call a social actor in a specific organization an "organizational member." Smith, Peterson and Schwartz (1995) define the social actor:

> "The acting observer is any individual, group, organization, nation, society or other identifiable social entity that one cares to define and analyze. A social actor is a generalized 'subject' constructing and processing an event treated as an 'object' for some period of time, while the event is the focus of attention (Davidson, 1985; Le Pore 1985; Quine, 1985; Peterson, 1998; Peterson & Smith, in press)" (Smith, Peterson and Smith 1995, p 6).

An organizational member is not defined by any number of individual persons, but is determined by the designation of organizational tasks. It is the researcher's job to determine the organizational members that their theory acts upon most directly, tend to sample those organizational members.

The organizational members chosen for sampling in this study are *individual departmental members.* Perhaps a good argument could be made supporting departments as the social actors most relevant to the theory, rather than departmental members. However without conclusive evidence that departments interpret information in a similar fashion to individuals, I'm reluctant to focus upon departments.

Departments. Departments are typically the 'first cut' below the organizational level of analysis. Some, but not all employees are members of particular departmental sub-groups, but the vast majority of employees are members of departments. Department types were selected and divided using the widely accepted taxonomy provided by Michael Porter's (1985) value chain. Line (core) and staff (support) departments are clearly indicated, as are standard names of the departmental members of the value chain within a business organization.

The "knowledge transfer style" of departmental members across business units is measured, allowing for the analysis of similarities and differences between members of different departments, as well as the general knowledge transfer performance within and between departments.

Departmental Members and Kinds. I theorize that through rational boundaries, acculturation, and exposure to coordinating mechanisms, members of the same department

tend to acquire similar knowledge transfer related beliefs, habits and behaviors, while members of other departments tend to be different from them on those same beliefs, habits and behaviors. It may also be the case that through forces of institutionalization and the experience of confronting similar tasks, members of the same *kinds* of departments in an industry, like members of accounting departments across high tech firms, tend to develop common work related beliefs, habits and behaviors. The level analysis in this study is the departmental member, who is simultaneously a member of a single department in a firm and a member of a *kind* of department across firms. For the sake of specificity, I will define the term 'departmental members' and its use. Departmental members are the individual persons who are directly participating in the tasks of a specific kind of department. For example, Siemens Information and Communication Networks has a kind of department known as an accounting department, John is an accountant who works in the accounting department, John is departmental member.

Departmental membership is measured by having respondents indicate the department with which they are most closely related and the workgroup with which they are most closely related, if any. Respondents are also asked to describe the nature of their work, so that any discrepancies may be resolved.

3.3.4 Level of analysis of events: occasions, situations and processes

Following Peterson (1998) the terms "event" and "events" are used to describe elements that social actors extract from social processes, as they engage an action frame of reference (Goffman, 1959, Burrell and Morgan 1979, Quine 1985, Isabella 1990, Peterson, 1998). Citing Commons (1924/1957) who advocated the transaction as a basic unit of

analysis for social science, Peterson (1998) calls for the adoption of the event as a common unit of analysis across organizational research streams.

Events are seen as having distinct qualities that environments, markets and other units of analysis do not. Events are always embedded within some degree of context, and events can occur at various levels. Because events are the typical context within which data occur and information is given meaning, analysis of events offers the ability to clearly specify the context, the problem domain and the meaning/information provided by data.

This dissertation is generally concerned with how organizational members handle more or less important, complex, and embedded inter-departmental knowledge transfer events. Given this context, I have adopted the following categorization of knowledge transfers. Any particular knowledge transfer event is an "occasion." A category of similar knowledge transfer occasions is a knowledge transfer "situation." For example one could say that the situation is the same but the specifics of each occasion vary. A knowledge transfer event (an occasion or general situation) is part of a "process," because it can be understood as an element of organizational learning, of organizational communication, or the organizational control process. A theory based upon events as the units of process influences the way that items are constructed a survey. Each should be anchored to an occasion, situation, and general process to provide a sufficient action frame of reference for the respondent to answer the question.

3.3.5 Organizational knowledge

To operationalize organizational knowledge situations, respondents were explicitly directed to contemplate only those transfers of practices, techniques, routines,

recipes or information to their department or group that were/are generally considered already *"tried and true"* within another area or other areas of the firm.

3.3.5.1 The targeted organizational knowledge

It is important to specify *which* knowledge I am measuring, rather than continuing to speak of 'organizational knowledge' in general. In other words, the context of each knowledge transfer situation is important to understanding the dynamics of the knowledge transfer process in general. Five "areas of knowledge" are assessed: a) the internal cost and/or financial performance knowledge, b) marketing knowledge about customer preferences and satisfaction, c) knowledge about management policies and procedures utilized within the firm, d) knowledge about innovations produced by research and development, such as products, services or processes and e) knowledge about computer software applications fully adopted by the information technology support group for use in the firm.

Figure 27 Areas of Organizational Knowledge

The five areas of knowledge examined in this study	
A:	Knowledge about cost and financial performance
B:	Knowledge about customer satisfaction and preferences
C:	Knowledge about organizational management practices
D:	Knowledge about technological innovations, products and services
E:	Knowledge about computer software applications adopted by the firm

Breaking out different areas of knowledge is not done for the purpose of gaining separate orthogonal factors. The technique serves two purposes. First, utilizing "areas of knowledge" is helpful because of the need to keep the level of analysis of events on the situational level. Secondly, addressing several critical areas of organizational knowledge is a way of ensuring that when speaking of 'organizational knowledge,' some major facets of organizational knowledge are being specified and measured so that the general construct is meaningful. Interviews with three top executives of high technology firms indicated that

these are each considered critical areas of organizational knowledge.

3.3.5.2 Knowledge transfer situations measured

I am interested in 'kinds' of knowledge transfer events, so that the results can be generalized to similar future situations. Therefore, specific occasions are avoided in favor of more comparable knowledge transfer situations. One might argue that unless all subjects are focused upon the same knowledge transfer occasion, one survey will not be commensurable with the next. It is therefore that Szulanski (1997) gathers data on specific knowledge transfer occasions within a firm. However, it is also customary in empirical science to observe a number of distinct but similar specific occasions and then group them

Figure 28 Knowledge Transfer Situations

I.When we implemented a management practice learned from another department.
From which department?_____
II.When an innovation created by research and development led to trying a new practice.
III.When customer feedback or other related knowledge from marketing led us to try something new.
IV.When internal accounting or finance reports led us to try a new policy or practice in our group.
V.When new computer technology/software was provided by the information technology (IT) support group
On a scale from 1 (low) to 5 (high), rate how often each of the above events occur: a.___ b.___ c.___ d.___ e.___

as 'kinds' (Quine, 1960).

Measures are directed at organizational knowledge transfer situations, as presented in **Figure 28.** As stated above, interviews CEO's helped me to arrive at the final set of situations. These situations represent an adequate range of the types of knowledge transfer situations in which many firms engage and management can monitor and strategically intervene in order to increase firm performance.

For example, when cost accountants create and distribute reports, a wealth of

potentially useful knowledge changes hands. Great costs can be incurred with inefficient transfer of this knowledge when reports are not timely, or when a manager does not understand the contents of a report. Value can be added and costs can be reduced by adjustments organizational members make when *using* the knowledge.[3] The other situations are similarly important to investigate. The process of transferring knowledge about customer preferences, management practices, technological innovations and software applications all may add help add value and/or reduce costs.

To summarize the discussion about level of analysis, I am measuring and comparing five knowledge transfer *situations* in which *departmental members* find themselves. This is primarily accomplished by querying respondents at the specific occasion level, and having them self-code the occasion as a 'kind' of situation.

3.3.6 Styles of questionnaire items

Wherever possible, items on the Knowledge Transfer Style Survey are posed in terms of events: "When a high-tech innovation was transferred leading to a new practice...." When customer comments and other feedback were gathered and reported...." Note that the event language allows the respondent to reference any occasion within the type of situation described in the item.

The questionnaire utilizes multiple methods and item formats. Many frequency scales are presented using semantic difference scales and extent-type items. Frequency scales are most appropriate for primary measurement in this study because I am measuring

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[3]During pilot testing, a survey of 53 working students indicated that 90% that were not comfortable reading accounting reports, and doubted there ability to make sense of them.

situations. As discussed above, situations are events that are generalizations over similar knowledge transfer occasions. Respondents indicate the frequency with which likely alternatives occur in a particular knowledge transfer situation.

Other items measure extent of agreement or disagreement with a statement. Scales are anchored with response alternatives such as "to a very small extent" and "to a very large extent" to extract attitudes and beliefs of the respondents. For example, following Smith, Peterson and Schwartz (1995), in order to profile characteristic sources of meaning, respondents are asked to rate a contingent item of the form 'when [such and such event occurs], to what extent are actions taken are affected by each of the following.....' Smith et al (1995) explain that this type of phrasing uses the passive voice and specifically avoids the use of the active voice. This removes any connotation that a social actor must *use* a source in order for the source to have an effect upon an action or situation. This type of effort to decentralize the items from the individual to the more general level of analysis is a convention I use throughout the survey. Furthermore, by providing context, Peterson (1985) demonstrates that event contingent measures capture detail and meaning that other measures can not. As suggested by Glick (1985;1988) simply using the more macro social level as the subject of each item can be very helpful. For example: "when your group decided to use a new high tech product or new high tech feature...." Each item offers a similar direct description of the situations that I want to measure.

3.3.7 Difficulty level of item language

I use the terms sense and reference when I speak of questionnaire items. Sense is the full meaning of an item, and reference is the external or the *extended* object. Quine (1951)

explains the importance of removing variability, removing differences between sense and reference in our sciences. However, natural language is filled with discrepancies, and whenever possible I prefer the use of scientific language and terms. Although scientific terms are often less familiar to respondents, their sense and reference are less ambiguous/equivocal. Furthermore, science to some extent has become a universal language. Reduction of equivocality is a critical goal when dealing with sensemaking and meaning (Weick, 1979; Weick and Daft, 1992). In this project there is a clear tradeoff between simplicity of items and specificity of items. I have chosen the specificity side. I am depending upon the respondents to have broad enough vocabularies to comprehend occasional scientific phrases. I control for confusion by carefully re-framing questions, presenting them multiple times in different formats, and having a trained administrator on cite to explain the items. In this way I make sure the full scientific object is described while preserving the intended sense and reference. The success of this technique is determined by checking the psychometric properties of the data: that is, examining factor structures and alpha coefficients to assess reliability and validity of the measurement scales.

3.3.8 Scaling conventions

The vast majority of questionnaire items are used to construct discrete five point scales for each construct. Because the constructs in the model are latent variables, multiple measures of each variable are needed to capture all facets of each construct and to create useful scales. Items which contribute inordinately to low scale reliability scores are removed unless it is theoretically inappropriate to do so. No less than three items are used to construct the large majority of scales.

3.3.9 Sources of Measures

In the first stage of the model the predictor (department type) and the dependent variables (the knowledge transfer style constructs) come from separate sources, so there is no major concern about systematic measurement error confounding the results. However, the second stage hypothesis tests are conducted using same source data. That is, I gain my measures of both the independent and dependent variables from the same respondent on the same survey instrument, rather than from separate sources. The following steps have been taken to minimize systematic measurement error commonly associated with same source data.

First, multiple item-styles and scales styles were used on the questionnaire survey. As I will demonstrate in the next section, each construct was measured using a very different item style and format. Some scales were reversed, some scales used "extent" language, other scales used icons rather than works as anchors. Secondly, items were constructed and presented in such a way that it was difficult for respondents to discern the relationship between them. Thirdly, each variable was measured using sets of items that forced the respondent to reply from at least three different event contexts. Finally, hierarchical regression analysis is used to eliminate the correlation between the independent and dependent variables that is due to a systematic tendency of respondents to use only a certain portion (like the top end) of scales.

3.4 Measures for the theoretical constructs

This section provides detailed explanation and description of how each construct in

the proposed model is operationalized and measured. Each sub-section does seven things. It (1) summarizes the dimensions of each construct that are measured; (2) discloses relevant prior studies that have dealt with the same or similar variables; (3) provides a rational for the measurement method selected; (4) describes the construction of the scales used to measure these dimensions including examples of the items used; (5) provides evidence for the reliability and validity of the scale; (6) when necessary reports any special issues related to the scale; and (7) contains a statement about the adequacy of the scale. The section concludes with a descriptive statistics of all of the variables measured. Pearson correlation statistics are not included with these descriptive statistics, but can be found in the appendix.

3.4.1 Measuring strategic orientation of the firm and strategic orientation of the department

3.4.1.1 Previous usages of strategic orientation

Strategic orientation of the firm (Miles and Snow, 1978) has been measured many times. However, there is debate in the management literature about how to best assess strategic orientation of the firm. Furthermore, there is no precedent for measuring the strategic orientation of the *department* – a closely related construct that is introduced in this dissertation.

One popular measurement technique used to assess strategic orientation is the self typing paragraph approach. This method asks each respondent to read four short paragraphs and choose that which best identifies the group/organization in question. Another method is to use multiple survey items that measure different facets of strategic orientation. Beekun and Ginn (1993) use both methods to measure strategic orientation: self typing by paragraph

Figure 29 Strategic Orientation Descriptions

Please read the following four paragraphs and then respond to the questions as best as you can:

1. Organizations which have narrow product-market domains. Top managers in this type of organization are highly expert in their organization's limited area of operation but do not tend to search outside of their domains for new opportunities. As a result of this narrow focus, these organizations seldom need to make major adjustments in their technology, structure, or methods of operation. Instead, they devote primary attention to improving the efficiency of their existing operations.

2. Organizations which operate in two types of product-market domains, one relatively stable, the other changing. In their stable areas, these organizations operate routinely and efficiently through use of formalized structures and processes. In their more turbulent areas, top managers watch their competitors closely for new ideas, and then they rapidly adopt those which appear to be the most promising.

3. Organizations which almost continually search for market opportunities, and they regularly experiment with potential responses to emerging environmental trends. Thus, these organizations often are the creators of change and uncertainty to which their competitors must respond. However, because of their strong concern for product and market innovation, these organizations usually are not completely efficient.

4. Organizations in which top managers frequently perceive change and uncertainty occurring in their organizational environments but are unable to respond effectively. Because this type of organization lacks a consistent strategy-structure relationship, it seldom makes adjustment of any sort until forced to do so by environmental pressures.

identification and scaled questionnaire survey items. First they duplicated the methods used by Miles and Snow (1978), and Snow and Hrebiniak (1980). CEO's were provided with a description of each Miles and Snow strategy type (see **Figure 29**) and were asked to classify their firm's strategy using these descriptions. The CEOs were also asked to classify the strategy of competing firms in their market area. As a third check on strategy classification, each executive also rated his/her firm along 12 dimensions, extracted by Ginn (1990) from Miles and Snow's (1984) discussion of the four strategy types. These dimensions were presented in the form of Likert-scaled questions. The purpose of administering these policy

questions was to see if the CEO's responses were consistent with the self-evaluations. Floyd and Wooldridge (1992) do not use the self-typing paragraph approach at all. They identify strategic orientation based upon interviews, annual reports, and questionnaire survey items. James, and Hatten, (1995) investigated various methods of assessing Miles and Snow's strategic archetypes in the banking industry and found support for the validity of the self typing paragraph approach.

Doty, Glick and Huber (1993) tested the Miles and Snow typology using three different interpretations of the strategic orientation theory. One interpretation includes three canonical ideal types, another interpretation add the reactor type as a fourth canonical category, and a third interpretation suggests that the three ideal types form a continuum from defender to analyzer to prospector. The results of their study revealed that a superior 24% of the variance in effectiveness was explained using the three type continuum interpretation ($p<.01$), while the three ideal type canonical interpretation explained 17% ($p<.01$) of variance, and the four category model only 8 percent ($p<.05$).

3.4.1.2 Strategic orientation scale development

Following the lead of the Doty et al (1993) study, I decided to collect data on three categories and analyze the results as if they formed a single continuous scale. As Doty et al argue: "...the continuum-of-types interpretation of the theory is superior on each of the three evaluation criteria suggested above: consistency with *a priori* arguments of Miles and Snow, predicted variance in effectiveness, and parsimony." (Doty et al, 1993, p 1234.) Furthermore, in deference to James, and Hatten's (1995) study, I decided to at least pre-test the effectiveness of the self typing paragraph technique.

Eight items were subjected to extensive pre-testing for inclusion in the strategic orientation scales. Two scales were needed, a "strategic orientation of the firm" scale and a "strategic orientation of the department" scale. The first item on each scale asked respondents to read four paragraphs describing the four strategic orientations, and to indicate which paragraph best matched their own firm/department. The descriptions from Miles and Snow (1978) shown in **Figure 29** were used during pre-testing. The other seven items are presented in **Figure 30**.

Two problems were expected with the self-typing method for measuring strategic

Figure 30 Firm Strategic Orientation Items

1 Does your *company* focus on a narrow or a broad market for your products?

1	2	3	4	5	6	7
very narrow						very broad

2 Does your *company* have a broad product line?

1	2	3	4	5	6	7
very narrow						very broad

3 Does your *firm* usually try hard to preserve old ways of doing things (1) or is there a push for innovation and change (7)?

1	2	3	4	5	6	7
preserve old						constant change

4 To what extent is your firm continuously looking for new ways of doing old things?

1	2	3	4	5	6	7
A small extent						A great extent

5 In your firm, is there more of an emphasis on efficiency (1) or creativity (7) or something in the middle?

1	2	3	4	5	6	7
Efficiency						Creativity

6 To what extent is your firm searching for new, alternative markets for your firm's products?

1	2	3	4	5	6	7
A small extent						A great extent

7 Is your company looking for new knowledge about work processes, consumer markets or competitors, or do you pretty much have all the information you need already?

1	2	3	4	5	6	7
Have what we need						Constantly in need of new knowledge

orientation. The paragraph typing technique seems likely to evoke emotive responses, begging the question so that respondents are likely to pick the "most appealing" paragraph rather than the most accurate. Secondly, the original paragraphs were written only to describe business units. While appropriate for my need to measure strategic orientation of the firm, it is not apparent that these same paragraphs make clear enough sense on the departmental level to continue their use in this study. However the items were tested anyway, substituting 'department' for 'organization' in the paragraphs, and offering special instructions that respondents refer to their department or work group, and not their firm.

The other items were targeted at more detailed and specific facets of strategic orientation of each of Miles and Snow's ideal types. These items were constructed from the paragraphs to produce a single scale moving from "defender" through "analyzer" to "prospector," as suggested by Doty, Glick and Huber (1995).

A correlation matrix of the initial test results indicates that the paragraph-typing item may in fact be problematic. While there was significant correlation between SOG1 and other items, the degree of inter-item correlation is weaker than that of any of the other items.

An attempt has also been made to measure strategic orientation (Miles and Snow, 1978) on the departmental level as well as the traditional business unit level. The same items were used for both constructs, with the language very slightly changed to focus the subject upon his/her sub-group or department rather than the strategic orientation of the business unit in general.

3.4.1.3 Reliability and validity of pilot data

Scale reliability was examined using Cronbach's coefficient alpha statistic for

internal reliability. Overall, in pilot testing, the scale performed very well (α=0.86). However there was evidenced that the paragraph typing item was not valid. If the scales items are measures of the paragraph descriptions, then a multiple regression model of that relationship should have a very high r^2. However, multiple regression indicates that only 17% of the variance in the paragraph responses can be explained by the other strategic orientation items. The r^2 statistic of .17 and an adjusted r^2 statistic of 0.09 indicate that the two scales may not be functionally equivalent. Subsequently, for reasons of caution and parsimony, the paragraph typing method was not included in the final data collection.

Principle component factor analysis was conducted on the seven Likert scale items, first for the department orientation scale, then for the firm orientation scale. If the items are properly constructed to yield single scales, a single factor should be found to account for the vast majority of the variance, and all of the items should load well on that single factor. Furthermore, in light of the need for parsimony, it might be possible to reduce the number of items from seven to something less while preserving the integrity of the scale. For the department orientation scale, only one factor was extracted, accounting for 55% of the variance in responses. For the firm orientation scales, only one factor was extracted accounting for 52% of the variance.

After gathering this evidence that the both department and firm orientation scales are reliable, I checked for evidence of discriminate validity. I did this by testing for a significant difference between strategic orientation at the firm level, and strategic orientation at the group level. The individual items composing each scale were aggregated across items to give overall strategic orientation scores. Then a simple paired t-test was used to check for a

significant difference between the strategic orientation of the firm and strategic orientation of the department. A p-value of .0281 indicates that the difference is significant, so I reject the null hypothesis that there is no difference between the two constructs. I also ran the Wilcoxon signed rank test, which is more robust against the potential error introduced by less than normally distributed continuous data. The results (p=.0188) confirm the rejection of the null hypothesis. All of these test results, along with theory developed by Thompson (1967) and my own arguments that there is face validity for strategic orientation across departments, lead me to conclude that both scales are reliable and valid.

Organizational members are therefore asked to identify the strategic orientation of both the firm as a whole, and of their particular department or work group using the continuous scales as recommended by Doty, Glick and Huber. **Figure 30** lists the final set of items used to measure firm strategic orientation. See the KTS Survey in the appendix for the relatively identical items used to measure strategic orientation of the department.

Figure 31 KTS 1.1 Factor Analysis of two strategic orientation measures

	Component	
	1	2
SOG5	.837	-.127
SOG3	.803	.281
SOG6	.800	.173
SOG4	.778	.341
SOG1	.705	.346
SOG7	.693	.218
SOG2	.670	.334
SOF6	-.014	.794
SOF3	.103	.753
SOF4	.190	.741
SOF7	.238	.734
SOF2	.275	.653
SOF5	.198	.578
SOF1	.276	.492

Rotation Method: Varimax with Kaiser Normalization.

SOG: Strategic Orientation of Department
SOF: Strategic Orientation of Firm

3.4.1.4 Reliability and validity of final strategic orientation sample

Subjects were presented with fourteen items, i.e. seven items asking about firm strategic orientation and seven similar items asking about department strategic orientation. Because strategic orientation of the group/department is a proposed construct, the corresponding hypothesis test needs to be

conducted in this section as construct validity is assessed. The hypothesis constructed to test that proposition is:

Hypothesis KTS 1.1 : *Organizational members meaningfully distinguish the strategic orientation of their department from the strategic orientation of their firm.*

The reliability of the scale for strategic orientation of the department/work-group was fine (alpha=0.8966). The reliability of the strategic orientation of the firm was also satisfactory (alpha=0.8297). Factor analysis validated the existence of two distinct theoretical constructs. A confirmatory-style (not LISREL) principle components factor analysis with varimax rotation, in which the factors are limited to two (see **Figure 31**) shows all 'firm' items loading together on one factor with no department items, and all 'department' items loading together on another factor with no 'firm items'. The two factors together account for about 60% of the variance. When constraints on the number of factors were released, the departmental and firm measure remained 100% distinct. These results offer evidence that strategic orientation of the firm is functionally and psychometrically distinct from strategic orientation of the department/work-group. While (strictly speaking) there is not a statistic for testing the null hypothesis using factor analysis, the quantitative evidence is sufficient to reject the null hypothesis that organizational members do not distinguish between departmental and firm strategic orientation.

The next task is testing statistic the slightly different question of significant difference between strategic orientation of the firm and strategic orientation of the department. Subjects may distinguish between the two, but find that their department and the firm both tend to have the same strategic orientation.

Hypothesis KTS1.2: *There is a significant difference between the strategic orientation of the firm and the strategic orientation of the department.*

The null hypothesis is that there is no significant difference between strategic orientation of the group and strategic orientation of the firm measures. Controlling for firm membership, a paired sample t-test, correlation analysis, discriminant analysis and MANOVA (Levine's test of equality of error variances and Box's M test for equality of covariance matrices), were all used to test the null and alternative hypotheses. The Levene's statistic tests the null hypothesis that the error variance of the dependent variable is equal across groups. The test for firm strategic orientation had p=.235 (can't reject that error variances are equal across groups) while department strategic orientation had p=.001 (can reject that error variances are equal across groups). Box's M indicates that an equivalent covariance matrix across department hypothesis can be rejected with only a .019 chance of error, implying that error covariance matrices are different for different departments. The t-test also indicates shows a statistically significant difference with a p-value of <.001 (see **Figure 32**). These are all indications that KTS1.2 is supported. These results also validate the two scales and offer construct validity for the strategic orientation of the department.

Figure 32 KTS1.2 Strategic Orientation t-test results

Paired Samples Test	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Dev	Std. Error Mean	95% CI Lower	95% CI Upper			
Firm Strategic Orientation - Department Strategic Orientation	0.5	1.425	.13118	0.2402	.75980	3.812	117	.000

There are practical limitations to these results. The two constructs are found to be

significantly correlated ($p < 0.001$), casting doubt on this hypothesis of a significant difference between the two. Furthermore, on a seven point scale, from 1=Defender to 7-Prospector, the mean difference between the two constructs is no more than .50, which in most situations would not likely indicate a practical difference in orientation.

3.4.1.5 Adequacy of the strategic orientation measures

From a psychometric perspective, these scales appear adequate for the task at hand. Respondents have little difficulty making sense of the items. However there are shortcomings.

First, despite the positive psychometrics, there is still the possibility that strategic orientation at the department level is an unclear construct. How, for example, are respondents supposed to interpret terms like "new markets for your products?" Does "new markets" mean new internal customers/user in the business value chain or new external markets, or both? This remains a built in weakness of this scale. The current solution is to provide clear directions that customers and markets can be either internal or external to the firm. These directions were provided by the administrator of the survey prior to each assessment session.

Secondly, the use of Doty, Glick and Huber's (1991) scales breaks to some extent with the theory of distinct routines to solve organizational problems. Miles and Snow present us with three distinct orientation categories that are in many ways mutually exclusive. The defenders go about solving core organizational problems in fundamentally different ways than do the prospectors or the analyzers. Continuous scales cloud this distinction. One solution is creating cut-off points on the scales. For example, on the seven point scales scores

of one or two might be considered "defender-ish," three four and five "analyzer-ish" and six and seven "prospector-ish." I have decided not to code the scores into discrete orientations, foregoing categorical analytic methods in favor of linear analyses like regression. The weakness of this decision is that it becomes less accurate to say "defender" and more correct to speak of "relatively defender-ish." The strength of this decision is the enhanced ability to test directional hypotheses. That is, a high score on the perceived strategic orientation scale is a "more-prospectorish" score, which can be tested for association with greater levels of organizational knowledge discernment.

Finally, for some of the hypothesis tests, perceived strategic orientation of the department is removed from the analysis. This is because of a high level of covariance between the strategic orientation of the department measure and external location of attentions measure. The factor analysis of all the measurement scales provided with other summary statistics at the end of this section clearly creates a single dimension among external locations of attention, perceived strategic orientation and external task environment sources of meaning. At least in the minds of respondents, these are very similar ideas. Please see **Figure 61** for detailed statistics.

3.4.2 Measuring locus of attention

Locus of attention describes the characteristic or most common location and logical mode of a social actor's attention. More than one scale is needed to assess the different facets of this construct. Two general facets and two specific facets need to be measured. One general facet to measure is the degree to which departmental members' attention is focused internally versus externally. The other is the degree to which departmental members

attend to inductive cues versus deductive cues. These scales refer to the *location* of attention and the *logic* of attention.

3.4.2.1 Previous measurements of locus of attention

No prior measurements of this construct or of the individual facets of this construct were found in the management literature. Some scales measuring related facets exist and are discussed below. These existing scales were found to be insufficient for the current research.

Previous measures of the inductive and deductive facets. Measures for inductive and deductive reasoning ability have been established in the area of cognitive abilities in education. Deductive reasoning is applying general rules and theories to different individual and unlike pieces of information (clues) to solve problems and arrive at logical answers. Jobs requiring enhanced deductive reasoning ability are engineer, mathematician, computer programmer, research analyst, judge and auto mechanic (Fleishman and Reilly, 1992). The Educational Testing Service's (ETS) *Nonsense Syllogisms Test -RL-1,* presents subjects with two fifteen item subscales composed of formal logical syllogisms using nonsense content. This content is used so that a solution cannot be arrived at using past experience. *The PSI Basic Skills Tests for Business Industry and Government: Reasoning (BST #10),* by Psychological Services, Inc. is used to select clerical and office workers. Respondents are asked to draw logical conclusions from factual information presented in multiple choice format. The Verbal Critical Reasoning by Saville and Holdworth Ltd. is a 60-item multiple choice test. The items ask whether (a) a suggested conclusion, (b) the opposite conclusion, or (c) neither, follow logically from passages that the subjects are asked to read. The test has a high degree of correlation with managerial skills and success (Fleishman and Reilly, 1992)

and is used for management selection and graduate student recruitment. The California Critical Thinking Skills Test (Facione, 1991) contains subscales for both inductive and deductive reasoning ability.

Inductive reasoning is recognizing patterns in separate pieces of similar information, and extracting a general rule. Jobs that tend to specifically require excellent inductive ability are statistician, psychologist, medical doctor, juror and meteorologist (Fleishman and Reilly, 1992). The ETS *Letter Sets* test presents subjects with five sequences of four letters. The task is to find the rule that relates four of the sets to each other, and to mark the set that does not fit the inductively derived rule. The ETS *Locations Test* is similar to the Letter Sets test, except that respondents are presented with items containing five rows of dashes and gaps rather than sequences of letters. The Educational Testing Service (ETS) reports that these tests have been used in a number of research and experimental projects. Saville and Holdsworth hold the rights to the *Numerical Critical Reasoning Test.* It is a pencil and paper measure composed of 40 multiple choice items. Respondents make inferences from numerical data. Saville and Holdsworth report that the test is useful for selection of general managers and other senior managerial staff, as well as graduate students.

All of the above scales concerning induction and deduction were reviewed for use in this dissertation, and none were deemed appropriate. The main barrier is the length and complexity of these established scales. The better scales use as many as 60 items. Secondly, the facet I am trying to measure in this dissertation is logic of attention bias precipitated by departmental membership. Thus, I am more intent upon finding department members' *preferences for attending to* inductively or deductively presented knowledge, than upon

measuring their ability to *correctly analyze* and learn the organizational knowledge.

Previous measures of the location of attention facet. The need for social actors to consider environmental forces is obvious. Duncan, (1972) identified particularly important factors and components of the environment that must be considered. A sharp distinction is made between internal and external environments. Internal components include factors related to personnel, organization structure and organizational mission and purpose. External components include customers, suppliers, competitors, technology, and socio-political sub-groups such as governments, public attitudes and trade unions. The Duncan study asked individuals to think about the "decision unit" of which they are a member. Respondents then indicate what environmental components they utilized.

Duncan's (1972) purpose was to gain a perceived uncertainty measure faced by the decision group under different contingencies. Duncan did not focus upon *which* particular environmental components are attended to (as is my purpose), but on *how many* different environmental components are utilized in a decision. Boyd and Fulk, (1996) utilize the Miles and Snow (1978) administrative, engineering, entrepreneurial and regulatory management problem categories to construct their contingencies affecting scanning behavior. These studies indicate that because behavior may vary given different decision making situations, it is important to either measure and explain behavior under different contingencies, or to keep the situations measured at similar levels of simplicity/complexity.

Thomas, Clark and Gioia (1993) measured scanning behavior in terms of sources of information used by heath care workers in making sense of events. For the most part, the scales developed for that study are specific to health care facilities. They present different

paragraph-style health care management scenarios followed by nine items constructed directly from each scenario. The items ask respondents to "indicate for each piece of information the extent to which your hospital would use it to clarify and define the issue(s)" (p.269). The items are used to assess the respondent propensity for scanning internal and external sources. Their items are scaled so that high scores indicate extensive use of external sources.

Maier, Rainer and Snyder (1997) created scales to measure usage frequency of six different information sources by high level information systems managers. They use six-point scales to measure attention to a number of different human sources (friends, advisors, customers, peers, scholars, etc), different documentary sources (newsletter, handbooks, indices, etc) , different vendor sources, different combination sources (trade shows, conferences, etc), academic journal and trade journals. The scale reliabilities were acceptable. Unfortunately, the number of items per scale are a major barrier if there are any other measurement tasks at hand. Furthermore, efforts to contact the authors and obtain the exact items were unsuccessful.

3.4.2.2 Adopted measurement strategy for locus of attention

I adopt from the Duncan (1972) study the method of asking respondents to indicate what environmental factors they attend to, but rather than decision making situations, I substitute knowledge transfer situations. For control purposes I try to keep the level of simplicity/complexity and area of management problem (Miles and Snow, 1978; Boyd and Fulk, 1996) consistent across the items, so that perceived environmental uncertainty and contingency issues do not confound my measures. I adopt from Thomas, Clark and Gioia

(1993) a general internal/external bifurcation, but also break the environments into sub-factors such as customers, suppliers, etc. in case this cross sectional information is useful, as indicated by Duncan (1972).

The facets of locus of attention are measured assuming three slightly different situations: when trying to increase productivity in the department; when trying to find better ways to plan, organize and control in the department, and when trying to find ways to add more value to the product or service provided by the department. As stated above these are all of similar complexity and all involve solving an "administrative" problem (Miles and Snow, 1978) Each contingency provides one item for the locus of attention scale. Some variance is expected across the contingencies since they describe somewhat different work-related situations. However, locus of attention in this study is a cognitive tendency across situations, so the three items provide a general indication of a social actor's locus of attention. To the extent that different departments engage in solving the different organizational problems (i.e. administrative, engineering, entrepreneurial and regulatory) these contingencies are controlled for by department membership.

The two primary scales were internal vs external location of attention, and inductive versus deductive logical preference. For example, because I want to know the extent to which a firm looks internally versus externally, items are included to specifically create a single internal to external attention scale. An example of this sort of item is included in **Figure 33.**

Figure 33 LOA item example

Where does your group typically look for new knowledge: outside the firm (externally) or within the firm (internally).

1	2	3	4	5
Only Internally		Both Equally		Only externally

Because it is possible that the endpoints of the scales are not mutually exclusive, each of the attention location and attention logic facets is also measured on independent scales. For example, departmental members may focus attention both internally and externally, and they may be comfortable (or uncomfortable) with both inductive and deductive logics. Therefore individual scales are included to measure the extent to which the departmental members' joint attention is focused within the firm, outside the firm, etc. when looking to make action oriented decisions.

Seven items are targeted at finding out what biases organizational members have concerning where they look for information and new knowledge and how they acquire it. Organizations and organizational members may be biased toward looking externally to partners or customers for knowledge, or internally to a research and development department. Secondly organizations and organizational members may have a bias toward inducing knowledge, while others may have a deductive acquisition bias. Subjects are presented with five items to determine and inductive-deductive bias scale.

Subjects are asked to what extent their group tends to look in different locations in different situations. Their attention may be toward internal sources, to sources in the task/industry environment, or in the more general environment. Items A through G are presented to the respondent three times, with slightly different situational descriptors. Three

Figure 34 LOA item example 2

When your group is trying to find a way to increase your group's productivity, it very often looks:

A.	Within our own group	Y!	Y	O	N	N!
B.	To another group/unit in the firm	Y!	Y	O	N	N!
C.	To our customers	Y!	Y	O	N	N!
D.	To our suppliers	Y!	Y	O	N	N!
E.	To our competitors	Y!	Y	O	N	N!
F.	To our professional community and colleagues	Y!	Y	O	N	N!
G.	To joint venture and other business partners	Y!	Y	O	N	N!

of the same item for a scale. In this manner scales are produced indicating the department's general attention biases toward a number of different locations. **Figure 34** offers one of the situations and the items used for each situation. For the current study, item "B" shown in **Figure 34** may be especially useful. For example, three item B's form a scale assessing the extent to which knowledge gaining attention is focused upon other groups and departments within the firm.

Figure 35 Induction/Deduction item example

When your group acquires knowledge, how does it realize that the a new practice, policy or technique related to the knowledge will probably work well?

A. **We try it out a few times (use induction):**

Y! Y O N N!

B. **We figure out if it is logical (use deduction)**

Y! Y O N N!

I also attempt to determine if departmental members have a bias toward logically-inductive or logically-deductive constructions of knowledge. It is possible that inductive bias and deductive bias are not part of a continuous scale, but are rather independent scales. If their scales are indeed separate, it is expected that a high score on both deductive and inductive attention biases will lead to more frequent discernment of knowledge. To allow

for this possibility, items concerning inductive and deductive bias are utilized to construct independent scales. **Figure 35** contains one of each of these items used in the questionnaire survey. If the scales are independent, there may be difficulty collapsing them into a single continuous scale ranging from inductively biased to deductively biased. In order to avoid this difficulty, a number of items are offered in order to directly create a single inductive vs. deductive scale.

3.4.2.3 Reliability and validity of final sample. Items were aggregated to produce single scores for each of the locus of attention variables. Internal reliability for all locus of attention scales were adequate. **Table 36** lists each scale and its corresponding internal reliability statistic.

Figure 36 Reliability Statistics for Locus of Attention

Scale	No. of Items	Chronbach's Alpha
Inductive Propensity	4	.6899
Deductive Propensity	4	.7794
Inductive vs Deductive	3	.9096
Attention: Within Department	3	.8462
Attention: Other Departments Within Firm	*3*	*.8261*
Attention: Within the Firm	6	.7654
Attention: Outside the Firm	15	.8962

Factor analysis confirmed an highly organized factor structure that mirrors the theoretical facets of the construct. **Figure 37** displays the results of the factor analysis with varimax rotation. Items for each scale load together and generally form their own factor. For graphic clarity, cross loadings were removed from the figure.

3.4.2.4 Adequacy of locus of attention measurement scales.

For the most part, the measures appear to be adequate for the study. One functional shortcoming is my concern that, when asked, respondents may report that they tend to use examples, when they in fact may really use theory more often. That is, they may not be aware of what they actually prefer. While this sort of problem is a general shortcoming of questionnaire surveys, I believe that the items could be better constructed. One psychometric shortcoming is the lack of distinction between the "deductive preference" scale and the 'inductive vs deductive scale. This may indicate that inductive and deductive logic of attention do not form independent facets, but form instead one continuous preference scale. This confusion does not imply a material shortcoming. As previously discussed it is

Figure 37 Factor Structure of All LOA measures

	Component							
	1	2	3	4	5	6	7	8
attention, competitors 1	.769							
attention, competitors 2	.743							
attention, customers 2	.721							
attention, customers 1	.685							
attention, competitors 3	.636							
attention, customers 3	.518							
Deductive 4		.775						
Deductive 3		.761						
Inductive vs Deductive 3		.728						
Inductive vs Deductive 2		.715						
Deductive 2		.702						
Inductive vs Deductive 1		.702						
Deductive 1		.672						
attention within own department 3			-.774					
attention within own department 2			-.765					
attention within own department 1			-.729					
attention, external1				.356				
Hunter 2				.792				
Hunter 1				.764				
attention, external 3				.596				
attention, external 2				.579				
attention, professional community 1					.862			
attention, professional community 2					.814			
attention, professional community 3					.784			
attention, other department in firm 2						.858		
attention, other department in firm 3						.821		
attention, other department in firm 1						.557		
inductive 4							.805	
inductive 3							.721	
inductive 1							.528	
inductive 2							.456	
attention, suppliers 1								.758
attention, suppliers 3								.706
attention, suppliers 2								.566

Extraction Method: Principal Component Analysis, Varimax rotation with Kaiser Normalization.
a Rotation converged in 12 iterations.

acceptable for different measures of the same facet (or dimension) of a construct to be somewhat correlated since they are measuring very nearly the same thing. It is the different facets of a construct that should not be correlated (James, Muliak and Brett, 1982; Sharfman and Dean, 1991b). Howver, for the majority of the hypotheses tests, the location of attention facets will be tested separately from the logic of attention facets. Only when a measure of "general breadth of loci of attention" is needed, will a unified 'locus of attention' score be included in an analytic model.

3.4.3 Measuring sources of meaning

3.4.3.1 Previously existing methods for measuring sources of meaning.

There is well documented empirical literature on sources of meaning, making measurement of the sources that social actors utilize to construct meaning relatively straightforward. Peterson, Elliott, Bliese and Radford (1996) provide scales and items for the assessment of group-level sources of meaning. Over more than a decade Smith and Peterson have developed and refined the items and scales to measure sources of meaning. They have consistently measured eight sources of meaning. These include formal rules and procedures, organizational culture, subordinates, specialists from outside the department, other people at my level, superiors, opinions based on own experience and training, and national culture.

Smith, Peterson and Schwartz (1995/1999) indicate that the many sources of meaning may be collapsed into three main categories: *individuals themselves, social sources, and impersonal sources* or three variable contrasts: *"Self versus Explicit Impersonal Sources," "Associates versus Superior" contrasts and "Unwritten Rules."* The data in this survey are

examined to see if similar factors emerge. If they do emerge, then by collapsing multiple sources of meaning into these categories prior to testing hypotheses, demands upon degrees of freedom are relaxed.

Measurement items focus on customary sources of meaning utilized in common work action/decision situations. Furthermore, items use the passive voice so that multiple and external sources may be equally active in determining meaning for the organizational member (Smith, et. al., 1995).

3.4.3.2 Measurement strategy for sources of meaning in this study

I adopt the methodology developed by Peterson et. al for the measurement of sources of meaning. Items from assorted questionnaire surveys conducted by Smith, Peterson and others were reviewed for inclusion in the current study. Three situations deemed appropriate for the current survey were selected. An example of one of the items is offered in **Figure 38.** The other situations presented are "when there are differing opinions within your own group/department about how well your group is doing..." and "when the time comes to EVALUATE THE SUCCESS of new work procedures...."

This study expands Smith and Peterson's work by including six previously unmeasured sources of meaning. Both Smith and Peterson have reviewed these additions in a favorable light, although it was suggested that suppliers would probably be little used by the subjects of the study. Sources of meaning added are: internal financial reports, religious beliefs, family lives and members, customers, norms/knowledge specific to professional field, and suppliers. Sources of meaning included in the study are those listed as the individual items in **Figure 38.**

In total, 42 items were included to measure 14 different sources of meaning. Subjects are asked to indicate which sources of meaning they turn to in the three different situations. The first situation is when there are differing opinions within the department about department performance, the second situation is when there is a need to introduce new work procedures in the department, and the third situation is when the time comes to evaluate the

success of new work procedures.

3.4.3.3 Reliability and validity of scales

Figure 38 Sources of Meaning Item

Decision 2 **When you see the need to INTRODUCE new work procedures into your department, to what extent are the actions taken affected by each of the following?**

For each of the items from a to n, select one the five possible responses.

		1 To a very large extent	2	3 to a moderate extent	4	5 To a very small extent
a.	Formal company rules and procedures.	1	2	3	4	5
b.	Unwritten rules about 'How we do things around here'	1	2	3	4	5
c.	Our subordinates	1	2	3	4	5
d.	Specialists outside this department	1	2	3	4	5
e.	Other people at our level	1	2	3	4	5
f.	Our superior(s)	1	2	3	4	5
g.	Internal financial reports (from accounting and finance)	1	2	3	4	5
h.	Opinions based on our own experiences and training	1	2	3	4	5
i.	Beliefs which are widely accepted in my country about what is right	1	2	3	4	5
j.	Religious beliefs	1	2	3	4	5
k.	Our family lives and members	1	2	3	4	5
l.	Our customers	1	2	3	4	5
m.	Norms/knowledge specific to our professional field	1	2	3	4	5
n.	Our suppliers	1	2	3	4	5

Internal reliability for all sources of meaning scales are adequate. Coefficient alpha ranged from a high of 0.88 for "formal company rules" to a low of 0.72 for "specialists outside of the department." The scales name and the coefficient alpha statistic for each scale

are listed in **Figure 39.**

Figure 39 Reliability Statistics for Sources of Meaning Scales

Source of Meaning Scale	Alpha Stat.
Formal Company Rules	.8792
Unwritten Rules/Org Culture	.8420
Subordinates	.7325
Specialists outside this department	.7209
Co-workers at same level	.7259
Superiors	.8429
Internal financial reports	.7799
Opinions based on own experience	.7618
National culture	.8212
Religious Beliefs	.8460
Family lives and family members	.8422
Our customers	.7381

Factor analysis was conducted to validate the facets of the construct and to examine if the sources of meaning could be collapsed into fewer categories as they were in the Smith, Peterson and Schwartz (1995/1999) study. The factor structure is consistent with the proposed model of three items each for fourteen different sources of meaning. However, there is not clear evidence that the sources of meaning can be meaningfully collapsed into the three categories proposed by Smith, Peterson and Schwartz (1995/1999).

Figure 40 displays the complete factor structure. Seven clear factors emerge from the factor analysis. The first factor links together religion, family and national culture, all traditional sources of meaning. The second links important secondary sources of socialization – personal experiences and professional group norms. Customers and suppliers are grouped together, forming the external task environment group. Specialists, coworkers and subordinates are linked, forming social collaborating sources of meaning. Explicit internal sources of meaning are represented by rules, budgets and financial reports, while organizational culture indicates implicit internal sources of meaning. Finally superiors as a

Figure 40 Factor Analysis of Sources of Meaning Items

Rotated Component Matrix(a)

	Component					
	1	2	3	4	5	6
Religious Beliefs as Source of Meaning	.907	-.065	.034	.106	.102	.045
Family Lives and Members as Source of Meaning	.896	.033	.032	.107	.098	.081
National Culture as Source of Meaning	.760	.078	.248	.030	-.120	.142
Superiors as Source of Meaning	-.518	.469	.163	-.111	.082	.343
Own Experiences as Source of Meaning	.045	.851	-.054	.289	-.049	.045
Norms/Knowledge specific to Profession as Source of Meaning	.018	.812	.315	-.024	.132	-.025
Customers as Source of Meaning	-.032	.288	.830	-.091	-.038	-.052
Suppliers as Source of Meaning	.300	.118	.653	.232	.212	.118
Outside Specialists as Source of Meaning	.200	-.332	.545	.498	.250	.044
Subordinates as Source of Meaning	.268	.100	-.120	.806	.195	-.055
Co-workers at Same Level as Source of Meaning	-.056	.237	.325	.732	-.253	.161
Internal Financial Reports as Source of Meaning	.164	.014	.091	-.074	.810	-.198
Formal Rules as Source of Meaning	-.169	.088	.0668	.188	.730	.369
Organizational Culture as Source of Meaning	.206	.021	.012	.046	-.034	.914
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.						
a Rotation converged in 9 iterations.						

source of meaning is left on its own. For all of the hypotheses tested, these new collapsed sources of meaning are used in the statistical models. However, there are infrequent occasions where specificity matters more than parsimony, and the original sources of meaning need to be included.

3.4.3.4 Adequacy of the sources of meaning measures.

In general the measures appear to be adequate to the task. The three item scales display sufficient internal reliability, and the empirical factor structure closely matches the intended clustering of items. The three-item-per-facet scales are a significant improvement in efficiency over previous scales constructed and implemented over the years by Smith and Peterson, who have been using up to eight items per facet scale. Because there is psychometric evidence in this sample that the different sources of meaning form systematic and clearly interpretable sub-groups, I collapse the sources into the seven categories explained above: external task environment sources of meaning, explicit internal sources of meaning, traditional sources of meaning, social collaborating sources of meaning, implicit

internal sources of meaning, superiors as a source of meaning and secondary socialization sources of meaning.

3.4.4 Measuring communication media preferences and discrepancies

3.4.4.1 Previous measures

Communication media preferences. There are many studies that have investigated the use of different communication media or communication media. Daft and Lengel's (1984a) richness study indicated that social actors prefer face to face media for messages containing equivocality, especially under conditions of uncertainty, while less rich communication media, like written media, were preferred for unequivocal messages, especially in conditions of relative certainty (Daft and Lengel, 1984b). Daft and Lengel (1984a) used the following classifications, in order of increasing richness: numeric documents: impersonal written documents like formal reports: personal documents like letters and memos; telephone; and face to face communication media.

More media have been added to these initial categories. Dennis and Kinney (1998) report Kinney and Panko's (1996) findings that informal communications are widely utilized in team communications. Dennis and Kinney (1998) also include other 'new media: such as voice mail, video and email in their test of media richness theory. A number of papers have justified the addition of these "new" communication media into the theory and future research (e.g. Daft, Lengel and Trevino 1987; Rice, 1992, Markus, 1994; Walther, 1995). The majority of empirical studies have generally centered around media choice and perceptions of message senders (Dennis and Kinney, 1998). For example, Trevino, Lengel and Daft (1987) interviewed 65 managers and asked them for the reasons they chose

particular communication media in different situations with different senders.

It was very difficult to decide from previous studies what particular communication media to include in this study, not wanting to create cumbersome scales by including too many, and not wanting to exclude important media types. I decided to include items by starting with Daft and Lengel's list of media types and asking knowledgeable practitioners to review the list for exclusions or irrelevant inclusions. The results of this survey are discussed below.

Discrepancies (Dysfuction). Discrepancies can be difficult to capture, or can have undesirable psychometric properties that attenuate the reliability of the scales. Cronbach and Furby (1970) indicate that using the difference between the scores of a paired sample causes deep reductions in reliability, unless the correlation between the two is exceptionally low. Peterson (1985) suggests that a combination of contingent measures and direct questioning about "dysfunction" (i.e. lack of fit) may circumvent the psychometric troubles. An example of a dysfuction item is presented in **Figure 41.**

Figure 41 Dysfunction item example
Example of contingent measure of dysfunction as an alternative to constructing discrepancy scores by subtraction:

When communicating something simple, did the other department match your preferences for using [formal meetings]:

1	2	3	4	5
Complete Mismatch				Perfect Match

3.4.4.2 Communication media scale development and pretesting

Initially I developed communication media preference scales composed of 15 different communication media each. These different means were chosen by presenting a

list of communication media from previous studies on media richness to knowledgeable practitioners. After explaining the purpose of the study and the communication media construct to them, the interviewees were asked to see if the list properly represented the types of communication media utilized in their organizations. They were asked to add items that they felt were important but missing from my list. While most of these practitioners were members of high technology/communications technology firms, some were from low tech and other firms. The final fifteen item list was gained from these interviews

Items covering all 15 communication media were pilot tested on 162 subjects. Respondents were asked "When your group/department communicates something [simple, complex, important], does it prefer to use:..." This was followed by the fifteen items listed next to five-point Likert scales ranging from "Y!" to "N!" The reliabilities of these scales were fine , with scores typically in excess of 0.8 on the Cronbach's alpha scale of internal consistency.

Unfortunately, respondents were impatient with the multitude of communication media items. They complained that the items were taking too much time and were redundant. Because the overall length of the questionnaire survey was already a major concern, the number of communication media items was reduced. Prior to any reduction, the full survey time was rated at 40 minutes, plus a five minute introduction by the administrator. A goal was set for a 25 minute rating.

Examining inter-item scale reliability statistics, I found that communication media items asking respondents about communicating something "in general" could be removed without ruining the internal reliability of the scales. Furthermore, since these items did not

convey a contextual contingency to help give the situation meaning, I viewed them as the theoretically weakest of the group. These items were removed from the questionnaire.

Factor analysis with varimax rotation was applied to pre-test data. The factor analysis indicates that some of the communications means items of this fifteen items scale measure more or less the same thing. After reviewing the statistical analysis descriptions of the data, the following final adjustments were made to reduce the original fifteen communication media items to the ten.

"Film, video or similar;" "video conferencing" and "website/internet" were collapsed to create one item named "video conferencing or the internet." "A lot of numbers" and "spreadsheets" were collapsed to "spreadsheets and numbers." "Regular mail" and "Overnight mail" were collapsed to "regular post or overnight mail." "Internal memos" and "Formal reports" were collapsed to "memos or formal reports."

These reductions have both face validity and the evidence from the factor analysis. They reduce the number of items on the questionnaire survey by 60. (That is five items per situation, times two scales per situation (one discrepancy and one preference scale) times three different situations (simple, complex and important) equals thirty items, plus the removal of the entire thirty item set corresponding to "when communicating something in general." Internal reliability scores of the remaining scales were strong. A factor analysis with varimax rotation showed that this reduced list of different communication media formed independent scales with only minor exceptions.

3.4.4.3 Adopted strategy for measuring communication media preferences and discrepancies

I decided to measure communication media discrepancies using the direct items about dysfunction, or "mismatch". There were some difficulties with this method. For example, there is evidence that some of the subjects had difficulty understanding and working with these direct measures of dysfunction. Although the dysfunction scales promoted ease of statistical analysis, construction of user friendly items was difficult. Despite this difficulty, dysfunction scales were a better alternative than using difference scales. When difference scales were tested, the direct measures of dysfunction proved to be the more statistically robust of the two scales. Therefore, dysfunction measures were used for subsequent analysis.

All of this analysis of the pilot data resulted in the creation of paired ten-item sets of

Figure 42 Sample of Communication Media Preference and Discrepancy Scales

	When your group/department communicates something *important*, *does it prefer* to use:					When communicating *something important*, did the other department match your preferences for using:				
	YES!				NO!	COMPLETE MISMATCH				PERFECT MATCH
email	Y!	Y	O	N	N!	1	2	3	4	5
regular post or overnight mail	Y!	Y	O	N	N!	1	2	3	4	5
telephone or voicemail	Y!	Y	O	N	N!	1	2	3	4	5
fax	Y!	Y	O	N	N!	1	2	3	4	5
video conferencing or the internet	Y!	Y	O	N	N!	1	2	3	4	5
formal meetings	Y!	Y	O	N	N!	1	2	3	4	5
informal meetings	Y!	Y	O	N	N!	1	2	3	4	5
memos or formal reports	Y!	Y	O	N	N!	1	2	3	4	5
spreadsheets and numbers	Y!	Y	O	N	N!	1	2	3	4	5
pictures and diagrams	Y!	Y	O	N	N!	1	2	3	4	5

5-point Likert scales for assessing what communication media the subjects use in different circumstances, and to what extent the communication media' used by the "sending," department members were dysfunctional. One half of the pair of scales asks to what extent various communication media are preferred given a work situation. The complimentary scales ask to what extent did communication media used by the "sender" match the receiver's (the respondent's) preferences. An example of one pair of communication media scales is given in **Figure 42.** Please see the KTS Survey in the appendix for the actual items.

3.4.4.4 Reliability and validity of communication media scales.

The official sample's preferences for the ten different communication media were measured. Internal reliability scores for communication media preferences and communication media discrepancies are presented in **Figure 43.** Coefficient alpha statistics for communication media preferences range from about 0.6 to about 0.9 with the majority between 0.7 and 0.82. Some internal consistency limitations are expected because one of the situations presented ("when communicating something simple") is different from the other two (when communicating something complex and when communicating something important). Coefficient alpha statistics for the dysfunction scales

Figure 43 Reliability Scores for Communication Media Scales

Communication Mean	Preference α	Discrepancy α
email	0.7153	0.8383
regular post or overnight mail	0.7839	0.9508
telephone or voicemail	0.6926	0.7729
fax	0.8245	0.9362
video conferencing	0.8231	0.9559
formal meetings	0.6018	0.8064
informal meetings	0.6521	0.7979
memos or formal reports	0.8195	0.9318
spreadsheets and numbers	0.9026	0.9048
pictures and diagrams	0.8255	0.8478

were a bit more consistent with only one score below 0.8.

Factor analysis indicates that the communication media discrepancy scales are not as well structured as the communication media preference scales. Although internal reliability of the discrepancy scales is high, the factor analysis does not indicate a good fit between the factor structure and the ten dimensions of the construct that were measured. Although six factors were found, the majority the discrepancy items load on a single factor.

While this could be the result of some confusion by the subjects about the meaning of the items, I find evidence that indicating that subjects give meaning to the subject of discrepancy 'in bulk.' That is, subject either think 'they generally used appropriate communication media' or 'they generally did not.' This would account for the lack of dimensionality within the construct. Reliability analysis of the grouped items was high, and results of a confirmatory factor analysis indicate that subjects clearly separated the preference issue from the discrepancy issue.

As a result of these psychometric properties, discrepancy items are only utilized to measure general communication media discrepancy between the sending and the receiving departments.

3.4.4.5 Adequacy of communication media preference and communication media dysfunction scales.

The communication media preference scales seem to be free from problems, and to be adequate to the task. As for the dysfunction scales, there was initial evidence of difficulty with the directions. During very early administration, respondents were sometimes confused about the use and the meaning of the scales. Some of the early responses fail a runs-test,

indicating that those participants moved through each question using one idea of "how good communication was" in that particular situation. Responses often changed on the next questions, since the context is slightly different, but once within the next question, there were systematic responses again. During the rest of the data collection period, this scale was specifically addressed and explained prior to distribution of the survey. However, during the earliest administrations, the collection team was less aware and proactive about this problem, and there is more evidence of confusion. The above mentioned solution of utilizing only a general dysfunction measure is adequate, if not ideal, for the current project.

3.4.5 Discernment of organizational knowledge

3.4.5.1 Previous measures of organizational knowledge discernment.

Although the word 'discernment' is common in natural language, it has not heretofore been theoretically developed as a process in organizational science, nor has is been utilized as a construct in organizational studies. To fill this gap, my dissertation is taking on the task of developing the construct, introducing its place within organizational theory, and designing assessment scales for research. The organizational knowledge discernment process is made explicit by asking subjects contingent questions about when their department *notices*, *understands*, *recontextualizes* and *objectifies* organizational knowledge. As mentioned in Chapter 2, sensemaking participates in the discernment process.

3.4.5.2 Development of discernment scales

The alpha version. The development of this scale took an unusual amount of work, and I believe it calls for slightly greater explanation than the other constructs in the study. The scales' design went through multiple iterations, each time improving upon the last.

Figure 44 Discernment Scale, Verbose

The following questions deal with how your department deals with information that exists outside of your department.

Please use the following scale concerning how your group deals with external information:

1	DON'T PAY MUCH ATTENTION to external stuff
2	We FOCUS OUR ATTENTION on external knowledge, but don't really notice much
3	We NOTICE outside information and knowledge, but generally don't make an effort to understand what it specifically means.
4	We notice or seek external knowledge, and try to UNDERSTAND what it means to the group who has it.
5	We try to understand it and usually EXTRACT it, bringing it into the department/group.
6	We spend some time trying to MAKE SENSE of what this information knowledge could mean to our group
7	We objectively analyze and figure out specifically what actions this particular knowledge implies for our group/department or our work, in terms of helping us perform better, and we make a plan to use it, or we write it up for inclusion in a manual or database.
8	We TAKE ACTION, changing our routines or processes to become more efficient or more effective according to what the new knowledge suggests for us.

Creating the alpha version of the measure began with knowledge transferred from psychological research on attention and cognition. Drafts of the initial discernment scale were shown to three corporate executives for comments. The resulting scale contained nine event-anchored items using a 7-point scale. This initial scale is reprinted in the **Figure 44.** This scale is labeled "Discernment Scale, Verbose" because of its length relative to other experimental iterations of the scale. The scale was constructed using the following process.

The high-end anchor of this initial discernment scale concerned 'taking action.' The interviews indicated that action is often taken without full discernment of the knowledge. While agreeing it was rational to expect that action taken after *full* discernment would most probably lead to better knowledge transfer performance, *action is often taken just posterior to, or during, the sensemaking stage, i.e. prior to any clear objectification of the knowledge.* I therefore, removed using the organizational knowledge" from the discernment process, and included it in measures of transfer performance.

This version of the scale was presented to a small set social scientists. They suggested that the language, the length and complexity of the anchors used in the scale would

Figure 45 Discernment Scale, Parsimonious

The following questions deal with how your department deals with information that exists outside of your group.

Please use the following scale concerning how your group deals with external information:

1) don't pay attention
2) focus attention on it
3) notice it
4) understand it
5) extract and differentiate it from other, different stuff that is around it.
6) make sense of what it could mean to our group
7) create some type of plan or report based on the new knowledge
8) take action, using the new knowledge

most likely confuse the respondents, and reduce the validity of the scale. Then, using a paired convenience sample of two groups[4] the original scale was tested against another version with shorter anchor descriptions. The more parsimonious version is reprinted in the **Figure 45**, labeled "Discernment scale, parsimonious."

Comparison of the parsimonious and verbose scales: While the initial 'verbose' scale showed some promise, the short scale results were discouraging. They showed little internal consistency, and less evidence than the verbose scale that subjects could meaningfully distinguish between the discrete steps. During the next meeting I presented to the pilot sample the version of the scale they had not yet seen. They were asked to write comments on both scales, making suggestions for clarification, and to indicate which scale they found more meaningful and easier to understand. Over 80% of the joint sample (n= 103) indicated a preference for the "verbose" version, while less than 50% indicated that they sufficiently understood the parsimonious scales anchors.

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[4]approximately 50 business college juniors, median age of about 26, in an evening introductory management course.

Responses also indicated that after struggling with the first item, the following items are easily understood. I dropped the parsimonious version of the scale and continued to improve the verbose version and test a beta version.

Beta reliability and validity. A Pearson correlation analysis showed that the "numbers" oriented items were significantly correlated with one another, the internal items were highly correlated and the external focused items were highly correlated. This showed evidence of useful sub-scales with face validity if they were needed.

Further evidence of the validity of the original scales is provided by a factor analysis. Under optimal conditions there will be a few embedded scales. All of the items together will compose a general scale of organizational knowledge discernment. A factor will be composed of the internally and externally focused situations. The numerically oriented and the non-numerically oriented items will account for two factors that are diametrically opposed, and each area of knowledge will form a subscale.

Figure 46 Beta Factor Analysis of Discernment Items

FACTOR	1	2
D1	-0.3669	-0.1930
D2	-0.3231	-0.3240
D3	-0.2859	-0.1158
D4	-0.2098	-0.4923
D5	-0.3682	0.3250
D6	-0.3360	-0.2204
D7	-0.3731	-0.1544
D8	-0.3572	0.4643
D9	-0.3463	0.4565

Results of factor analysis are presented in **Figure 46.** In the factor analysis the items show a nice balance between the loadings on factor 1, which accounts for nearly half of the total variance. Factor 2 associates items 5, 8, and 9, all numbers oriented items. This factor also shows that loadings from items 1,3,and 7, the internally oriented items, and 2,4, and 6, the externally oriented items are similar.

Figure 47
Discernment, Beta Reliability Coefficients

	Alpha if Item Deleted
D1	.8115
D2	.7881
D3	.8054
D4	.8089
D5	.7984
D6	.7981
D7	.7880
D8	.7829
D9	.7826

Alpha = .8149

There was a prior belief that the first item in the scales would be less reliable than the others. This was projected because the first test subjects (11/23/98) indicated that after they had responded to the first item, the scale became easier to use, but that the first item had been a challenge. However, there is little weak evidence that the first item is unreliable. The "alpha if item deleted" statistic indicates that reliability would drop only very slightly if item D1 were removed. The reliability statistic of 0.8149 (see **Figure 47**) provides enough evidence of high internal reliability for continued use of the scales.

Creation of 5 point knowledge discernment scale. Unfortunately, there was a skewness problem and a kurtosis problem in the response distribution of the beta scales. Respondents were not using the middle points enough, tending to choose either point 1 "don't pay much attention to that stuff," or point 7 "we specify actions this particular knowledge implies for our group/department, in terms of helping us perform better, and we either MAKE AN ACTION PLAN or we WRITE IT UP for inclusion in a manual or database."

Concluding that items two and three were being systematically ignored, I guessed that subjects did not know how to deal with them. I collapsed the first two categories into a single step. I also collapsed the fourth and fifth steps of the discernment process. A five-point scale based upon the seven-point scale was therefore developed to make the distinctions between steps in the discernment process more obvious. More pilot data was gathered. Distributions markedly improved and internal reliability of the overall scale was a solid 0.83.

Figure 48 Contingent Organizational Knowledge Discernment Item

When marketing research reports customer satisfaction and product usage numbers, what does your department do?

1	We DON'T REALLY GET TO HEAR ABOUT THAT sort of thing
2	We usually NOTICE, but mostly don't spend time tying to figure it all out.
3	We take time to understand why it is important *TO THEM*
4	We figure out what this new knowledge means *FOR US*
5	We FORMULATE A COMPREHENSIVE ACTION PLAN to implement this knowledge in our group.

A few minor adjustments were made to the scales and the measurement process for use with the target population. Realizing that respondents may not like to admit "that they do not notice that sort of thing" the language of the category one anchor was altered so that respondents could externalize the cause of failure to notice organizational knowledge. **Figure 48** shows the adjusted language, "we don't really get to hear about that sort of thing."

Finally, needing to fight the tendency of users to stick to the top of the scales, the strong phrase: "please do not exaggerate" was added to the directions.

3.4.5.3 Reliability and validity of discernment scales: research sample

The organizational knowledge discernment scale used to measure the research sample contains 10 items. The knowledge transfer situation differs slightly for each item while the scale remains the same. Each point on the one to five scale represents the next stage in the knowledge discernment process, with the first point indicating 'not discerned at all.'

Internal reliability of the final full scale was adequate ($\alpha = 0.7584$). Sub-scales for each of the different knowledge transfer situations were also adequate. Discernment scale reliability statistics are reported in **Figure 49.**

Figure 49 Discernment Scale Reliability

	Alpha if Item Deleted
D1M	.7681
D2T	.7689
D3C	.7466
D4SFT	.7546
D5$	.7676
D6T	.7599
D7M	.7551
D8$	.7784
D9C	.7497
D10SFT	.7536
Alpha =	**.7792**

Factor analysis of the scales was conducted using both exploratory and constrained methods. The factor analyses help to establish construct validity, indicating that the items measure what they are meant to measure. Factor analysis extracts three factors accounting for 65% of the variance, grouping technological, accounting, and management/marketing items. With extraction forced to four factors, technological, marketing, management and accounting each form a distinct factor, jointly accounting for 74% of the variance. When extraction was forced to five factors (to account for every possible sub-scale, each of the five scales forms a factor, jointly accounting for 82% of overall variance, with no single factor dominating the others.

3.4.6 Measuring knowledge impedance

I believe that most knowledge characteristics remain relatively stable regardless of the subjects of knowledge transfer. I have argued that there is a difference between "perceptions of knowledge," or what Polanyi (1962) and others term 'understanding' and the knowledge itself. Understanding is part the discernment process, while knowledge is the subject of the process. While I do have some sympathy for arguments that subject and process are often, if not usually mutually constructive (Ranson, Hinings and Greenwood, 1980), my preference is to investigate knowledge and subject as if they were independent. Simple alterations in ontology like replacing 'tacit knowledge' with 'tacit understanding' help to keep this distinction. If the knowledge-as-object is independent, then the impedance characteristics can be separated out and measured as subjective descriptions. Members of different departments will likely have different rules for applying the terms 'important' and 'complex' and 'explicit.'

Since each organizational member is not given open access to the same areas of organizational knowledge, the "perceived explicitness" organizational knowledge will likely vary between organizational members. This an example of a rational boundary imposed by the organizational structure (Simon, 1959). Individual respondents can therefore be polled to assess the perceived impedance qualities of organizational knowledge in their department.

3.4.6.1 Previous measures of knowledge impedance.

Zander and Kogut (1995) demonstrate through an empirical test that specific characteristics of organizational knowledge have an influence upon the speed of knowledge transferability. The five characteristics they tested, adopted from Rogers (1983) and Winter (1987) are: codifyability (explicitness); teachability; complexity; system dependance (embeddedness); and product observability. These five facets "are ways to measure the degree to which a capability can be easily communicated and understood" Zander and Kogut (p79). The results of their tests indicate that codifyability and teachability are both significantly related to transfer speed. The study also demonstrates that organizational knowledge complexity, explicitness and embeddedness are importance facets of organizational knowledge to measure in studies concerned with the knowledge transfer efficiency. Szulanski, (1996) measures specific characteristics attributed by subjects to organizational knowledge that might attenuate or relieve organizational knowledge "stickiness". However, these measures are more appropriate for knowledge transfer performance that impedance per se.

The Zander and Kogut scales have reliabilities that range from the low to mid 0.60's. The complexity scales (alpha not reported) Since the generally accepted lower bound cutoff

for adequacy in social science is 0.7, (Nunnally, 1978) these statistics gave me pause to adopt their scales. Furthermore, the complexity scales were very specific to a single low-tech industry. As As it turned out, neither the Zander and Kogut, nor the Szulanski (1996) scales assess the importance, simplicity and explicitness of organizational knowledge in the way that seemed appropriate to this dissertation. However, Zander and Kogut's (1995) study does indicate that complexity and embeddedness and importance are objectifyable. I therefore engaged in constructing scales for each facet and the construct as a whole.

3.4.6.2 Constructing knowledge impedance scales

I constructed items to determine linear scales for three facets of organizational knowledge impedance: the *importance* of the knowledge, the *embeddedness* of the knowledge, and the *complexity* of the knowledge.

An example of the items used to measure the facets of knowledge impedance is provided in **Figure 50.** These items uses the "icon" based 5-point scales used by Szulanski (1997) when he measured the internal stickiness of organizational knowledge.

Figure 50 Knowledge Impedance Item examples

1.	**The following are IMPORTANT to our group:**						
	1.	Cost and financial performance information	Important? Y!	Y	O	N	N!
	2.	Marketing, sales and customer satisfaction information	Y!	Y	O	N	N!
	3.	How different departments and groups are managed	Y!	Y	O	N	N!
	4.	New technological innovations or new high-tech products and services	Y!	Y	O	N	N!
2.	**The following things are SIMPLE to figure out:**						
	1.	Cost and financial performance information	Simple? Y!	Y	O	N	N!
	2.	Marketing, sales and customer satisfaction information	Y!	Y	O	N	N!
	3.	How different departments and groups are managed	Y!	Y	O	N	N!
	4.	Information about the development of new technological innovations	Y!	Y	O	N	N!
3.	**The following are made OBVIOUS AND EASILY AVAILABLE to our department:**						
	1.	Cost and financial performance information	Obvious/Explict? Y!	Y	O	N	N!
	2.	Marketing, sales and customer satisfaction information	Y!	Y	O	N	N!
	3.	How different departments and groups are managed	Y!	Y	O	N	N!
	4.	Information about the development of new technological innovations	Y!	Y	O	N	N!

I am also using a second type of item to assess organizational knowledge impedance. Examples of these items are offered in **Figure 51.**

Figure 51 Implicit vs. Explicit Scale Example

I.If you want to know if your group is over or under budget, is this hard to find out, or is it explicit and easy for anyone find out?

1	2	3	4	5
Very hard to find out		moderately available		Very easy to find out

II.Is *customer preference or customer satisfaction* knowledge hard to find out, or is it very explicit and easy for anyone find out?

1	2	3	4	5
Very hard to find out		moderately available		Very easy to find out

All of the items were pre-tested on the same pilot sample as the other constructs. The pilot study results showed that all of the nested impedance scales have internal reliability statistics above 0.75 on the Cronbach's alpha scale.

3.4.6.3 Validity of knowledge impedance scales: research sample

The final knowledge impedance scale is composed of one general scale and three bipolar sub-scales to account for each of the facets (dimensions). A high combined score on the items indicates low impedance, allowing the knowledge to travel with relative ease. A low score (unimportant, complicated and embedded) indicates high impedance, adding relative difficulty to the transfer of that organizational knowledge. The general scale has an adequate internal reliability statistic (α = 0.7328). This is very reasonable especially considering the items cover four very different areas of organizational knowledge (accounting, marketing, management practices and technological).

The primary sub-scales are: importance/unimportance; simplicity/complexity; and explicitness/implicitness. Internal reliability statistics for each of the scales are presented in **Table 52**. Because the eight items ask respondents about four different areas of knowledge, their answers were not consistent across these different areas of knowledge. On might argue that the facets be conceived another way. Scoring of the impedance facets could be contingent upon the area of knowledge in question. The internal reliability statistics of these alternative sub-scales was also tested, and the

Figure 52 Reliability Scores, Impedance Facets

Impedance Scale	# of Items	Reliability (α)
All Areas of Knowledge	24	.7328
Importance/Unimportance	8	.6162
Simplicity/Complexity	8	.7578
Explicit/Inexplicit	8	.4897

statistics were generally inadequate. This was expected, due to how the scales are constructed. These alpha statistics are reported in **Figure 53**. As discussed in the previous section, different facets of a construct are not supposed to be significantly correlated. For example, a subject might feel that technological knowledge is important (less impedance), is complicated (more impedance), and moderately explicit (moderate impedance). The net score for technological knowledge would then be a moderate impedance value. This cross-dimensionality leads to low degrees of correlation between the items on these scales.

Figure 54 Reliability Scores, Impedance by Area of Organizational Knowledge

Area of Knowledge	# of Items	Reliability (α)
All Areas of Knowledge	24	.7328
Accounting Knowledge	6	.7322
Marketing Knowledge	6	.6048
Management Practices Knowledge	6	.6814
Technological Knowledge	6	.4374

Finally, sub-scales for different areas of knowledge are constructed across the three impedance dimensions. For example, two items measure the importance of technological knowledge, two items measure the simplicity of technological knowledge, and two items measure the embeddedness of technological knowledge. It is the same for the other areas of knowledge. Because these are only two-item scales, correlation analysis is more appropriate than Cronbach's coefficient alpha. Correlation statistics for these two-item scales are presented in **Figure 54.**

Figure 53 Correlation Among Impedance Facets

Item Pair	Correlation	Sig.
IMPS	.581	.001
IIMPcust	.395	.001
IMPmgt	.321	.001
IMPtech	.376	.001
SIMPS	.473	.001
SIMPcust	.198	.023
SIMPmgt	.123	.157
SIMPtech	.337	.001
EXPLS	.316	.001
EXPLcust	.326	.001
EXPLmgt	.392	.001
EXPLtech	.432	.001

Figure 55 Impedance Item Factor Analysis

Rotated Component Matrix(a)

	Component		
	1	2	3
SIMP1S	.753	-.020	.229
SIMP3M	.660	-.005	.070
SIMP6S	.594	.175	.243
SIMP2C	.592	.200	-.064
EXPL1S	.569	.097	.387
SIMP4T	.530	-.161	-.142
SIMP7M	.405	.396	.274
EXPL5S	.399	-.186	.147
EXPL4T	.215	.160	-.025
EXPL6C	-.095	.635	-.038
EXPL8T	.252	.597	-.049
IMP8T	-.057	-.589	-.009
SIMP5C	.154	.558	.007
EXPL2C	-.067	.491	.113
EXPL7M	.347	.461	-.059
SIMP8T	.261	.453	-.213
EXPL3M	.240	.437	.111
IMP7M	.206	-.409	.347
IMP4T	-.079	.282	.220
IMP1S	.223	-.136	.786
IMP2C	-.171	.159	.642
IMP6S	.183	-.044	.639
IMP3M	.142	-.020	.590
IMP5C	-.436	-.372	.438

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

A constrained factor analysis of the all items lends discriminate validity to the three dimensional knowledge impedance construct. Items generally divided up into the three dimensions of importance, explicitness and complexity. Detailed results of the factor analysis are presented in **Figure 55.**

3.4.6.4 Adequacy of organizational knowledge impedance measure

There seems sufficient psychometric evidence to establish construct validity. Reliability of the general scale is adequate, the three main facets shake out relatively well in a factor analysis. Furthermore, respondents reported that they had no difficultly understanding the scales.

3.4.7 Measuring organizational knowledge transfer performance

3.4.7.1 Clarification of knowledge transfer performance scales

Rogers (1983), Goodman, Bazerman and Conlon (1980), Nelson and Winter (1982) and Szulanski (1996) all tell us that knowledge without a proven track record of past usefulness is more difficult to transfer. Szulanski refers to this barrier to transfer as "unproven-ness." This study needs to control for this barrier. Szulanski also separates out perception of reliability of the knowledge as an important to the 'stickiness' of knowledge transfer. I therefore ask respondents about that sort of knowledge which has a long track record of 'proven-ness" and "reliability" so that we can see the transfer process, unimpeded by these barriers. For example, financial knowledge constructed by accounting department has a long history of past usefulness for internal control, So much so, that every organization seems to construct and transfer it.

It is also important to ask questions about the action oriented results of new knowledge transfers. If the knowledge is put to use at all, than we can begin to say a knowledge transfer is effective. Therefore how often transfer-related actions are taken is an important measure of effectiveness. If a knowledge transfer leads to more or less positive outcomes when it is used, I can scale the effectiveness of knowledge transfers.

Higher scores for performance will be a composite average of knowledge transfer efficiency in terms of time and cost, and knowledge transfer effectiveness in terms of the use of transferred knowledge, and valuable improvements stemming from the use of transferred knowledge.

Knowledge Transfer Cost. The cost of a knowledge transfer may be determined

by measuring the resources expended during the transfer process. A large portion of the cost of a knowledge transfer is assumed to be the excess employee time and effort taken by the transfer. Managerial time is costly. Slack managerial time is a strategic resource due to it's fungible nature (Teece, 1982). Therefore managerial time spent on knowledge transfer is one way to assess the efficiency of knowledge transfer. For example: the transfer of this knowledge from accounting to operations disrupted the accounting departments normal operations. These marginal costs of each organizational knowledge transfer should be measured on scales concerning the disruption of employee time and effort.

3.4.7.2 Previous measures of knowledge transfer performance

Questionnaire item scales measuring efficiency were created by Szulanski (1996). Szulanski utilized four scales to measure the "internal stickiness" of organizational knowledge. Each scale measures internal stickiness during one of the stages of an organizational knowledge transfer: the initiation, the implementation, the ramp-up and the integration stage. Their original use was to measure the stickiness of organizational knowledge transfer during the final two-fourths of a full knowledge transfer process -- specifically they were measuring the stickiness during the "ramp-up stage" and the "integration stage" of internal knowledge transfer. Szulanski's stickiness measures determine the abnormal costs of the transfer. The more organizational resources used to implement and integrate a new knowledge usage, the higher the cost. These resources may be people, time, capital or other obvious organizational resources. This cost is our measure of the efficiency of the knowledge transfer. The first group of items constitute Szulanski's (1996) "Stickiness-process-based measure: Ramp-up stage." The reliability statistic reported

by Szulanski for these 9 items is reported as ~ =0.77.

Knowledge transfer effectiveness: As discussed above, is important that knowledge is transferred on time, on budget, and with satisfied recipient. The cost of the transfer concerns the budget. The effectiveness concerns the timeliness, the satisfaction of the recipient, and the general benefit to the organization. The second group of Szulanski's (1996) items, form a scale she labeled: "Stickiness-process-based measure: Integration stage." This group of items measure the implementation usefulness of the transfer by scaling for the achievement of satisfactory performance of the transferred knowledge. The reported reliability of this scale is ~ =0.79 for the 12 items. These items are functionally appropriate for measuring the 'effectiveness' of a knowledge transfer.

3.4.7.3 Adopted measures of organizational knowledge transfer performance

The knowledge transfer performance scales were adapted from Szulanski (1996). The format and language of Szulanski's scales have been preserved. I use Szulanski's the ramp-up stage and the integration stage scales to break knowledge transfer performance into two dimensions. The first set of items (adapted from the ramp-up scales) are meant to capture the efficiency dimension of a knowledge transfer, while the integration stage items are used to measure the effectiveness dimension of the transfer. Szulanski's ramp-up items are largely concerned with the time and effort taken to get organizational knowledge put to use in another department. Employee time and effort are utilized as a proxy for transaction costs in this study. Szulanski's integration stage items are largely concerned with the appropriateness and usefulness of the transferred knowledge in the adopting department. In the absence of objective results measures tied directly to each transfer, these items are

considered good proxies for the effectiveness of organizational knowledge transfer. All items are included in the appendix. Knowledge transfer efficiency and knowledge transfer effectiveness combine together to describe knowledge transfer performance (KTP).

3.4.7.4 Reliability and validity of organizational knowledge transfer performance scales

The full scale and the two sub-scales representing the efficiency and the effectiveness facets were adequate. Effectiveness scale reliability for the current study was ~ 0.90. The reliability statistic for knowledge transfer efficiency is ~ 0.84. Reliability statistics are presented in **Figure 56.** Factor analysis was used to check for discriminate validity of the constructs dimensions. When forced to yield two factors, the effectiveness and the efficiency items divided up cleanly. Results of this factor analysis can be found in **Figure 57.**

Figure 56 Knowledge Transfer Performance Inter-item Reliability Scores

Knowledge Transfer Performance Scale	No. of Items	Internal Reliability α
Knowledge Transfer Effectiveness	13	0.9069
Knowledge Transfer Efficiency	9	0.8430
General Knowledge Transfer Performance	4	0.7835

3.4.7.5 Knowledge usage: an alternative scale for assessing knowledge transfer performance

I am interested in determining value which can be attributed to knowledge transfer. When knowledge assets are being used to their fullest, value associated with knowledge assets will be at its maximum. I therefore will attempt to measure the degree to which any knowledge is contributing to its full potential. Perfect knowledge transfer performance is

knowledge that contributes 100% of its potential value at a minimum transfer/transaction cost.

For example, if we assume that internal auditing has the knowledge that computer hardware expenses costs could reduced by 5% with a change in a purchasing and receiving routine. Purchasing reads the report issued by the internal audit group in the accounting department, and discerns this knowledge. However, no formal action plan is created explicitly showing how the knowledge should be implemented. Assume further that the manager initiates action with the express purpose of altering a purchasing routine to reduce costs as suggested by the knowledge transferred through the accounting report. If the routine is altered only enough to reduce costs by 2.5%, the effectiveness performance of the knowledge transfer is 50%.

Figure 57 Knowledge Transfer Performance Scale Factor Analysis

Rotated Component Matrix[a]

	Component 1	2
KTEFTV7	.812	.206
KTEFTV8	.780	.143
KTEFTV9	.771	.210
KTEFTV13	.746	.309
KTEFTV4	.730	.107
KTEFTV3	.727	-.157
KTEFTV12	.700	.153
KTEFTV10	.695	.237
KTEFTV1	.645	.244
KTEFTV2	.595	.370
KTEFFC5	.559	.476
KTEFTV5	.483	.444
KTEFFC8	.423	.396
KTEFFC2	-.073	.773
KTEFFC4	.322	.726
KTEFFC3	.182	.712
KTEFFC6	.470	.621
KTEFFC1	-.288	.618
KTEFFC7	.479	.514
KTEFTV6	.356	.478
KTEFFC9	.376	.425
KTEFTV11	.233	.279

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Therefore, for the purposes of this study a third and shorter scale for perceived knowledge transfer performance was developed. Subjects respond to four items that measure the extent to which knowledge that has been determined to be useful is in fact put to use. Examples of these items are presented in **Figure 58**. The scale has the typical shortcomings:

it measures subjects perceptions rather than objective facts, and it may prompt subjects to make exaggerated statements.

Figure 58 Sample: General Knowledge Transfer Performance Items

Scale: Achievement of Organizational Knowledge Potential

When your group determines that some newly received knowledge could be used, about what percent of the time does the knowledge *actually* get used?

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

On average, to what extent does knowledge, which seems like it might be useful to improve a product or a process, actually end up getting used for those type of improvements?

1 (0%) a very small extent | 2 (25%) | 3 (50%) a moderate extent | 4 (75%) | 5 (100%) a very large extent

When your group receives some knowledge from elsewhere in the company that seems important *concerning revenues or costs*, to what extent does the knowledge tend to get turned into action?

1 (0%) a very small extent | 2 (25%) | 3 (50%) a moderate extent | 4 (75%) | 5 (100%) a very large extent

In your group/department, to what extent of the time does new information that seems useful about your *customers* actually get turned into action?

1 (0%) a very small extent | 2 (25%) | 3 (50%) a moderate extent | 4 (75%) | 5 (100%) a very large extent

Still, the KTP usage percent scale also asks an important question in a very straightforward fashion, and serves to anchor and distinguish between the high end of the discernment scale and the beginning of a performance scale. The knowledge discernment scale tops out when subjects objectify knowledge that *could be useful*. Performance does not begin until knowledge is *actually used*. This simple scale measure how much of our planned use of discerned organizational knowledge moves to the implementation stage at all. The scales adapted from Szulanski indicate something different -- once put to use, how much of

potential usefulness of the transferred organizational knowledge is actualized. There is an important theoretical difference between using something and getting full use of something. In business, this equates to the management performance measures of return on assets.

Evidence suggests that this is a robust scale of employee perception of knowledge usage. The items means have a low of 46 and a high of 58, normal distributions and no evidence of excess skewness or kurtosis. There is no evidence that subjects had any difficulty with the items or reluctance to complete the items. Internal reliability of this knowledge potential achievement scale is quite adequate (alpha = .81), with no single item contributing inordinately to the balance of the scale. Factor analysis (see **Figure 59**) was utilized to assess discriminate validity of all three dimensions of

Figure 59 Factor Analysis of Three KTP Dimensions

Rotated Component Matrix[a]

	Component		
	1	2	3
KTEFTV9	.775	.151	.148
KTEFTV7	.768	.150	.311
KTEFTV4	.747	3.E-02	.135
KTEFTV13	.734	.252	.224
KTEFTV3	.733	-.221	5.E-02
KTEFTV8	.720	9.E-02	.320
KTEFTV1	.679	.193	3.E-02
KTEFTV10	.672	.181	.247
KTEFTV12	.660	.128	.192
KTEFFC5	.619	.433	-.020
KTEFTV5	.564	.377	-.018
KTEFTV2	.518	.356	.381
KTEFTV6	.462	.427	-.152
KTEFTV11	.380	.215	-.290
KTEFFC2	-.052	.787	.103
KTEFFC3	.230	.694	6.E-02
KTEFFC4	.373	.691	8.E-02
KTEFFC1	-.160	.612	-.261
KTEFFC6	.501	.593	9.E-02
KTEFFC7	.477	.492	.168
KTEFFC9	.275	.429	.423
KT1G_PCT	.247	8.E-02	.756
KT4C_PCT	6.E-02	3.E-03	.755
KT3$_PCT	4.E-02	7.E-02	.725
KT2G_PCT	.167	-.138	.723
KTEFFC8	.349	.377	.408

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

knowledge transfer performance: efficiency, effectiveness and general usage. Results indicate that the dimensions are cleanly distinguished from one another.

3.4.7.6 Summary statistics and conclusions about adequacy of measures

In this section the measurement details were discussed for each of the variables involved in the study. For each variable, I presented a rationale for the related measurement technique, discussed prior research that has measured these relationships, offered examples of measurement items, presented the reliability statistic(s) of the scale and factor analysis results where necessary, presented any other evidence of validity, discussed special issues such as aggregation of measures and discrepancy scales, and finally presented some conclusions about the overall adequacy of the measurements.

Most of the measure were found to be very adequate for the purposes of the study. Success is credited to pilot testing, quantity of items, data collection methodology and the quality of the sample. Refinements made during three to four rounds of pilot testing of the scales greatly improved the reliability and validity of the measures.

All of the constructs and facets involved in the dissertation were examined for correlations that might lead to extensive covariance in regression analysis. Bivariate correlations are reported in the appendix. Some particularly strong correlations were found among the location of attention variables and some of the sources of meaning variables. That is, respondents did not always clearly differentiate between locations where they look for knowledge (withing department, outside department but within firm, and external to firm) and sources from which they make sense of that knowledge. A correlation analysis and factor analysis among these variables is presented in **Figure 61**. Please see **Figure 61** for

a factor analysis of all of the final measures of the constructs in the dissertation. It has already been shown that perceived orientation of the department overlaps with the location of attention facets. For hypothesis tests that would otherwise contain these three constructs and their facets, a reduced set of facets is used. Strategic orientation of the group and task environment sources of meaning are removed because of extensive overlap with external to firm location of attention. We know by definition that inductive propensity an ability to generalize from embedded knowledge and deductive propensity is ability to specify from explicit

Figure 60 Correlation and Factor Analysis of Locus of Attention and Sources of Meaning Facets

Factor Analysis, LOA and SOM	Component			
	1	2	3	4
Overall Location of Attention outside firm	.859	.165	.162	.094
Overall Location of Attention within department	-.711	.216	.177	.020
Attn to other departments within firm for knwldg	.654	.079	.090	-.211
External Task Environment Sources of Meaning	.526	-.032	.460	.487
Inductive vs. Deductive Propensity Scale	-.048	.836	-.208	-.048
Deductive Propensity	.247	.826	.053	.134
Explicit Internal Sources of Meaning	-.112	.547	.275	.167
Inductive Propensity	.438	-.457	.121	.318
Traditional Sources of Meaning	.213	.030	.739	-.258
Social Collaborating Sources of Meaning	.040	.082	.723	.058
Implicit Internal Sources of Meaning	-.285	-.145	.553	.168
Superiors as Source of Meaning	-.221	-.059	-.220	.810
Secondary Socialization Sources of Meaning	.096	.311	.193	.726

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Pearson Correlation

	Overall Location of Attention within department	Overall Location of Attention outside firm	Deductive Propensity	Inductive Propensity	Inductive vs. Deductive Propensity Scale	Attn to other departments within firm for knwldg
Formal Rules as Source of Meaning	.209	-.099	.189	-.219	.200	-.067
Organizational Culture as Source of Meaning	.151	-.125	-.038	.078	-.130	-.090
Subordinates as Source of Meaning	.243	.011	.017	-.140	-.101	.046
Outside Specialists as Source of Meaning	-.073	.197	-.056	.037	-.065	.234
Co-workers at Same Level as Source of Meaning	.157	.112	.120	.142	-.009	.029
Superiors as Source of Meaning	.080	-.139	-.039	.080	-.024	-.172
Internal Financial Reports as Source of Meaning	-.011	.144	.302	-.176	.221	.088
Own Experiences as Source of Meaning	.153	.070	.211	.114	-.026	-.118
National Culture as Source of Meaning	-.143	.237	.063	.216	-.215	.100
Religious Beliefs as Source of Meaning	-.043	.219	.173	.043	.006	-.035
Family Lives and Members as Source of Meaning	-.028	.245	.116	.105	.010	.022
Customers as Source of Meaning	-.307	.444	.011	.427	-.300	.136
Norms/Knowledge specific to Profession as Source of Meaning	-.031	.293	.488	.103	.257	-.099
Suppliers as Source of Meaning	-.188	.475	.170	.132	.043	.118

generalizations. A clear factor emerged associating these items. I therefore remove explicit internal sources of meaning due to extensive overlap with deductive propensity. I retain both the inductive and implicit internal sources of meaning because they are not as obviously confounded in the minds of respondents. The final set of measures used for the majority of multivariate tests contains: (a) either the single communication discrepancy score or all ten communication media preference scores; (b) deductive score and inductive score; (c) traditional sources of meaning, superiors as source of meaning, secondary socialization sources of meaning, social collaborating sources of meaning, implicit internal sources of meaning, within firm attention, and external to firm attention scores; and (d) complexity, embeddedness and lack of importance facets scores of impedance.

The following tables report final summary statistics for all of the constructs and facets measured.

Figure 61 Factor Analysis, All Constructs

	Component						
	1	2	3	4	5	6	7
EXTERNAL Overall Location of Attention outside firm	.765	.220	.342	-.097	-.097	-.057	-.156
SMF_TASK External Task Environment Sources of Meaning	.747	.095	.055	.304	.260	-.020	.098
SOG Department Strategic Orientation	.606	-.055	-.091	.448	-.268	.253	-.165
ATTNDEPT Overall Location of Attention within department	-.580	.164	-.367	.183	.243	-.238	.039
SIMPLE Simple/Complex	-.198	.869	.157	.189	-.095	.062	-.030
DEDSCORE Deductive Propensity	.271	.683	.036	-.092	-.096	-.407	-.111
SMF_SOCL Secondary Socialization Sources of Meaning	.354	.607	-.275	.086	.220	-.077	.336
CDSC_GEN Communication Means Dysfunction	.012	.023	.799	.162	.108	.168	-.085
ATTNFIRM Attn to other departments within firm for knwldg	.282	.036	.776	-.015	-.082	-.097	-.071
SMF_COLB Social Collaborating Sources of Meaning	.149	.031	-.028	.760	.296	-.098	-.198
IMPORTNT Important/Unimportant	.049	.158	.195	.712	-.311	-.055	.151
SMF_IMPL Implicit Internal Sources of Meaning	-.035	-.065	.022	-.016	.864	-.055	.024
SMF_EXPT Explicit Internal Sources of Meaning	.075	.213	.016	.296	.059	-.689	.079
EXPLICIT Explicit/Implicit	.198	.316	.227	.197	-.347	.607	-.177
INDSCORE Inductive Propensity	.477	-.0457	.0155	.068	.153	.599	.124
SMF_BOSS Superiors as Source of Meaning	.031	.115	-.156	.012	.165	.091	.868
SMF_TRAD Traditional Sources of Meaning	.203	.250	-.063	.144	.428	.128	-.682

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Correlations

	Department Strategic Orientation	Deductive Propensity	Inductive Propensity	Overall Location of Attention within	Attn to other departments/grps	Overall Location of Attention outside firm	Traditional Sources of Meaning	Superiors as Source of Meaning	Secondary Socialization Sources	External Task Environment Sources	Social Collaborating Sources of Meaning	Explicit Internal Sources of Meaning	Implicit Internal Sources of Meaning	Communication Means Dysfunction	Impedance	unimportant knowledge	complexity of knowledge	embeddedness of knowledge
Department Strategic Orientation	1	.134	.396(**)	-.332(**)	.109	.394(**)	.129	-.152	.132	.397(**)	.310(**)	-.057	-.166	.129	-.280(**)	-.314(**)	.048	-.422(**)
Deductive Propensity	0.134	1.000	-.064	.080	.184(*)	.333(**)	.131	-.039	.402(**)	.108	.033	.308(**)	-.038	-.004	-.374(**)	-.145	-.415(**)	-.232(*)
Inductive Propensity	.396(**)	-.064	1.000	-.217(*)	.161	.268(**)	.141	.080	.122	.334(**)	.013	-.247(**)	.078	.084	-.070	-.080	.122	-.255(**)
Attention within department	-.332(**)	.080	-.217(*)	1.000	-.302(**)	-.470(**)	-.084	.080	.063	-.296(**)	.144	.122	.151	-.268(**)	.026	.036	-.148	.226(*)
Attn other department in firm	.109	.184(*)	.161	-.302(**)	1.000	.468(**)	.036	-.172	-.122	.152	.139	.014	-.090	.395(**)	-.192(*)	-.127	-.080	-.235(*)
Attention outside firm	.394(**)	.333(**)	.268(**)	-.470(**)	.468(**)	1.000	.265(**)	-.139	.211(*)	.549(**)	.142	.030	-.125	.212(*)	-.259(**)	-.195(*)	-.139	-.252(**)
Traditional Sources	.129	.131	.141	-.084	.036	.265(**)	1.000	-.360(**)	.063	.252(**)	.325(**)	.065	.245(**)	.131	-.185(*)	.011	-.175	-.250(**)
Superiors as Sources	-.152	-.039	.080	.080	-.172	-.139	-.360(**)	1.000	.350(**)	.123	-.063	.133	.117	-.219(*)	.049	-.030	-.033	.205(*)
Secondary Socialization Sources	.132	.402(**)	.122	.063	-.122	.211(*)	.063	.350(**)	1.000	.388(**)	.193(*)	.124	.074	-.090	-.267(**)	-.096	-.326(**)	-.135
External Task Environment Sources	.397(**)	.108	.334(**)	-.296(**)	.152	.549(**)	.252(**)	.123	.388(**)	1.000	.365(**)	.202(*)	.108	.150	-.187(*)	-.158	-.034	-.251(**)
Social Collaborating Sources	.310(**)	.033	.013	.144	.139	.142	.325(**)	-.063	.193(*)	.365(**)	1.000	.193(*)	.150	.101	-.273(**)	-.274(**)	-.105	-.242(**)
Explicit Internal Sources	-0.057	.308(**)	-.247(**)	.122	.014	.030	.065	.133	.124	.202(*)	.193(*)	1.000	.092	-.075	-.191(*)	-.204(*)	-.212(*)	.032
Implicit Internal Sources	-.166	-.038	.078	.151	-.090	-.125	.245(**)	.117	.074	.108	.150	.092	1.000	.029	.227(*)	.179	.109	.229(*)
Communication Means Dysfunction	.129	-.004	.084	-.268(**)	.395(**)	.212(*)	.131	-.219(*)	-.090	.150	.101	-.075	.029	1.000	-.250(**)	-.183(*)	-.118	-.270(**)
Impedance	-.280(**)	-.374(**)	-.070	.026	-.192(*)	-.259(**)	-.185(*)	.049	-.267(**)	-.187(*)	-.273(**)	-.191(*)	.227(*)	-.250(**)	1.000	.710(**)	.778(**)	.697(**)
unimportant	-.314(**)	-.145	-.080	.036	-.127	-.195(*)	.011	-.030	-.096	-.158	-.274(**)	-.204(*)	.179	-.183(*)	.710(**)	1.000	.276(**)	.299(**)
complexity	.048	-.415(**)	.122	-.148	-.080	-.139	-.175	-.033	-.326(**)	-.034	-.105	-.212(*)	.109	-.118	.778(**)	.276(**)	1.000	.328(**)
embedded	-.422(**)	-.232(*)	-.255(**)	.226(*)	-.235(*)	-.252(**)	-.250(**)	.205(*)	-.135	-.251(**)	-.242(**)	.032	.229(*)	-.270(**)	.697(**)	.299(**)	.328(**)	1.000

	Mean	Std. Dev.	Skew	Kurtosis
Age Group	3.23	.89	.195	-.406
Firm Strategic Orientation	4.79	1.02	-.259	-.555
Department Strategic Orientation	4.29	1.47	-.277	-.966
Deductive Propensity	3.58	.82	-.333	-.099
Inductive Propensity	3.60	.69	.113	-.783
Inductive vs. Deductive Propensity Scale	2.69	.86	-.265	-.312
Internal vs. External Attention Scale	2.93	1.01	.019	-.610
All internal to firm ocations	3.58	.58	-.496	.911
All external to firm ocations	2.89	.81	-.186	-.186
Attn within own group/department	3.92	.77	-.571	.590
Attention to other departments/groups in firm	3.23	.95	-.308	-.556
Attn to other departments within firm for knwldg	3.24	.95	-.308	-.556
Attn to customers for knwldg	3.01	1.01	-.155	-.661
Attn to suppliers for knwldg	2.91	1.02	-.100	-.661
Attn to competitors for knwldg	2.66	1.12	.035	-1.073
Attn to external professional grp for knwldg	3.08	1.11	-.297	-.878
Attn to joint venture, alliance partners for knwldg	2.82	1.12	.072	-.889
Formal Rules as Source of Meaning	3.46	.90	-.229	-.241
Organizational Culture as Source of Meaning	3.01	.93	-.244	-.151
Subordinates as Source of Meaning	2.77	.87	-.234	-.098
Outside Specialists as Source of Meaning	2.62	.87	.189	-.661
Co-workers at Same Level as Source of Meaning	3.07	.81	-.022	.861
Superiors as Source of Meaning	3.99	.82	-.797	.620
Internal Financial Reports as Source of Meaning	2.77	.92	-.016	-.560
Own Experiences as Source of Meaning	3.57	.80	-.381	.297
National Culture as Source of Meaning	2.40	.98	.215	-.670
Religious Beliefs as Source of Meaning	1.73	.88	1.179	.849
Family Lives and Members as Source of Meaning	1.98	.89	.828	.277
Customers as Source of Meaning	3.63	.97	-.535	-.374
Norms/Knowledge specific to Profession as Source of Meaning	3.63	.88	-.539	.181
Suppliers as Source of Meaning	2.57	.97	.319	-.341
E-mail preference	4.20	.69	-.379	-1.003
Regular or Overnight mail preference	1.99	.84	.531	-.415
Telephone/Voice-mail preference	3.63	.92	-.924	.970
Fax preference	2.44	1.04	.230	-.806
Video Conference/Internet preference	2.54	1.03	.158	-.896
Formal Meeting preference	3.53	.72	-.564	.830
Informal Meeting preference	3.71	.80	-.580	.870
Memos/Formal Reports preference	2.97	.91	.152	-.491
Spreadsheets/numbers preference	2.98	1.02	-.039	-.607
Pictures/Diagrams preference	3.28	.98	-.485	-.368
Important/Unimportant	3.89	.58	.052	-.650
Simple/Complex	3.04	.68	.355	-.600
Explicit/Implicit	2.87	.68	.838	1.832
Impedance	3.29	.46	.198	-.358
Discernment (avg.)	2.91	.77	.115	-.677
Discernment of Technological Related	3.45	.93	-.523	-.533
Discernment of Financial Related	2.49	1.27	.337	-1.246
Discernment of Customer Related	2.92	1.30	-.055	-1.342
Discernment of Management Practices	2.24	1.11	.583	-.887
Knowledge Transfer Performance	3.34	.78	-.364	-.805
KTP: Effectiveness only	3.44	.82	-.398	-.551
KTP: Efficiency only	3.24	.86	-.260	-.841
KTP: Proportion put to use	57.70	19.73	-.168	-.349

3.5 Data Analysis and Other Hypotheses Testing Techniques

3.5.1 Analysis of grand hypotheses

The following hypotheses form the core of the dissertation:

$Hgrand_A$ - Departments Cause Knowledge Transfer Styles. If a department's rational boundaries cause the department's members to have a common and characteristic knowledge transfer style, then we can accurately predict what department an employee belongs to by observing their knowledge transfer style.

$Hgrand_B$ - Firms Cause Knowledge Transfer Styles. If a firm's rational boundaries cause the firm's members to have a common and characteristic knowledge transfer style, then we can accurately predict what firm an employee belongs to by observing their knowledge transfer style.

I will test these hypotheses using multiple methods. Discriminant analysis will be the primary statistical technique, and multiple analysis of variance and/or covariance will be used in a complimentary fashion. (Tacq, 1997) notes that Sir Ronald Fisher, who originated the discriminant analysis technique (as well as the *F*-test), explained the close relationship between discriminant analysis and analysis of variance. He saw discriminant analysis as the reverse of ANOVA/MANOVA, that is only the causal arrows are reversed. In terms of calculations, Tacq (1997, p352) points out that it does not make any difference which direction the arrows of the model go. That is, both techniques depend upon examining the eigenstructure of the inverted variance-covariance matrix with the objective of maximizing the ratio of the variance between the groups and the variance withing the groups. The two techniques therefore form a complimentary analysis pair.

My reasoning for using discriminant analysis is as follows. Based upon a set of variables I want to distinguish between mutually exclusive groups, that is, different departments and different firms. The data are psychometric measures for cases whose group membership is known. I also would like to identify variables that are most important for distinguishing among the departments and groups, so that knowledge management system design can focus upon those most important variables.

In a discriminant analysis, linear combinations of the independent variables are formed and used as a basis for classifying cases into one of the groups. In multiple group discriminant analysis, linear equations, very similar to multiple regression equations, are formed and become the basis for assigning cases to groups. One less "discriminant function" than the number of different groups is possible. The beta's of the equations are optimized by the process so that the resulting values of the discriminant functions differ as much as possible between groups. That is, the ratio of between group sum of squares and within group sum of squares is maximized. This ratio is called the eigenvalue. Large eigenvalues are typically associated with significant discriminant functions. A discriminant score is calculated for each case.

Using Bayes' rule, and prior probabilities, discriminant analysis assigns a case to the group to which it has the highest probability of belonging. Prior probability estimates the likelihood that a case belongs to a group when there is no information available. In this study, the observed proportions of cases in each department, and in each professional group serve as the estimates of prior probability. Because models most likely fit the sample from which they are derived, I use a "jackknife" or leave-one-out technique. Since the case which

Figure 61 Prior Probabilities for Groups

Department Code	Prior
Information Systems Support	.117
Research and Development	.311
Business Operations	.233
After Sales Support	.175
Accounting/Finance	.165
Total	1.000

is being classified is not included in the calculations, the reported classification rate is a less biased estimate of the true population classification rate. The observed classification rate is compared to the classification rate that is expected by chance alone. As the number of groups increases, the percentage of cases that can be classified correctly by chance alone decreases. For example, if there are ten groups with equal numbers of group members, only 10% of the cases would be expected to be classified correctly. When group membership (i.e. cell sizes) vary, discriminant analysis is instructed to weight the prior probabilities according to the number of cases within each group. As previously noted, departments with less than 10 members were collapsed into a temporary category department named "other." 14 cases were thereby classified as "other" and discriminant analysis was instructed to exclude that data, leaving 104 usable cases. This adjustment slightly affects the prior probabilities used for the analysis. **Figure 61** shows the exact weighted prior probabilities used for the analysis.

Discriminant analysis also provides the *U* statistic (Wilk's Lambda). Wilk's Lambda provides the ratio of the within-groups sum of squares to the total sum of squares. A value of 1 indicates that all observed group means are equal, and a value close to zero indicates that most of the total variability is due to differences between the means of the groups. That is, small values of *U* indicate that groups means do appear to be different, while large values indicate that they do not. There is a well known distribution related to Wilk's Lambda, making significance testing a straightforward affair. This can be used to test the null

hypothesis that there are no differences between group means.

The hypotheses tests will be supplemented with analysis of variance/covariance. Multiple analysis of covariance is an appropriate method for determining if there are overall mean differences between the members of different groups in knowledge transfer style, while controlling for other known factors that may interact with the independent variable, moderating or attenuating its effect upon the dependent variables. This supplementary analysis using MANOVA and MANCOVA statistics is useful because the way multiple analysis of variance handles independent and dependent variables matches the causal direction of the hypotheses (a single independent variable causing five dependent variables). Unless otherwise noted, all MANOVA analyses in the dissertation are conducted by inputting all of the variables simultaneously.

The *U* statistic (Wilk's Lambda) discussed above is also provided in the output from MANOVA and MANCOVA analysis. Discriminant analysis and MANOVA procedures are closely related through the generation of the *U* statistic. Both discriminant analysis and MANOVA are robust techniques that adequately handle the cell sizes provided by the sample.

If the results of discriminant analysis and MANOVA are not clear, using multinomial logistic regression is a possibility. Multinomial logistic regression is useful when classifying subjects based on values of a set of predictor variables. Multinomial regression is similar to logistic regression, but it is more general because the dependent variable is not restricted to two categories.

Continuous scales are used for department strategic orientation and knowledge

impedance scores. Locus of attention is measured on two continuous scales, one for attention location and one for attention logic. Sources of meaning scales and communication media preference scales cannot be aggregated into a single scale, so each communication media and each source of meaning is included in the analysis.

$Hgrand_C$ - Causes of Discernment. The strategic orientation (SO), the locus of attention (LOA), the characteristic sources of meaning (SOM) dysfunction in communication media (CM) and knowledge impedance (KI) cause a significant portion of the variance in an organizational member's knowledge discernment (D) behavior.

$$Knowledge\ Discernment\ (D) = Y + \beta_1 SO + \beta_2 LOA + \beta_3 SOM + \beta_4 CM + \beta_5 KI + \epsilon$$

This hypothesis concerns not only identification of significant mean differences, but also analysis of covariance among scales to determine the degree that a set of independent variables explain variance in a dependent variable. These types of hypothesis are typically tested using multiple regression analysis. I

Multiple regression determines the amount of variance in the dependent variable that can be explained by the joint variances of the independent variables. It is also of interest to specify which independent variables have the greatest impact upon knowledge discernment (D). Furthermore, there are specific hypotheses that question the impact of each variable independent of the others. For the multivariate model, I use a robust multiple regression analysis provided by general linear modeling to examine the relative impact of the constructs. For the specific hypotheses, I am using hierarchical regression to determine the additional impact of an individual variable. Stepwise regression will also be used for descriptive

purposes to report variables in order of greatest impact upon the dependent variable.

Solutions to order of entry bias problems in multiple regression. Because classical multiple regression indicates only the p-value of the additional variance explained by the next variable in the model, the order of input impacts the results if the variables are anything less than completely orthogonal. That is, when there is covariance in the model, the variable entered first has the greatest likelihood of having a significant p-statistic, while each subsequently entered variable has a lower and lower chance of demonstrating significance. This means that p-values and beta's will be biased toward those variables that are entered first into analysis.

There are two solutions to this difficulty. The first solution is to use a modeling approach to regression that enters all of the variables into the analysis simultaneously, eliminating any concern about order of entry. The GLM General Factorial procedure provides regression analysis and analysis of variance for one dependent variable by one or more factors and/or variables. The general linear modeling approach to regression enters all variables simultaneously, and also accounts for covariation among the variables. For regression analysis, the independent variables are specified as covariates. In addition to testing hypotheses, GLM regression produces parameter estimates. Parameter estimates are labled 'eta-squared' rather than 'beta', which is used in traditional regression analysis. These p-values and parameter estimates do not change no matter in what order the variables are listed in the model.

Factor variables can also be included to divide the respondents into groups. For example, using this general linear model procedure, I can test hypotheses about the effects

of the independent variables on the means of department-type groupings of the dependent variable discernment. The GLM approach handles both balanced and unbalanced designs. A design is balanced if each cell in the model contains the same number of cases. It is also possible to include interactions between factors as well as the effects of individual factors. In addition, the effects of covariates and covariate interactions with factors can be included.

Two-tailed hierarchical multiple regression analyses (Cohen & Cohen, 1983; Stone and Hollenbeck, 1984) Inclusion of covariates in the model is required to ensure that the hypothesized effect is observed, even when considering the effects of the specified control variables. Hierarchical regression analysis proceeds in stages, conducting F-tests on the incremental r^2 of the overall model when the next stage of the model is entered The p-value of the last stage entered is the significance of the effect of that variable controlling for all other variables in the model. The analysis procedure jackknives so that each stage is given the chance to be in each position, including last.

Hierarchical regression also eliminates one of the major concerns about same source data. James (1982) and James, Demaree and Wolf (1984) indicate that hierarchical moderated regression may also be used to minimize the order of entry problem and to account for systematic scale biases. Because *incremental* r^2 is tested and reported for each variable, error from systematic scaling biases is controlled. That is, there is always the possibility that some of the correlation between the independent and dependent variables is due to a systematic tendency of respondents to use only a certain portion (like the top end) of scales. However, if another independent variable is already entered into the model, any incremental variance captured by the next variable cannot be explained by systematic error,

since the first one will have claimed that systematic variance for itself.

I use the hierarchical method to test the specific hypotheses concerning the impact of any one of the predictor constructs upon the discernment of organizational knowledge. For example, when testing the hypothesis a high level of communication media dysfunction predict a low level of discernement, the hierarchical method is used. I implement the hierarchical analysis as follows. There are five general constructs that are predicted to impact the discernment of organizational knowledge plus the prior department type variable. Because prior variables need to be controlled, the first stage in the model is always department type, entered into the model in the form of one dummy coded variable for each of the five department types. Next, each knowledge transfer style construct is added to the model in its own stage. Constructs that have a single measure (strategic orientation, communication means dysfunction) are always entered directly when its stage is included. I include individual facets for those constructs that have multiple facets. That is, complexity, importance and explicitness are simultaneously entered as the "impedance" stage, and induction and deduction are entered in the logic of attention stage. As discussed earlier, because of strong covariance the location of attention facets are combined with the different sources of meaning. When the sources of meaning stage is added, a stepwise procedure is used to include only significant sources of meaning/locations of attention. This stepwise procedure eliminates the order of entry problem within stages.

Thus, prior variables (department type) are entered in the first stage. The predictor variable entered in the second stage captures systematic error, and is an unreliable estimate. The predictor variable entered in the third stage gets the most optimistic reliable estimate,

since most of the other variables are not yet controlled. The predictor variable entered in the last stage get the most conservative significance and parameter estimates. Figures reported in the results of the specific hypothesis test indicate incremental variance explained (i.e., changes in r^2). I report two p-values and betas for each construct. One p-value/beta pair for the most optimistic estimate after controlling for systematic error and prior variables, (i.e. when it is entered in the third stage) and one pair for the most conservative estimate (i.e. when it in the last stage).

Testing the impact of discernment upon knowledge transfer performance.

The next hypothesis concerns the bivariate relationship between the discernment of organizational knowledge and the performance of organizational knowledge transfer. When organizational members complete more of the discernment process -- moving from attention, through recontextualization, toward explicit objectification and a plan of action -- there is a better chance that the organizational knowledge will be put to use efficiently and effectively. When organizational members complete little or none of the discernment process, there will be less of a chance that the knowledge will be put to efficient and effective use in their department.

$HGrand_D$ - Knowledge Transfer Performance. Higher levels of knowledge discernment (KD) cause higher performance of knowledge transferred to the department (KTP).

$$KTP = Y + \beta_1 KD + \epsilon$$

This hypothesis may be examined at the general level and the more specific knowledge transfer *situation* level. That is, the average knowledge transfer performance of

all organizational knowledge transfer situations can be assessed or the performance of five different knowledge transfer situations can be examined independently. For example, some respondents are involved in situations in which computer technology is transferred from the information technology support group to their own group. In these cases, the most relevant variables are the discernment of technological organizational knowledge and the characteristics of technological knowledge. It is appropriate to predict knowledge transfer performance of a specific type of situation, based upon group characteristic related to those kinds of situations. For example, there is little reason to expect that high levels of discernment of financial knowledge will be associated with high levels of customer knowledge transfer performance. Other situations include when management practices are transferred, when knowledge about customer preferences are transferred, when financial performance knowledge is transferred, and when new knowledge product or process knowledge from research and development is transferred. **Figure 62** contains a breakdown of the different knowledge transfer situations measured in the sample.

Figure 62 Breakdown of Knowledge Transfer Situation Sample

Transfer Situation Knowledge About:	Frequency	%
Management Practice	12	9.0
R&D Innovation	22	16.5
Customer Preferences	34	25.6
Financial Reports from Accounting	19	14.3
Computer Tech/Software from IT Support	46	34.6
Total	133	100

The general and specific hypotheses are best tested using regression analysis. Continuous scales are developed for both discernment of organizational knowledge and knowledge transfer performance. Knowledge transfer performance is composed of two sub scales: a knowledge transfer efficiency scale and a knowledge transfer effectiveness scale.

In order to control for possible covariance of prior variables with knowledge transfer performance, department and firm-id are included in a second version of the model.

$HGrand_E$: A significant portion of organizational knowledge that is identified as potentially useful is not actually put to use.

The null hypothesis tested here is that 100% of the organizational knowledge that is identified as useful is actually put to use. This is tested by constructing scales that assess the portion of organizational knowledge available for use that gets put to use, and applying a simple one tailed t-test to find if the result is significantly less than 100%.

3.5.2 Idiosyncratic analysis techniques for specific hypotheses

The vast majority of the specific hypotheses are direct sub-statements of one of the grand hypotheses, and use the same analysis techniques. However, some specific hypotheses tests have analysis idiosyncrasies.

Strategic Orientation. Because I have used continuous scales to assess strategic orientation, defenders, analyzers and prospectors are not broken into three clearly discrete cells. The scores rather offer us comparative than absolute categorizations. When a member rates their department high on the scales, it is "prospector-ish," while somewhat lower scores would be "more analyzer-ish" and substantially lower scores more "defender-ish." Regression analysis is the method that can best utilize the information in these continuous scales, indicating the response in overall discernment as strategic orientation scores increase.

I have measures of each respondent's perception of strategic orientation, of the department and of the firm. I do not aggregate individual perceptions to the group level. By choosing to operate completely at the individual level of analysis, I am technically testing

how an individual's perception of their department's strategic orientation impacts organizational knowledge discernment. Taken alone, this crosses individual level of analysis with group level theory. However, by previously demonstrating that individual perception of department strategic orientation is cause by department membership, this source of inconsistency is removed. However, if it is not demonstrated that department membership causes individual perception of the department's strategic orientation, then the level of analysis vs level of theory problem remains.

Communication media. In order to test some hypotheses related to communication media, certain assumptions have to be made about what communication media are richer than others. As stated in the second chapter, there is at least some worthwhile evidence that richness is subjective, that is, a poor medium for one group may be a rich medium for another. Nonetheless, media which are considered more "face to face" and have quicker turnaround times are generally those that are consider richer forms of media in the management information systems and communications literature. It is not entirely clear where pictures, which as we always say are "worth a thousand words," fall in terms of richness. For the purposes of this study I consider pictures and diagrams to be rich media forms and will include them in the "rich" group. Of the ten different communication media assessed, the richer forms are: video conferencing, formal meetings, informal meetings, telephone, and pictures.

I test hypothesis D4.1, which states that "a preference for richer communication media will be associated with higher levels of knowledge discernment," in a two stage fashion. In the first stage organizational knowledge discernment is regressed on all ten

communication media, then regressed on a reduced model only containing the richer communication media.

If the less-rich communication media are not closely associated with organizational knowledge discernment, than removing them from the model will not have much of an impact, and an F-test will not indicate a statistically significant change from one model to the other. The second stage is to check if even this reduced set of rich communication media significantly impacts the discernment of organizational knowledge. Multiple regression analysis and analysis of variance procedures will offer all the statistics needed.

3.5.3 Chapter conclusion

This chapter reviewed the research questions, the research sample and data collection sites, methodological conventions, measurement scales and the hypothesis testing techniques chosen for the study. The data collection method for the study was a highly controlled, on site questionnaire survey containing over 200 items. The sample of 118 respondents was drawn from two well know, very large high technology firms, Intel Corporation and Siemens ICN. The response rate was over 90%. The primary statistical methods used for analysis were a (1) discriminant analysis, and (2) ANOVA, MANOVA, linear regression and multiple regression all run within a general linear modeling framework. While the sample size remained relatively small, the quality of the data proved to be excellent. The positive role of collecting data in on-site sessions in a controlled environment with the aid of top management cannot be emphasized enough, especially for the administration of a long and complex questionnaire survey.

Constructing measurement scales is a difficult process and many of the measures for

this dissertation had to be custom designed and assembled. Evaluation of the measures included preliminary screening of each scale using exploratory factor analysis, alpha reliability estimation, item-to-total correlations and item-to-item correlations. Measurement items that had very low loadings on the factor they were intended to represent, that substantially reduced the scale's reliability, or having very low item-to-total correlations were dropped from the measures. The measures used in hypothesis tests reflect scales that omit such items.

Each scale has strengths and weaknesses, but overall the work is a success. Internal reliability, construct validity and discriminate validity has been adequately established for each measure that will be used to test the hypothesis of the study. This concludes tests of reliability and validity of the constructs in this study. The next section takes on the task of utilizing these carefully constructed measures to test the grand hypotheses of the study.

CHAPTER 4 HYPOTHESIS TESTS AND RESULTS

4.0 Core Hypothesis Tests

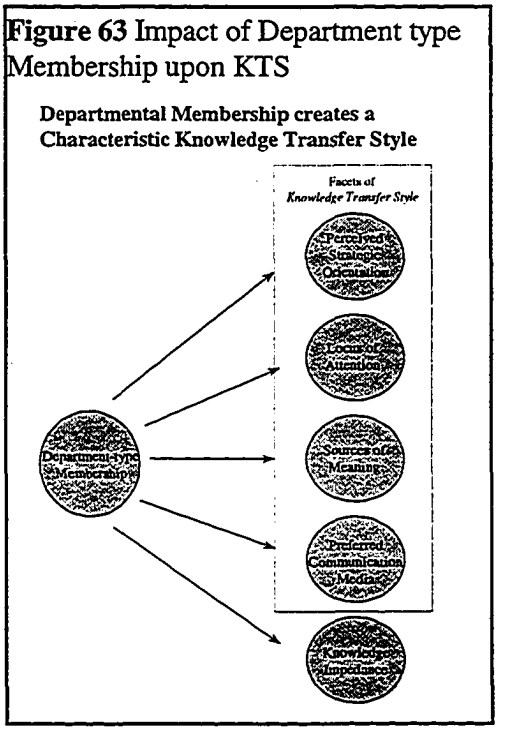
This chapter presents results of the primary hypotheses tests. These results are offered in the order presented in section 3.1, following the three sub-sections of the full path diagram. First the effects of departmental membership upon knowledge transfer style is tested. Next the impact of knowledge transfer style upon organizational knowledge discernment is assessed. Finally the degree to which organizational knowledge transfer performance can be explained by the discernment of organizational knowledge is ascertained.

4.1 The Effects of Departmental Membership upon Knowledge Transfer Style

4.1.1 Can we predict departmental membership by observing knowledge transfer styles?

Hgrand$_A$ - *If a department type's rational boundaries lead that department type's members to have a common and characteristic knowledge transfer style, then we can accurately predict what type of department an employee belongs to by observing their knowledge transfer style.*

Figure 63 Impact of Department type Membership upon KTS



A discriminant analysis is used to find out how well the KTS variables uniquely describe members of different departments. The discriminant analysis correctly classifies 72.8% of the cases, (see **Figure 64**) with no prior probability greater than 31%, and an average prior probability of correct classification of only

20%. Exact prior probabilities for each department type are reprinted in **Figure 61** in the previous section.

Figure 64 Hypothesis GrandA, Classification Results

	Classification Results	Predicted Department Type					Total
	Department Type	Information Systems Support	Research and Development	Business Operations	After Sales Support	Accounting/ Finance	
Count	Information Systems Support	8	1	3	0	0	12
	Research and Development	0	26	5	1	0	32
	Business Operations	1	10	12	1	0	24
	After Sales Support	1	1	3	13	0	18
	Accounting/Finance	0	0	0	1	16	17
	Ungrouped cases	1	3	3	5	2	14
%	Information Systems Support	66.7	8.3	25.0	.0	.0	100.0
	Research and Development	.0	81.3	15.6	3.1	.0	100.0
	Business Operations	4.2	41.7	50.0	4.2	.0	100.0
	After Sales Support	5.6	5.6	16.7	72.2	.0	100.0
	Accounting/Finance	.0	.0	.0	5.9	94.1	100.0
	Ungrouped cases	7.1	21.4	21.4	35.7	14.3	100

72.8% of original grouped cases correctly classified.

The Wilk's Lambda statistic (see **Figure 65**) provides the ratio of the within-groups sum of squares to the total sum of squares. A value close to zero indicates that most of the total variability is due to differences between group means. The Wilk's Lambda statistics for the first two discriminant functions (significant at the .001 and .003 levels respectively) indicate that department membership explains a significant portion of the variance in the KTP variables.

The discriminant structure matrix and discriminant function scores at department type centroid are also presented in **Figure 65**. You can compare the function score for each department type at it's centroid (on the righthand table) to the discriminant function correlation coefficients (in the left hand table). The first and the second functions show evidence of being significantly discriminatory between department types (see Wilk's Lambda statistics below). For example, the first function, with which accounting/finance has a very

Figure 65 Discriminant Function Scores by Knowledge Transfer Style Facet

KTS Facet	Discriminant Function			
	1	2	3	4
Spreadsheets/numbers preference	.394*	.111	-.269	0.089
E-mail preference	-.301*	.248	.281	.172
Complexity of knowledge	-.284*	-.173	.030	0.154
Memos/Formal Reports preference	.232*	-.230	.127	-0.01
Secondary Socialization Sources of Meaning	.171*	.134	.032	0.055
Deductive Propensity	.343	-.424*	.043	0.028
Unimportant knowledge	.106	-.318*	.031	0.315
Department Strategic Orientation	-.069	.313*	.104	0.181
Overall Location of Attention outside firm	.010	.212*	.192	0.188
Implicit Internal Sources of Meaning	-.097	-.052	-.321*	0.182
Social Collaborating Sources of Meaning	-.158	.155	-.230*	-0.114
Regular or Overnight mail preference	.099	-.103	.194*	0.089
Informal Meeting preference	-.013	-.132	.159*	0.101
Video Conference/Internet preference	.097	.217	.225	.512*
Pictures/Diagrams preference	-.176	.092	-.030	.432*
Telephone/Voice-mail preference	.043	.071	.181	.330*
Inductive Propensity	-.112	-.196	.204	.321*
Fax preference	.083	-.001	.034	.261*
Superiors as Source of Meaning	-.006	-.181	-.052	.219*
Formal Meeting preference	.211	-.117	-.104	-.217*
Attn to other departments/grps within firm for knwldg	-.040	.040	.195	-.206*
Embeddedness of knowledge	-.071	-.121	-.066	.142*
Traditional Sources of Meaning	.087	.108	.079	-.112*

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions Variables ordered by absolute size of correlation within function.

* Largest absolute correlation between each variable and any discriminant function

Functions at Group Centroids				
Department Code	Function			
	1	2	3	4
Information Systems Support	-.390	.376	1.749	0.291
Research and Development	-.662	.709	-.557	0.3
Business Operations	-.813	-.245	0.032	-0.62
After Sales Support	1.764	-1.790	-.139	0.14
Accounting/Finance	3.478	-0.05	-0.08	-0.04

Unstandardized canonical discriminant functions evaluated at group means

Test of Function(s)	Wilks' Lambda	Sig.
1 through 4	.094	.000
2 through 4	.332	.008
3 through 4	.593	.313
4	.879	.936

high score, shows a positive propensity to use spreadsheets and numbers for communicating knowledge, and a positive propensity for use of memos and formal reports. It shows a negative propensity for using email to communicate organizational knowledge, and a negative correlation with the attitude that organizational knowledge is complex. Notice that the other department types have negative scores at the centroid for this first discriminant function. Members of the after sales support department type stand apart from all others on the second function, while research and development members score differently from members of other department types on the third function.

These descriptive results were confirmed using multiple analysis of variance. After controlling for firm effects, the MANOVA test that department type membership explains

multiple KTS variables) indicates that approximately 46% of the variance between departments can be explained by the KTP variables (R^2=.464, Adjusted R^2=.277), with the full model significant at the .001 level (p<.001). MANOVA results reinforce the findings of the discriminant analysis. These results are reported in **Figure 66**. Firm membership is a significant covariant (p=.002), but department type membership significance remains at p<.001.

There were clear differences between members of different department types. For the R&D department type members, deductive propensity and social collaborating sources of meaning were significantly impacted by department membership (p<.01). For members of the accounting & finance department type, deductive propensity <.001, inductive propensity .014, traditional sources of meaning .041, secondary socialization sources of meaning .022, complexity of knowledge <.001, importance of knowledge .026, email preference <.001, formal meeting preference .031, preference for memos and formal reports .011, preference for spreadsheets and numbers .001 and preference for pictures and diagrams .004 were all significantly impacted by department membership. For operations type departments deductive propensity (p=.001) and social collaborating sources of meaning p=.047) were significantly impacted by department

Figure 66 MANOVA, Grand Hypothesis$_A$
MANOVA Test Results: Department-type Membership:

Dependent Variable	p =	Eta Squared
Full Model	.000	.419
Deductive Propensity	.000	.343
Inductive Propensity	.044	.109
Traditional Sources of Meaning	.335	.059
Superiors as Source of Meaning	.682	.035
Secondary Socialization Sources of Meaning	.163	.079
Social Collaborating Sources of Meaning	.042	.110
Overall Location of Attention outside firm	.047	.108
Attn to other departments within firm for knwldg	.004	.156
Implicit Internal Sources of Meaning	.199	.074
Simple/Complex	.000	.231
Explicit/Implicit	.000	.208
Important/Unimportant	.017	.129
E-mail preference	.000	.234
Regular or Overnight mail preference	.333	.059
Telephone/Voice-mail preference	.484	.048
Fax preference	.240	.069
Video Conference/Internet preference	.010	.139
Formal Meeting preference	.053	.105
Informal Meeting preference	.513	.046
Memos/Formal Reports preference	.005	.154
Spreadsheets/numbers preference	.000	.277
Pictures/Diagrams preference	.004	.157

membership. For after sales support, importance of organizational knowledge (p=.011) was significantly impacted by department membership. In information systems department types, deductive propensity (p<.001) and preference for video conferencing and internet p=.05) are significantly determined by department membership.

4.1.2 Firm effects on knowledge transfer style

HGrand$_B$: *If a firm's rational boundaries cause the firm's members to have a common and characteristic knowledge transfer style, then we can accurately predict what firm an employee belongs to by observing their knowledge transfer style.*

I next tested the firm's effect on knowledge transfer style, after controlling for department type effects. Using the same statistical analysis techniques performed in the department membership tests, I found that firm membership accounts for a significant portion of the variance in KTS. **Figure 67** reports the statics from the MANOVA, including between subject effects. The MANOVA model describing KTS variance in terms of firm membership has a p-value of 0.002. Firm members were significantly different in KTS facets such as deductive propensity (p=.04), focusing attention outside of the firm (p=.01), attention to other departments within the firm (p=.001) preferring fax communications (p=.03), video

Figure 67 Tests of Between Subject Effects by Firm

Firm Effects, controlling for department type		
Dependent Variable	p =	Eta Squared
Full model	.002	
Deductive Propensity	.040	.038
Inductive Propensity	.202	.015
Traditional Sources of Meaning	.391	.007
Superiors as Source of Meaning	.436	.006
Secondary Socialization Sources of Meaning	.601	.002
Social Collaborating Sources of Meaning	.722	.001
Overall Location of Attention outside firm	.010	.058
Attn to other departments within firm for knwldg	.001	.028
Implicit Internal Sources of Meaning	.605	.002
Simple/Complex	.030	.042
Explicit/Embedded	.001	.082
Important/Unimportant	.182	.016
E-mail preference	.235	.013
Regular or Overnight mail preference	.184	.016
Telephone/Voice-mail preference	.935	.000
Fax preference	.031	.042
Video Conference/Internet preference	.030	.042
Formal Meeting preference	.896	.000
Informal Meeting preference	.199	.015
Memos/Formal Reports preference	.174	.017
Spreadsheets/numbers preference	.850	.000
Pictures/Diagrams preference	.007	.065

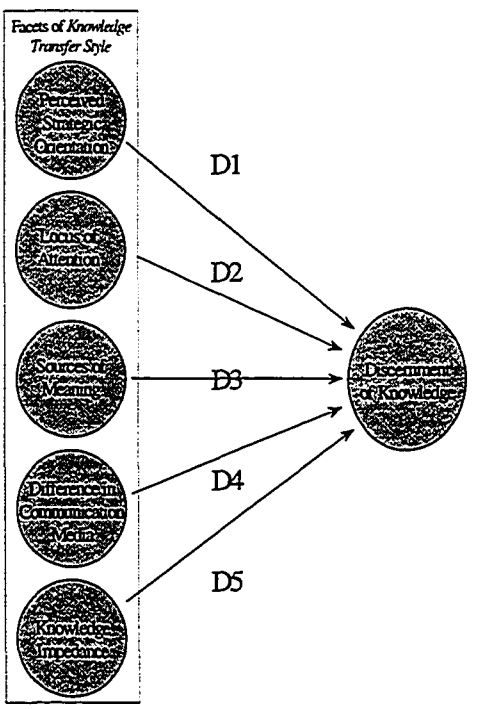
conference/internet (p=.03), using pictures and diagrams (p=.007), and their assessments of the complexity facet (p=.03) and the embeddedness facet (p=.001) of impedance to knowledge transfer.

In a discriminant analysis by firm ID, the discriminant function has a Wilk's Lambda of .537 yielding a p-value of 0.001. Furthermore, discriminant analysis was able to classify 84% of the 117 cases correctly as either an Intel member or a Siemens member, with prior probability around 60% for Siemens and 40% for Intel.

4.1.3 Effect of knowledge transfer style upon discernment of organizational knowledge

Hgrand$_c$ Causes of Discernment - *The perceived strategic orientation, locus of attention, characteristic sources of meaning, dysfunction in communication media and knowledge impedance together predict a significant portion of the variance in an organizational member's knowledge discerning behavior.*

Figure 68 Impact of Knowledge Transfer Style Upon Discernment of Organizational Knowledge



The standard null hypothesis tested here is that the knowledge transfer style variables, including organizational knowledge impedance (perceived complexity, embeddedness, and lack of importance of the knowledge), do not cause variance in discernment of

knowledge. The path diagram in **Figure 68** graphically depicts the hypothesis. I test this hypothesis controlling for prior variables (department type membership) and using the general linear modeling approach to multiple regression so that all of the predictor variables are entered into the analysis simultaneously, so that order of entry difficulties are avoided. Hierarchical moderated regression is used later to test specific hypotheses.

Results of the multiple regression statistical analysis are offered in **Figure 69**. The model has an adjusted r^2 of 0.448. Variance inflation factors (VIF) represent the increase in variance of a coefficient due to correlation between the independent variables (collinearity). A high degree of collinearity can compromise the ability of multiple regression to yield unbiased estimates. VIF scores are low, indicating no material problems with collinearity. Regression analysis also assumes a relatively normal distribution of the data. I found a good match between a histogram of the data and a standard normal curve, indicating adequate normality. Finally, there was sufficient evidence of equality of variances for valid interpretation of multiple regression results. Knowledge transfer style facets that have a significant effect upon the discernment of organizational knowledge *controlling for all covariants*, are inductive propensity (p=.014), attention to location outside of the firm

Figure 69 Regression Results $Hgrand_C$

Tests of Between-Subjects Effects Dependent Variable: Discernment (avg.)	p =	Eta Squared
Corrected Model[a]	.000	.543
Intercept	.753	.001
Name of Business Unit	.745	.001
Accounting/Finance Type	.172	.019
Research/Development Type	.027	.050
Operations Type	.121	.025
After Sales Support Type	.307	.011
Info Systems Support	.573	.003
Deductive Propensity	.913	.000
Inductive Propensity	.014	.061
Overall Location of Attention within department	.535	.004
Attn to other departments within firm for knwldg	.832	.000
Overall Location of Attention outside firm	.040	.043
Traditional Sources of Meaning	.108	.027
Superiors as Source of Meaning	.636	.002
Secondary Socialization Sources of Meaning	.530	.004
Social Collaborating Sources of Meaning	.823	.001
Implicit Internal Sources of Meaning	.110	.026
Communication Means Dysfunction	.246	.014
Simple	.792	.001
Explicit	.003	.087
Important	.184	.018
a : R2 = .543 (Adjusted R2 = .448)		

(p=.04) and the explicitness of the knowledge that is discerned (p=.003). Furthermore, membership in an R&D department type significantly impacts the discernment of organizational knowledge (p=.027).

A stepwise regression including all of the facets in a single step yields similar results to the regression above. As displayed in **Figure 70**, embeddedness/explicitness and external location of attention remain the significant variables for predicting discernment of knowledge. Together, these two variables explain 42% of the variance in organizational knowledge discernment (adjusted R^2 = .423). The coefficients are in the correct directions: embeddedness impedes discernment (Beta = -.551), and attention to external locations enhances discernment (Beta = .327). Inductive propensity is not retained in the stepwise model.

Figure 70 Discernment Regression Coefficients

Stepwise Regression

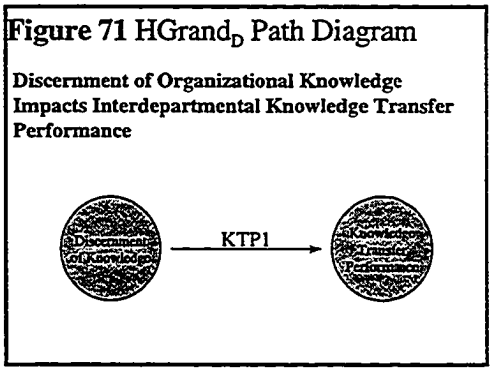
Dependent Variable: ***Discernment*** R2 .433, Adj R2 .423	Unstandardized Beta	Standardized Beta	p =	VIF
(Constant)	3.223		.000	
embeddedness of knowledge	-.551	-.456	.000	1.068
Overall Location of Attention outside firm	.327	.373	.000	1.068

4.1.4 Explaining organizational knowledge transfer performance with discernment of organizational knowledge

$HGrand_D$ - *Higher knowledge discernment behavior leads to higher performance of knowledge transferred.*

The standard null hypothesis tested here is that discernment of knowledge does not cause a significant amount of variance in knowledge

Figure 71 $HGrand_D$ Path Diagram



transfer performance. The standard form of the alternative hypothesis is:

Knowledge Transfer Performance$_j$ = *Constant* + β_i*Discernemnt of Knowledge*$_j$ + ϵ.

Figure 72 Knowledge Transfer Performance Hypothesis Test Results

Discernment → Knowledge Transfer Performance (KTP)	R2	Beta	Std. Beta	p=
KTP in general is explained by the level of Discernment of Knowledge	.218	.471	.428	.001
KTP in general is explained by the level of Discernment of Knowledge, using the usage-based scale measure of KTP	.301	14.51	.531	.001
KTP of tech knowledge is explained by discernment level of technological knowledge	.260	.425	.510	.001
KTP of information technology knowledge is explained by discernment level of IT knowledge	.510	.483	.714	.001
KTP of customer knowledge is explained by Discernment level of customer knowledge	.073	.-146	.270	.250
KTP of fiscal knowledge is explained by Discernment level of fiscal knowledge	.640	.506	.800	.001
KTP of management practice knowledge is explained by Discernment level of management practice knowledge	.022	.102	.147	.559
KTP of research and development knowledge is explained by Discernment level of management practice knowledge	.002	.022	.031	.910

Each alternative hypothesis i takes on the j value of five predefined knowledge transfer situations: knowledge transfer situations in general, technical knowledge transfer situation, customer knowledge transfer situations, fiscal knowledge transfer situations, and situations involving the transfer of management practice knowledge. **Figure 72** lists each individual hypothesis and the results of the related hypothesis tests. Tests indicate that we cannot reject that there is a positive predictive relationship between discernment of organizational knowledge and knowledge transfer performance (p=.001, Beta=.471).

4.1.5 The achievement of organizational knowledge potential

One of the implicitly understood hypotheses of this dissertation is that, in general,

there is a significant difference between potential and actual usage of organizational knowledge.

$HGrand_E$: *A significant portion of organizational knowledge that is identified as potentially useful is not actually put to use.*

Results. The null hypothesis tested here is that all of the organizational knowledge that could be put to use is actually put to use. The knowledge transfer performance items were aggregated to produce an average score for each subject. The mean score of 57.70 points of knowledge used out of a potential 100 points of knowledge available and considered useful had a standard deviation of 19.73 points. A one tailed t-test indicated that the null hypothesis should be rejected ($p < 0.001$). There is evidence to suggest that less than 100% of organizational knowledge that has been discerned and has been agreed upon as useful is actually put to use. I subsequently tested the more stringent hypothesis that 60% (null) or less than 60% (alternative) of the organizational knowledge that could be put to use is actually put to use. A t-test rejected the null hypothesis in this case as well ($p < 0.05$).

4.2 Specific Hypotheses

4.2.0 Overview of section

In section 2.4, a number of hypotheses were presented en route to the establishment of the grand hypotheses of the dissertation. In this section those hypotheses are tested. The tests are conducted in the order that they were derived in section 2.4. Because the hypothesis numbering system corresponds to the both the labels on the full path model, and the chapter, section and order in which hypotheses are proposed, referring back to theory development is simple.

The general format of the section is as follows. There is a subsection for each hypothesis (or group of hypotheses when appropriate). In each subsection, the hypothesis is reprinted, I discuss the reasoning for using a particular testing methodology, present any possible shortcomings of the testing method, and then present the results of the hypothesis test. Figures containing summaries or details of the numerical statistics are presented when appropriate.

4.2.1 Strategic orientation hypotheses

KTS1.3 - *We can accurately predict what type of department an employee belongs to by observing how they perceive their department's strategic orientation.*

This hypothesis is a sub-hypothesis of $HGrand_A$. Following the methodology used to test $HGrand_A$, I continue the method of collapsing into a single department called "other" any department for which I have less than 10 members sampled. 14 cases were

Figure 73 KTS 1.3 Results

Test of Function(s)	Wilks' Lambda	Chi-square	df	p =
1	.907	9.798	4	.044
33.7% of original grouped cases correctly classified.				

thereby classified as "other" and discriminant analysis was instructed to exclude that data. Once again, discriminant analysis is used as the appropriate test. The use of this methodology for this purpose is defended in Section 3.5.

Results of discriminant analysis (see **Figure 73**) indicate that by using strategic orientation of the department scores alone, 33.7% of cases are correctly classified, while prior probabilities of correct classification by chance are 20%. Box's M statistic, testing the null hypothesis of equal population covariance matrices, is significant at p = .031, and the *U*-statistic (Wilk's Lambda) is significant at p = 0.044.

D1.1 - *Those who perceive their department toward the Prospector end of the scale will have a higher average level of organizational knowledge discernment than those who describe their department toward the middle (analyzer) or the opposite end (defender) of the scale.*

and

D1.2 - *Those who score their department toward the Prospector end of the scale will have a higher average level of organizational knowledge discernment than those who score their department toward the middle (analyzer) of the scale, who will have a higher average level of organizational knowledge discernment than those scoring their department toward the defender end of the scale.*

Figure 74 Hierarchical Moderated Regression: Perceived Strategic Orientation's Impact Upon Discernment

Model: Perceived Strategic Orientation	R	R2	Adj. R2	Beta	Std. Beta	p =	R2 change	F change	p of F change
Perceived Strategic Orientation entered 3rd*	.580	.336	.287	.188	.396	.001	.139	22.633	.001
Perceived Strategic Orientation entered last	.719	.516	.455	.042	.088	.341	.004	916	.341
*Order of Entry: Department Types, Locations of attention and sources of meaning, Perceived Strategic Orientation of Department 3rd.									

Results of a hierarchical moderated regression analysis are presented in **Figure 74.** When perceived strategic orientation is entered after all other covariants and prior variables, no significant impact is found. When strategic orientation is entered third, after controlling for department type and one other covariant to help absorb any systematic response bias, a significant change in r2 is found p=(.001).

4.2.2 Hypotheses related to locus of attention

KTS 2.1 - *On a continuous defender (low) to analyzer to prospector (high) scale, there will be positive correlation between perceived department strategic orientation and the use and breadth of loci of attention.*

Figure 75 KTS2.1, Partial Correlation Coefficients
Controlling for Department Membership

Attention Facet	Dept.Strat.Orientation	
Internal vs External	.4168	P< .001
External to firm	.4081	P= .000
within department	-.1760	p= .058
Other departments	.0864	P= .354
To customers	.3959	P< .001
To suppliers		.2805P= .002
To competitors	.3320	P< .001
To professional group	.1938	P= .036
to joint venture partners	.2002	P= .030

Testing this hypothesis with correlation analysis is straightforward. Recall that the *locus* of attention construct contains two facets, *logic* of attention and *location* of attention. This analysis only utilizes the measure of location of attention.

Figure 75 shows the results of partial correlation analysis. Using partial correlation analysis, the reported statistics are controlled for covariance with department membership.

The first three scales are internal versus external focus, external to the firm focus and internal to the firm focus of attention. The remaining scales measure attention to different potential source locations of knowledge relevant to departmental productivity, efficiency or effectiveness.

The overall internal versus external focus of attention scales is significantly correlated to strategic orientation of the department (.4168, $p < .001$), as is the external attention scale (.4081, $p < .001$). The internal to the firm scale, which is a composite of internal to the department and other departments within the firm, is not significantly correlated. Attention to other departments within the firm is not significantly correlated, but all other external sources are correlated with increasing strategic orientation scores toward prospector, and decreasing scores toward defender.

Given the prevalence of routines and emergent modes of action, departmental members tend to look *where* they are accustomed to looking for knowledge, and to notice that which they are accustomed to noticing, thereby failing to notice or find knowledge which is attainable but hidden beyond their rational boundaries (Simon, 1957). By reusing the measures of the facets of locus of attention, department membership and organizational knowledge discernment, the following bivariate hypotheses is tested.

Hypothesis KTS2.2 - *Members of different departments types will utilize different loci of attention. Members of the same department type will utilize similar loci of attention.*

Analysis of variance is used to test this sub-hypothesis of $Hgrand_A$. Analysis indicates that locus of attention characteristics differ by department type membership.

MANOVA indicates that the locus of attention is significantly impacted by department type membership. Statistical significance for this hypothesis is found at the 0.001 level, with a R^2 of 0.228. Analysis of variance indicates that the primary driver of locus of attention differences between members of different departments is the *logic of attention* facet of the construct. Exact statistics are provided in **Figure 76.**

Figure 76 KTS2.2, Department Membership by Locus of Attention Facets

Tests of Between-Subjects Effects		
Dependent Variable	R2/Adj R2	Sig.
Attn within own group/department	.077/.036	.106
Attn to other departments within firm for knowledge	.034/-.009	.562
All external to firm locations	.050/.008	.324
Deductive Propensity	.355/.327	.000
Inductive Propensity	.098/.057	.040

Hypothesis KTS2.3 - *We can accurately predict what department type an employee belongs to by observing their loci of attention.*

This sub-hypothesis of $Hgrand_A$ is tested with discriminant analysis. This time, only the facet of locus of attention are utilized to predict department type membership. Statistical

Figure 77 KTS2.3, LOA Discriminant Analysis Statistics

Function	Eigenvalue	% of Variance	Wilks' Lambda	p =
1	.610(a)	84.7	84.7	.000
2	.055(a)	7.7	92.4	.566
3	.034(a)	4.7	97.1	.507
4	.021(a)	2.9	100.0	.357

a First 4 canonical discriminant functions were used in the analysis.

Classification Function Coefficients

	Department Code				
	Information Systems Support	Research and Development	Business Operations	After Sales Support	Accounting/ Finance
Overall Location of Attention within department	13.15	12.592	12.846	12.597	13.128
Attn to other departmentswithin firm for knwldg	4.925	4.552	5.124	4.656	4.964
Overall Location of Attention outside firm	3.924	3.487	3.207	3.05	2.956
Deductive Propensity	7.123	7.46	7.1	5.53	9.611
Inductive Propensity	7.021	6.299	6.323	7.737	5.61
(Constant)	-67.459	-60.476	-61.527	-58.954	-69.239

Fisher's linear discriminant functions

48.1% of original grouped cases correctly classified.

results are offered in **Figure 77.** In this sample, there is strong statistical evidence to reject the null hypothesis. The initial discriminant function has an Eigenvalue of .610 and accounts for 84.7% of the variance in the data. This function can be described as inductive vs. deductive propensity. The three other orthogonal functions account for the remainder of the variance. Wilk's Lambda statistic for the initial function is highly significant, and the analysis correctly classifies 48.1% of cases into the proper department. Members of the accounting/finance department type have the highest propensity for deduction and the lowest propensity for induction, compared to members of any other department type. Members of after sales support departments are just the other way around.

Hypotheses D2.1 through D2.3 are tested as a group. Using moderated hierarchical regression, I assess the degree of impact that different locus of attention facets and the general breadth of attention may have upon the discernment of organizational knowledge. Discernment of organizational knowledge is the dependent variable, and (D2.1) overall locus of attention, (D2.1a) attention upon other department in the firm, (D2.2) deductive propensity and (D2.3) inductive and deductive propensity are the independent variables.

Hypothesis D2.1 : *A broader physical and logical range of attention predicts a higher average level of organizational knowledge discernment by department members.*

Hypothesis D2.2 : *Focusing more attention upon other departments within the firm will lead to a higher average level of organizational knowledge discernment by department members.*

Hypothesis D2.3a : *Stronger inductive propensity predicts a higher average level*

of organizational knowledge discernment by department members.

Hypothesis D2.3b: *Stronger deductive propensity predicts a higher average level of organizational knowledge discernment by department members.*

Hypothesis D2.3c : *Stronger inductive propensity and deductive propensity predicts a higher average level of organizational knowledge discernment by department members.*

Figure 78 D2.1, D2.2 and D2.3

Model: Location of Attention	R	R2	Adj. R2	Beta	Std. Beta	p =	R2 change	F change	p of F change
Locations of Attention entered 3rd*	.691	.478	.423				.120	17.954	.001
attn within dept.				-.119	-.133	.145			
attn within firm				.036	.047	.569			
attn outside firm				.229	.261	.006			
Locations of Attention entered last	.728	.530	.454				.052	3.85	.011
attn within dept				-.089	-.099	.279			
attn within firm				.036	.048	.588			
attn outside firm				.175	.200	.050			
*Order of Entry: Department Types, Impedance Facets (complex, embedded, unimportant), Locations of Attention Facets 3rd.									

Model: Logic of Attention	R	R2	Adj. R2	Beta	Std. Beta	p =	R2 change	F change	p of F change
Logic of Attention entered 3rd*	.648	.420	.365				.062	5.666	.005
Deductive				.016	.002	.984			
Inductive				.283	.277	.001			
Logic of Attention entered last	.678	.460	.392				.028	2.631	.077
Deductive				-.024	-.003	.978			
Inductive				.205	.200	.024			
*Order of Entry: Department Types, Impedance facets (complex, embedded, unimportant), Logic of Attention facets (inductive, deductive) 3rd.									

Breadth of Attention

Model: Breadth of Attention	R	R2	Adj. R2	Beta	Std. Beta	p =	R2 change	F change	p of F change
Locus of Attention entered 3rd*	.579	.335	.293	.527	.475	.001	.200	32.881	.001
Locus of Attention entered last	.713	.508	.451	.324	.292	.001	.061	12.969	.001
*Order of Entry: Department Types, Communication Media Dysfunction, Locus of Attention 3rd.									

Figure 78 reports the results of these hypothesis tests. The test of hypothesis D2.1 shows a significant impact in the correct direction, even when the variable is entered last (p=

.001, Beta = .324). The relationships tested in D2.2 was not found to be significant. D2.3a was supported at p = .024, but D2.3b concerning the impact of deductive propensity, was not supported. D2.3c is also not supported (p=.077).

Overall, locations of attention account for between 6-12% of the total variance in discernment of organizational knowledge, depending upon how many other factors are controlled. Attention focused on members of the task environment outside of the firm (p=.05) is the location of attention variable that accounts for a significant portion of the variance in organizational knowledge discernment.

Deductive propensity does not have a significant impact upon discernment of organizational knowledge. Inductive propensity (p=.024) accounts for between 3 and 6 percent of the variance in organizational knowledge discernment, with a Beta of .205.

4.2.3 Sources of meaning hypotheses

KTS3.1: *We can accurately predict what type of department an employee belongs to by observing their sources of meaning.*

KTS 3.2: *Members of different departments will draw from different characteristic sources of meaning.*

KTS3.2a: *Members of Accounting/Finance department types will make strong use explicit internal sources of meaning, (financial reports and formal rules), and of secondary socialization sources of meaning (professional associations and experience).*

KTS3.2b: *Members of Research/Development department types will make strong use of social collaboration sources, such as coworkers, experts outside of their department and subordinates.*

KTS3.2c: *Members of Operations department types will make strong use of superiors as a source of meaning.*

KTS3.2d: *Members of after sales support department types will make strong use of the external task environment as a source of meaning.*

Figure 79 Results: Discriminant Analysis by Sources of Meaning

Classification Function Coefficients

	Department Code				
	Information Systems Support	Research and Development	Business Operations	After Sales Support	Accounting/ Finance
Traditional Sources of Meaning	3.774	2.789	3.006	2.733	4.819
Superiors as Source of Meaning	4.839	4.735	4.716	5.669	4.568
Secondary Socialization Sources of Meaning	3.759	3.558	3.254	2.366	5.778
External Task Environment Sources of Meaning	0.431	-0.09	0.31	0.522	-1.839
Social Collaborating Sources of Meaning	2.707	4.239	4.06	3.878	1.975
Explicit Internal Sources of Meaning	3.805	3.905	3.56	2.861	5.419
Implicit Internal Sources of Meaning	0.648	1.644	1.323	1.796	0.434
(Constant)	-33.556	-35.189	-33.475	-33.613	-38.216
47.1% of original grouped cases correctly classified.					

The reduced set of seven general sources of meaning is used to test these hypotheses. Use of fewer variables only underestimates the results. The results of this discriminant analysis are offered in **Figure 79**. Box's M is highly significant, as is Wilk's Lambda for the first two discriminant functions. The average hit rate of approximately 47% far outpaces the prior probabilities. These results support hypothesis KTS 3.1 and KTS 3.2, indicating that sources of meaning are department type dependent.

The 3.2a, b and c hypotheses contending that department types differ in specific ways on their uses of alternative sources of meaning are all supported by the descriptive statistics. Hypothesis 3.2d, concerning after sales support and the task environment as a source of meaning is not supported. Fisher's linear discriminant function coefficients indicate that the

members of the Accounting/Finance department type use secondary socialization sources and explicit internal sources of meaning more than any other source of meaning, and that they use these more than any other type of department in the study. Members of operations department use superiors as a source of meaning more than any other source of meaning, but other department types make strong use of superiors as well. There is evidence that members of the research and development department type make strong use of colleagues, outside experts and subordinates to make sense of events. Discriminant function coefficients show that social collaboration sources of meaning were weighted higher than all but one other source within this department type, and this source of meaning was used more by this department type than by any other department type.

D3.1: *Frequent use of sources of meaning external to the department will lead to improved discernment of organizational knowledge.*

Figure 80 Hierarchical Moderated Regression: Sources of Meaning

Model: Sources of Meaning	R	R2	Adj. R2	Beta	Std. Beta	p =	R2 change	F change	p of F change
Sources of Meaning entered 3rd*	.610	.372	.320				.237	36.86	.001
External Task Environment Sources				.282	.326	.001			
Implicit Internal Sources				-.241	-.320	.001			
Traditional Sources				.228	.263	.003			
Sources of Meaning entered last	.718	.516	.450				.021	4.468	.037
External Task Environment Sources				.156	.181	.027			
Implicit Internal Sources				-.164	-.217	.008			
Traditional Sources				.147	.170	.037			
*Order of Entry: Department Types, Communication Media Dysfunction ,Sources of Meaning Facets 3rd.									

A hierarchical moderated regression is used to test this hypothesis. When the analysis reaches the final stage, the sources of meaning are all presented, and a stepwise procedure is used within-stage to include only those sources of meaning that have might account for

some of the remaining variance in organizational knowledge discernment. Results of the hierarchical moderated regression (see **Figure 80**) indicate that use of external task environment sources of meaning (p=.027, Beta=.156) and traditional sources of meaning (p=.037, Beta=.147), both of which are external to the firm, significantly enhance the discernment or organizational knowledge. Use of implicit internal sources of meaning significantly decreases discernment of organizational knowledge (p=.008, Beta= -.164). Sources of meaning account for between 2 to 24 percent of organizational knowledge discernment, depending upon the level of control over other critical variables.

The next set of hypotheses propose that some departments will better discern particular areas of organizational knowledge than others based upon their tendencies to more or less frequently utilize different sources of meaning. This hypothesis, for example predicts that organizational knowledge about budgets and accounting reports would be more likely discerned by departments whose members tend to commonly use financial reports as a source of meaning.

D3.1a: *Frequent use of customers as a source of meaning is associated with a higher level of discernment of organizational knowledge about customers.*

D3.1b: *Frequent use of internal financial reports as a source of meaning is associated with a higher level of discernment of organizational knowledge in financial reports.*

D3.1c: *Frequent use of organizational culture as a source of meaning will be associated with a higher level of discernment of organizational knowledge about*

management practices.

D3.1d: *Frequently use of specialists from outside the department as a source of meaning will be associated with a higher level of discernment of organizational knowledge about management practices.*

The next set of displays (in **Figure 81**) show results indicating that different sources of meaning seem to account for discernment of different topical areas of organizational knowledge in different departments.

Figure 81 Results, Hypothesis D3.1

Dependent Variable: Discernment of Knowledge in accouting/financial reports

Source	F	Sig.
SM_RULES	.648	.423
SM_OCULT	2.063	.154
SM_SUBOR	4.130	.045
SM_SPECL	1.555	.215
SM_COWRK	6.110	.015
SM_SUPER	.228	.634
SM_ACCTS	23.452	.000
SM_EXPER	.505	.479
SM_NCULT	1.107	.295
SM_RELIG	1.460	.230
SM_FAMLY	.573	.451
SM_CUST	.397	.530
SM_PROFL	.635	.427
SM_SUPPL	.212	.646
TEMPDEPT	5.232	.000

Dependent Variable: Discernment of Technological Organizational Knowledge

Source	F	Sig.
SM_RULES	2.362	.128
SM_OCULT	.216	.643
SM_SUBOR	1.784	.185
SM_SPECL	2.283	.134
SM_COWRK	.095	.758
SM_SUPER	.553	.459
SM_ACCTS	.261	.610
SM_EXPER	.238	.627
SM_NCULT	.001	.976
SM_RELIG	.190	.664
SM_FAMLY	.005	.947
SM_CUST	15.039	.000
SM_PROFL	.431	.513
SM_SUPPL	.502	.480
TEMPDEPT	4.183	.002

Dependent Variable: Discernment of Knowledge about Customers' Preferences

Source	F	Sig.
SM_RULES	2.754	.100
SM_OCULT	.405	.526
SM_SUBOR	.661	.418
SM_SPECL	.316	.576
SM_COWRK	.213	.646
SM_SUPER	.642	.425
SM_ACCTS	.829	.365
SM_EXPER	5.096	.026
SM_NCULT	1.000	.320
SM_RELIG	.231	.632
SM_FAMLY	.024	.877
SM_CUST	12.618	.001
SM_PROFL	7.823	.006
SM_SUPPL	.699	.405
TEMPDEPT	1.554	.180

Dependent Variable: Discernment of Knowledge from Organizational Information Systems

Source	F	Sig.
SM_RULES	.425	.516
SM_OCULT	.325	.570
SM_SUBOR	2.716	.103
SM_SPECL	1.516	.221
SM_COWRK	.473	.493
SM_SUPER	1.233	.269
SM_ACCTS	.235	.629
SM_EXPER	.554	.458
SM_NCULT	.123	.726
SM_RELIG	.000	.986
SM_FAMLY	.047	.830
SM_CUST	10.523	.002
SM_PROFL	.073	.788
SM_SUPPL	.946	.333
TEMPDEPT	4.783	.001

Dependent Variable: Discernment of Knowledge about Management Practices

Source	F	Sig.
SM_RULES	.013	.908
SM_OCULT	11.724	.001
SM_SUBOR	1.464	.229
SM_SPECL	4.088	.046
SM_COWRK	4.629	.034
SM_SUPER	.306	.581
SM_ACCTS	.022	.883
SM_EXPER	2.615	.109
SM_NCULT	1.600	.209
SM_RELIG	.853	.358
SM_FAMLY	1.897	.172
SM_CUST	1.768	.187
SM_PROFL	.264	.609
SM_SUPPL	.446	.506
TEMPDEPT	1.040	.399

Dependent Variable: Discernment of organizational knowledge from Research and Development

Source	F	Sig.
SM_RULES	4.196	.043
SM_OCULT	.030	.863
SM_SUBOR	.235	.629
SM_SPECL	1.707	.194
SM_COWRK	1.939	.167
SM_SUPER	.001	.970
SM_ACCTS	.130	.719
SM_EXPER	.000	.995
SM_NCULT	.226	.635
SM_RELIG	.678	.412
SM_FAMLY	.018	.893
SM_CUST	10.575	.002
SM_PROFL	.784	.378
SM_SUPPL	.019	.889
TEMPDEPT	1.672	.148

Notice that for discernment of knowledge about customers, customers as a source of meaning impacts discernment with the lowest p-value (.001). For financial knowledge, accounting reports are the most statistically significant source of meaning ($p<.001$). For discernment of organizational knowledge about management practices elsewhere in the firm, the only significant sources of meaning are specialists from other departments, co-workers and organizational culture as sources of meaning. While I report results for six areas of organizational knowledge, these three are the only areas of knowledge that can be directly obviously mapped to specific sources of meaning measured in this study. The results do support hypothesis D3.1 and the sub-hypotheses D3.1a-D3.1d.

4.2.4 Communication media related hypotheses

I have argued that different groups and departments may establish different norms and preferences for the way they use the various communication media available within the firm. A discriminant analysis will correctly categorize subjects by department based upon the communication media preferences if there is sufficient variance between departments, and sufficient homogeneity within departments.

Hypothesis KTS4.1: *We can accurately predict what department type an employee belongs to by observing their communication media preferences.*

I tested this hypothesis using discriminant analysis. The discriminant analysis function was able to correctly categorize approximately 55% of all cases. Results are reported in **Figure 82.** This 55% hit rate should be compared to an average expected hit rate of 20% if subjects were randomly assigned to the departments types included in the analysis.

Figure 82 KTS4.1 Results

Eigenvalues, Wilks' Lambda and Classification Results

Function	Eigenvalue	% of Variance	Cumulative %	Wilks' Lambda	p =
1	1.177(a)	73.7	73.7	.313 (1-4)	<.001
2	.226(a)	14.2	87.9	.681 (2-4)	.108
3	.167(a)	10.4	98.3	.835 (3-4	.381
4	.027(a)	1.7	100.0	.974 (4)	.926

a First 4 canonical discriminant functions were used in the analysis.

Classification Function Coefficients

	Department Code				
	Information Systems Support	Research and Development	Business Operations	After Sales Support	Accounting/ Finance
E-mail preference	17.018	15.785	15.953	15.326	13.166
Regular or Overnight mail preference	8.051	7.013	7.613	7.866	7.153
Telephone/Voice-mail preference	-1	-1.246	-1.387	-1.332	-0.616
Fax preference	-4.072	-3.335	-3.646	-3.557	-3.452
Video Conference/Internet preference	0.845	0.375	-0.09131	-0.345	0.711
Formal Meeting preference	4.942	5.444	5.804	5.914	6.344
Informal Meeting preference	5.372	4.448	4.627	4.823	3.861
Memos/Formal Reports preference	3.27	2.324	2.746	3.317	2.842
Spreadsheets/numbers preference	-0.807	-0.2	-0.257	-0.815	2.11
Pictures/Diagrams preference	3.496	3.668	3.5	3.739	1.589
(Constant)	-73.273	-63.073	-63.987	-64.129	-59.843
Fisher's linear discriminant functions **54.4% of original grouped cases correctly classified.**					

Figure 83 shows the impact of each individual type of communication media upon differentiating one members of one department type from members of another. Preferences for email, telephone, video conferencing, memo's and formal reports, spreadsheets and numbers, pictures and diagrams appear to significantly distinguish between members of different department types.

Because of the number of different communication media in the analysis, data reduction (factor analysis) is used as a following technique to corroborate the findings. Factor analysis with varimax rotation divides the different communication media into four groups. Factor one contains mail, fax, telephone and video conferencing. Factor two groups together formal reports an memos, formal meetings, spreadsheets and numbers. Factor three

includes pictures, diagrams and informal meetings. The final factor is preference for the use of email .

Factor scores for each case are saved and subsequently used in a new discriminant analysis and analysis of variance. The results of this second test indicate that just departments do differ according to these four resulting factors. In particular, the second factor representing a facet that might be labeled "formal communications" (formal reports, memos, formal meetings, spreadsheets and numbers) seems to be the determining factor in differentiating between department types. Discriminant analysis on the four factors does an adequate job of classifying departmental members with a hit rate of approximately 57% with average prior probability of 25.%.

Figure 83 Analysis of Variance, Communication Media Preferences

Univariate Test Results

Dependent Variable	p =
E-mail preference	.000
Regular or Overnight mail preference	.406
Telephone/Voice-mail preference	.358
Fax preference	.664
Video Conference/Internet preference	.035
Formal Meeting preference	.029
Informal Meeting preference	.612
Memos/Formal Reports preference	.005
Spreadsheets/numbers preference	.000
Pictures/Diagrams preference	.041

Significant Between Subject Effects

Source	Dependent Variable	Sig.	Eta Squared
Accounting/ Finance	E-mail preference	.000	0.115
	Formal Meeting preference	.031	0.042
	Memos/Formal Reports preference	.011	0.058
	Spreadsheets/numbers preference	.001	0.097
	Pictures/Diagrams preference	.004	0.072
Information Systems Support	Video Conference/Internet preference	.005	0.035

KTS4.1a: *Members of accounting departments will report a communication media preference for spreadsheets and numbers, and for memos and formal reports*

KTS4.1b: *Members of research and development departments will report a communication media preference for informal meetings.*

KTS4.1c: *Members of IT support will report a communication media preference for the internet and video conferencing.*

There is evidence to support hypotheses KTS41.a (p=.01, p=.001) and KTS4.1c (p=.05). There was not clear support for hypothesis KTS4.1b. No one showed a positive preference for spreadsheets and numbers and numbers aside from members of accounting/finance department types. Other department types had a negative preference to this communication media.

The next hypothesis to test is D4.1 which questions some classical assumptions of media richness theory.

D4.1: *A preference for richer communication media predicts higher levels of knowledge discernment.*

Figure84 contains tables with the resulting statistics. There is no significant change in *F* with the reduced model (less rich media are dropped), indicating that the majority of impact upon organizational knowledge discernment rests with the richer communication media that remain. Analysis of variance indicates that both models have a statistically significant association with organizational knowledge discernment. The full model is significant at p = .025, and the reduced model of containing richer media types is significant at the .05 level.

Figure 84 Moderated Hierarchical Regression, Media Richness Preferences and Discernment

Model	R2	Adj R2	p =	R2 Change	F Change	Sig. F Change
1(a)	.169	.091	.025	.169	2.171	.025
2 (b)	.137	.098	.005	-.032	.819	.539

a Predictors: (Constant), Pictures/Diagrams preference, Memos/Formal Reports preference, Regular or Overnight mail preference, E-mail preference, Informal Meeting preference, Video Conference/Internet preference, Telephone/Voice-mail preference, Spreadsheets/numbers preference, Formal Meeting preference, Fax preference

b Predictors: (Constant), Pictures/Diagrams preference, Informal Meeting preference, Video Conference/Internet preference, Telephone/Voice-mail preference, Formal Meeting preference

Independent Variable	B	Std. Beta	p =
(Constant)	3.531		.000
E-mail preference	-.095	-.084	.413
Regular or Overnight mail preference	.040	.044	.700
Telephone/Voice-mail preference	-.160	-.191	.080
Fax preference	-.100	-.134	.263
Video Conference/Internet preference	.209	.279	.005
Formal Meeting preference	-.093	-.086	.445
Informal Meeting preference	-.021	-.022	.842
Memos/Formal Reports preference	.121	.144	.195
Spreadsheets/numbers preference	-.070	-.091	.426
Pictures/Diagrams preference	.074	.094	.367

Furthermore, ANOVA shows that only knowledge communication preference for video conferencing and use of internet has a significant impact upon the discernment of organizational knowledge with p= .005, (p = .05 after any post-hoc adjustments). I therefore find limited support for the hypothesis that preferences for richer media types aids the discernment of organizational knowledge.

The last hypothesis to test in this section concerns the overall effect of communication mean dysfunction, or disagreement between communication media used by the sender and the communication media preferences of the receiver. A perfect match between receiver preferences and the actual communication media used is expected to increase the likelihood that organizational knowledge is fully discerned.

D4.2: *Larger discrepancies between the communication media used by the sender(s) and the preferred communication media of the receiver(s), will cause lower levels of knowledge discernment. Smaller discrepancies will*

cause higher levels of discernment.

The communication dysfunction scale moves from low (complete mismatch) to high (perfect match). Therefore, high scores on the dysfunction scale should be associated with higher scores in discernment and, subsequently, enhanced scores in organizational knowledge transfer performance. Hierarchical moderated regression is used, regressing organizational knowledge discernment on the average communication media discrepancy score for each participant. **Figure 85** contains tables that report the statistical results of the analysis. Communication media discrepancy can account for between 1.8 and 8.3% of the variance in organizational knowledge discernment. Change in R2 is significant at p=.047 when media dysfunction is entered in the final stage of the hierarchical moderated regression. The negative coefficient (Beta= -.128) indicates that as media dysfunction increases, organizational knowledge discernment decreases.

Figure 85 Relationship Between Communication Media Dysfunction and Organizational Knowledge Discernment

Communication Means Dysfunction
Model Summary

Model: Communication Means Dysfunction	R	R2	Adj. R2	Beta	Std. Beta	p =	R2 change	F change	p of F change
Communication Media Dysfunction entered 3rd*	.546(c)	.298	.246	-.250	-.295	.001	.083	12.813	.001
Communication Media Dysfunction entered last	.733	.537	.468	-.128	-.150	.047	.0184	4.029	.047
*Order of Entry: Department Types, Inductive Propensity, Deductive Propensity, Communication Means Dysfunction 3rd.									

4.2.5 Hypothesis related to knowledge impedance constructs

The impedance of knowledge is a conceptual domain that includes (at least) the three constructs: complexity/simplicity of the knowledge, embeddedness/explicitness of the knowledge and importance of the knowledge. Some of the hypotheses address aggregate impedance while other hypotheses deal with one or more of the three constructs.

KTS 5.1: *We can accurately predict what type of department an employee belongs to by observing their perceptions of knowledge importance, complexity and embeddedness.*

This hypothesis is tested using the three impedance facet scores, so that each department and case can be profiled on three dimensions (importance, simplicity, explicitness). The resulting discriminant analysis statistics improve, with Wilk's Lambda significant at p=.007, and about 42% of cases correctly classified. All of these results are presented in **Figure 86.** Members of all department types indicated that organizational knowledge is generally embedded rather than explicit. Members of accounting/finance department types found organizational knowledge the least complex, while members of other department types found it equally complex. Members of accounting/finance department types indicate that organizational knowledge is generally unimportant, while members of other department types found it neither important nor unimportant.

Figure 86 KTS5.1

Classification Function Coefficients

	Department Code				
	Information Systems Support	Research and Development	Business Operations	After Sales Support	Accounting/ Finance
unimportance knowledge	0.397	-0.04308	-0.337	1.126	2.187
complexity of knowledge	3.265	3.213	3.387	3.5	0.687
embeddedness of knowledge	4.562	4.885	4.787	4.903	4.802
(Constant)	-10.525	-9.639	-9.806	-12.323	-8.63

Fisher's linear discriminant functions
42.3% of original grouped cases correctly classified.
Wilk's Lambda: .663, p=.007

The next hypothesis deals with the assertion that organizational knowledge which is made obvious and explicit is more likely to be well discerned than organizational knowledge that is deeply embedded in context or is left implicit.

D5.1 *More embedded organizational knowledge predicts lower levels of*

discernment of organizational knowledge, more explicit organizational knowledge predicts higher levels of discernment of organizational knowledge.

This hypothesis is tested with hierarchical moderated regression analysis. Statistical results are presented in **Figure87**. The relationship is significant (p=.005) and in the correct

Figure 87 D5.1 Results

Model: Impedance Facets	R	R2	Adj. R2	Beta	Std. Beta	p =	R2 change	F change	p of F change
Impedance entered 3rd*	.631	.399	.348				.173	10.27	.001
Complex				-.050	-.049	.617			
Embedded				-.484	-.401	.001			
Unimportant				-.146	-.122	.182			
Impedance entered last	.733(h)	.537	.468				.062	4.475	.005
Complex				-.030	-.029	.742			
Embedded				-.334	-.276	.003			
Unimportant				-.110	-.091	.281			
*Order of Entry: Department Types, Strategic Orientation of Department, Impedance Facets 3rd.									

direction. An analysis of variance indicates that between approximately 6-17 percent of the variance in the discernment of organizational knowledge can be explained by the explicitness of the organizational knowledge. The most conservative regression estimate indicates that for a unit increase on the 5-point "embeddedness" scale, discernment is expected to decrease by an average of .33 on the 5-point discernment scale (Beta = .334).

The next hypothesis contends that embedded knowledge will be better discerned by organizational members with a preference for reasoning by induction.

D5.2: *A propensity or preference for induction predicts a higher level of discernment of organizational knowledge that is perceived as deeply embedded.*

Figure 88 D5.2

Model: Discernment on Embedded and Inductive	R	R2	Adj. R2	Beta	Std. Beta	p =	R2 change	F change	p of F change
Embedded	.577	.333	.297	-.667	-552	.001	.296	49.179	.001
Inductive	.630	.396	.358	.285	.278	.001	.064	11.618	.001
Embedded:* Inductive	.641	.411	.367	.252	.817	.107	.014	2.634	.107
*Order of Entry: Department Types, Embedded, Inductive, Interaction Term.									

The hypothesis is testing using a hierarchical moderated regression model. Dummy coded department types are entered first, embeddedness is entered second, inductive propensity third and the interaction term is entered in the last stage. **Figure 88** contains the statistical results of the analysis. No significant effect of the interaction term is found.

D5.3: *Organizational members more likely ignore discerned-as- useful knowledge rather than putting it to use to revise existing routines and processes.*

Figure 89 D5.3 Results

	One-Sample Test Test Value < 50				
	t	Sig. (1-tailed)	Mean	Std. Dev	Std. Error Mean
KTP%	3.082	.998	57.70	4.12	1.81

This hypothesis is tested with a simple one-tailed t-test. The null hypothesis is that greater than or equal to half of organizational knowledge that is well discerned gets put to use. Recall that the alternative knowledge transfer performance scale is measuring the percent of discerned organizational knowledge deemed useful that actually gets put to use. "More likely ignore than use" is implying a worse than 50% usage rate. A t-test fails to reject the null hypothesis of greater than or equal to a 50% usage rate. Results are reported in **Figure89**. However, the mean is 57.70%, just over half of well discerned organizational knowledge gets put to use.

D5.4a: *Line department members are less likely to put discerned knowledge to use than members of staff departments.*

This hypothesis is similar to the last, but implies that there will be a significant difference between staff and line employees in their likelihood to actually put discerned knowledge to use. However, no statistically significant staff or line effect is found, and the hypothesis is not supported (see **Figure 90**).

Figure 90 D5.4a Results

KTP Optimization by Staff or Line		F	Sig.
Main Effects	Staff or Line	.168	.682
Model		.168	.682

Employing a similar method, hypothesis 5.4b is tested. This only differs by testing for line or staff effects upon discernment, rather than actualized percent of potential knowledge usefulness.

D5.4b: *Line department members are less likely than staff members to fully discern organizational knowledge*

Results offered in **Figure 91** indicate no support for rejecting the null hypothesis. No statistical significance is found for a main effect of line or staff membership upon discernment (p=.429).

Figure 91 D5.4b Results

Discernment (avg.) by Staff or Line		F	p =
Main Effects	Staff or Line	.629	.429
Model		.629	.429

The next group of hypotheses move back to the impedance construct. This time, the effect of level of importance of the organizational knowledge and the effect of the importance of the organizational knowledge is tested.

D5.5: *Organizational knowledge that is perceived as more important by*

organizational members leads to a higher level of discernment than organizational knowledge that is perceived as less important by organizational members.

D5.6: *Organizational knowledge that is perceived as more complex will more likely be ignored or avoided (not discerned at all) while organizational knowledge that is perceived as less complex will more likely be fully discerned by organizational members.*

These hypotheses are each tested with hierarchical moderated regression. As reported in **Figure 87**, no significant effect is found of importance/unimportance or of simplicity/complexity upon organizational knowledge discernment.

D5.7: *There is an inverse causal relationship between the level of impedance perceived by a department member, and the member's level of organizational knowledge discernment.*

This hypothesis is very similar to the last, except that now I am testing the composite

Figure 92 D5.7 Results

Model: General Impedance	R	R2	Adj. R2	Beta	Std. Beta	p =	R2 change	F change	p of F change
Impedance entered last	.719	.515	.455	-.385	-.249	.004	.041	8.705	.004

of all three of the facets of impedance, or an 'overall resistence' effect. **Figure 92** reports the results of regression analysis, supporting rejection of the null hypothesis with type 1 error at p=.004). Approximately 4% of the variance in organizational knowledge discernment can be accredited to the impedance of organizational knowledge. Furthermore, as impedance the scale moves higher, the discernment process moves lower. The regression coefficient indicates nearly a one unit to 2/5 unit relationship between increase in impedance and decline in discernment (Beta= -0.385).

D5.8: *There is an inverse causal relationship between the overall level of impedance perceived by a department member, and the frequency with which discerned organizational knowledge is put to use.*

This hypothesis concerns the relationship between organizational knowledge impedance and the knowledge usage percent scale. A simple regression analysis can be applied to assess the relationship between these two continuous scales. The usage measure is on a 0 to 100 scale, while the impedance of organizational knowledge measure remains on the 1 to 5 scale. Statistical results are reported in **Figure93.** R^2 for this relationships is .174 (adjusted R^2=.167). The relationship is significant at the .001 level (p<.001). The regression coefficient of -17.869 indicates that a single unit increase on the 1 to 5 impedance scales (higher overall resistance) is related to an approximate 18% decrease in the actual usage of organizational knowledge that has been discerned as potentially useful.

Figure 93 D5.8 Results

Dependent Variable: KTP Use	B	Std. Beta	R2/Adj. R2	F or t	p =
Regression			.174/.167	24.63	<.001
(Constant)	-1.061			-0.1	0.929
Impedance	-17.869	-0.417		4.963	.000

4.3 Chapter 4 Summary and Conclusions

I began this section by introducing the general research model. Using a path model, I broke the empirical analysis into three stages described by three sub-sections of the general path model. Using these path models as a graphic guide, I stated each of the core hypotheses of the dissertation, and described a statistical analytic method for empirically testing each hypothesis.

Next, tests of the Grand Hypotheses were presented. Each of the Grand Hypotheses were supported by with generally low probabilities of type 1 error. Results of various sub-hypotheses are presented in Section 4.2. The vast majority of these hypotheses were supported. I do not find it surprising that many of these hypotheses are supported. Building upon previous theory, the hypotheses make a lot of sense. However, the results are all the more significant because of the high level of difficulty of empirically measuring these organizational knowledge transfer related issues.

Including sections 4.1 and 4.2, the results of 33 hypotheses were reported. In the next chapter, both the implications and the limitations of these results are discussed.

CHAPTER 5 DISCUSSION OF RESULTS

5.0 Overview

In the introduction to this dissertation I discussed the possibility that knowledge resources in a firm can provide competitive advantages. I explained that an advantage can be realized when a firm manages organizational knowledge more efficiently and/or effectively than competitors. I then embarked on a quest to discover what it might mean to manage the flow of knowledge, what variables are involved and which ones deserve the most attention.

I ended up providing middle-range theory explaining why members of different types of departments discern organizational knowledge in fundamentally different ways, and demonstrating that members of some types of departments do a better job at discerning knowledge than members of other types of departments. This turns out to be important because discernment significantly impacts the performance of knowledge transfers.

There is already consensus in the field that organizational knowledge transfer is a strategically important process. But what do managers need to attend to when trying to manage this process? What variables need to be accounted for when developing and programming a knowledge management system to support the process? In the opening chapter, I stated that I am addressing the problem of how to optimize the flow of organizational knowledge around the firm. After all the analysis and discussion, the question then remains: *what are the underlying factors that help and hinder organizational knowledge from moving where it should, turning latent potential into increased value?*

In order to answer that question, there were three main issues addressed by this project. Each of these is revisited in this chapter, along with some other insights and

concerns. I discuss the general findings in section 5.1. I report and interpret the impact of departmental and firm membership upon "knowledge transfer style" in section 5.2. Section 5.3 addresses the effects of knowledge transfer style upon the discernment of organizational knowledge. Section 5.4 covers the final stage of the model-- discovering to what extent organizational knowledge transfer performance can be explained by the discernment of organizational knowledge. Section 5.5 contains discussion of my epistemological assumptions and how well the definition of organizational knowledge stood up to the pressure of an empirical study. Section 5.6 covers the limitations of the study and any steps taken to reduce the impact of these limitations. Finally, section 5.7 concludes the dissertation by summarizing the study and the results, and proposing directions for future research.

5.1 General Findings

I have found some specific variables that set rational boundaries for organizational members, and have demonstrated that these rational boundaries impact (among other things) the discernment of organizational knowledge. I have found it possible to measure macor level determinates of rational boundaries, micro level elements of rational boundaries, and five levels of discernment of organizational knowledge. By combining these measures, I have found that there are clear knowledge transfer style similarities among organizational members of similar department types across organizations. In fact, I feel the most impressive result of the study is the accuracy in predicting department type membership by individual knowledge transfer style.

Empirical data analysis provides evidence to support my contention that strategic orientation, organizational attention, sources of meaning, communication media and impedance characteristics of organizational knowledge impact the discernment of organizational knowledge and, in turn, the performance of organizational knowledge transfer. It also appears that managing the discernment of organizational knowledge is useful for improving knowledge transfer performance. All of the primary hypotheses in this dissertation are supported by the statistics gained from the analysis of empirical measures. The full model is supported by its fit with previous theory, by face validity provided in my discussions, and by the statistical results of discriminant analysis, multiple analysis of variance/covariance and regression analysis.

I recommend that these results be foundational to subsequent design of knowledge management systems. For example, I wondered in the first chapter if information

technologist were not missing the mark by designing information systems that deliver knowledge entirely via electronic media, such as internet web pages, email and the like. For example, it turns out that when attempting to transfer knowledge the use of certain low-technology communication media and sensemaking tools, such as formal and informal meetings, direct supervision, and paper memos may be as critical to members of some types of department as any high technologies. Furthermore, those same parameters may detract from knowledge discernment by members of other types of departments. Additionally, presenting the knowledge as simply and explicitly as possible, and in an inductive format, will tend to improve discernment. Unfortunately, these are not generally design parameters given to IT professionals as they design knowledge management systems.

The organizational knowledge discernment items cover five areas of knowledge, which are averaged to yield the overall discernment score. While internal reliability of the overall scale is adequate, there is still enough variance across items on the scale to work with sub-scales based upon area of knowledge. Using these sub-scales, I find that the discernment of organizational knowledge is very much dependent upon the area of knowledge in question. For example, organizational knowledge communicated in financial reports is different from organizational knowledge about management practices or about customer preferences. Members of accounting and finance may score low on discernment of customer behavior knowledge, while scoring high on discernment of knowledge about financial situations.

Because this is an interesting area of inquiry, I have altered the discernment items for my next study to include two sets of scales. Four additional items measure *discernment in general,* and five items are added to the existing ten items that are measuring discernment

of the five different major areas of organizational knowledge. This creates three-item sub-scales for the knowledge areas, and provides a way to validate the 'average' score. Simply concatenating the measures of discernment across diverse areas of organizational knowledge may be over-simplifying the true processes.

This is not to say that I didn't find strong support for the contention that discernment is a mediating variable between knowledge transfer style and knowledge transfer performance. The relationship was found to be significant at the .012 level, even after controlling for prior variables (department, firm) in the model. However, by testing the impact of the discernment of different areas of organizational knowledge upon knowledge transfer performance of that area of knowledge, I arrived at more theoretically clear and empirically clean results.

It is quite a large handful of new constructs that have been put forth in this dissertation (organizational knowledge discernment, departmental strategic orientation, locus of attention, communication media dysfunction, knowledge transfer impedance, knowledge transfer efficiency and effectiveness). I have offered some theoretical face validity and empirical validity for these constructs, including measurement scales that have displayed evidence of sufficient internal reliability and discriminant validity for continued use. Some of the constructs have made more and more sense over the course of this project. It has become clear to me that work groups and departments, to the extent that the members work together over time toward somewhat common goals (under what Mintzberg (1987/1996, p 105) has called "an umbrella strategy"), have local strategic orientations. These strategic orientations closely mimic those that were discovered by Miles and Snow (1978) when they

examined organizations at the business firm level. As discussed below, the logic of attention facet of locus of attention gained much prominence over the course of the study. While it was obvious that communication dysfunction would be important, I was glad to put forth a workable measure of this organizational difficulty.

None of these knowledge transfer style facets are entirely brand new. For example, the use of the natural language word 'discernment' resembles the construct theoretically and empirically represented herein. What is new is describing and deriving discernment carefully and scientifically. When we speak of discernment, we are speaking about thought processing and of the theorizing process itself. That is why the concept deserves close scientific scrutiny.

Perhaps the variables I am most satisfied with are the impedance measures. They are the only ones that describe characteristics of the knowledge itself. However, it is unclear whether knowledge impedance is a construct that complicates or simplifies investigation. On the one hand, it summarizes three areas of concern that have been given much attention in the literature. The joint outcome of organizational knowledge being more or less important, more or less explicit and more or less important is that it will or will not be discerned and will or will not transfer easily. Furthermore, my empirical findings support this contention ($p=.001$). Since "impedance" is the term used for measures of resistance in the physical sciences, it seems appropriate to use the same word for a similar measure in organizational science. On the other hand, unimportance, complexity and embeddedness are very different concepts. They also do not equally to impact the discernment of organizational knowledge. So, while a general impedance measure is desirable, it is unclear whether it is a construct.

Another main goal was to find if similar knowledge transfer styles are significantly associated with high discernment and high knowledge transfer performance between those same organizational members. Although all of the antecedents together impact organizational knowledge discernment, managers can take their choice of which one to focus upon first. For example, knowing that organizational knowledge that is high in complexity, highly implicit and not perceived as important will have high impedance, management can create programs to make the knowledge they want to transfer more explicit, simpler and of higher perceived importance. When management finds that discrepancies in preferred communication media are high between organizational members, information and communication systems should be redesigned to reduce these discrepancies.

Alternatively, and in many cases more importantly, management can use these finding to *reduce* the flow of organizational knowledge. There are certainly situations when management does not want organizational knowledge to be discerned. This may be to protect valuable intellectual assets from flowing to existing or potential competitors, or to maintain reasonably narrow rational boundaries around organizational members that may otherwise become overloaded with decision variables.

Apparently, management has a quite some options to choose from when dealing with the discernment of organizational knowledge. From a strategic perspective, it is probably best to concentrate efforts on one area at a time. For example, I have found that both firms and department types account for differences in knowledge transfer styles, and that knowledge transfer style impacts discernment levels.

However, management still must determine which knowledge transfer style variable

to manage first. It is certainly too early too claim that the knowledge transfer sytle variables that had the most impact in this study will have the same impact universally. For example, the current project indicated that the greatest impact on discernment of organizational knowledge can be had by paying attention to the impedance facets (Beta=.51), and by having departmental members look outward (externally) for solutions to their problems (Beta=.25). But this may not hold true for a broader sample of firms, or for firms in other industries. At lest for the time being, I suggest that firms measure the KTS variables and discernment levels themselves. The measurement can be done using the knowledge transfer style survey or something very much like it, to assess which KTS variables have the greatest impact upon discernment in their particular firm.

Complexity and length of the Knowledge Transfer Style Survey. The knowledge transfer style survey, in its current form is a complex, time consuming measurement instrument that produces a very large body of data. The questionnaire survey contains scales including over 300 items, many of them demanding significant reflection on the part of the participant. It would certainly be attractive to see the same results from more parsimonious measures. One might argue that success was achieved here by brute force. That being said, a victory is still a victory.

Still, simplification of the model would lessen the demands on the participants during data collection, and might even improve clarity of the analysis. A criteria for elimination might be a version of Occam's Razor, that if a facet in the model does not show statistical evidence of explaining a significant portion of variance, than it ought to be removed to simplify the model. I am all for this sort of empirical significance testing for theory and

model building. However, there is a risk of applying the razor too soon, and cutting off the wrong facets. As larger and more accurate databases on the topic are collected and analyzed, this risk will be reduced. I am therefore recommending the application of Occam's Razor, but not just yet.

So while I do not recommend any serious cutting and keeping decisions just yet, there is evidence from the current study that certain variables are closely monitored in the future. The strategic orientation of department type may be an expendable variable. As stated elsewhere (see the second half of section 5.3.2) the behaviors and perspective that define a strategic orientation may be largely covered by other more specific variables in the model. Variables that should almost certainly remain in future studies include the three impedance facets. Importance, embeddedness and complexity are well defined and well named, have a history in the literature, and measure critical attributes of organizational knowledge. An overall impedance score, which grants an average resistance score to the knowledge in question, also seems to be an attractive descriptor.

The data collection methods can be thanked for much of the success of the dissertation. Having respondents together in a room, prepared to complete what they have been pre-warned is an intensive survey, and having a live administrator available to explain important terminology, yielded quality psychometrics of impressive breadth and depth.

5.1.1 Do department-types cause knowledge transfer styles?

The results from this part of the research are indicating that departmental membership implies a set of cognitive and behavioral biases and/or habits. I tested the hypothesis that there are differences between members of different department types and and similarities

between same department-type members. This hypothesis were firmly supported. Nearly 80% of cases were correctly classified by a departmental discriminant analysis, with the average prior probabilities at only 20%. A full 100% of information systems support members and 94% of accounting/finance members were correctly classified, regardless of firm membership.

I also addressed a similar notion at another level of analysis. I tested the hypothesis that there are differences between members of different firms and similarities between members of the same firm. This hypothesis was also supported. The hit rate for predicting firm membership by *KTS* for the study was 88%, with an average prior probability of 50%. However, when both department type and firm are entered into a model simultaneously, department type dominates firm in the amount of variance in knowledge transfer style explained.

Specifically, the results of MANCOVA provide evidence that department membership ($p=.001$, r^2/ adj.r^2 =0.464/0.277) and firm membership ($p=.001$) help to explain knowledge transfer style. In terms of the individual KTS variables, department membership explains a statistically significant portion of the variance in both the *logic* of attention dimension and the *location* of attention dimension of the locus of attention construct. The inductive orientation ($p=.041$) and deductive orientation ($p=.033$), focusing attention on other departments ($p=.047$) and on locations external to the firm ($p=.004$) all show significant differences between departments.

Many of the sources of meaning facets differ significantly across departments as well. There are some sources of meaning that all departments seem to utilize with similar

frequency, (e.g. organizational culture, subordinates, superiors, members own experiences, religious beliefs and family life. However usage of some other sources of meaning seem to set department members apart. A significant portion of the variance in the use of outside specialists ($p=.044$), co-workers ($p=.012$), financial reports ($p=.009$), and professional group norms ($p<.020$) as sources of meaning was found to be explained by departmental membership with better than 95% certainty.

Preferences for some of the ten communication media were also common across departments, such as using the mail, using faxes, and having informal meetings. Other communication media preferences set members of different departments apart, such as email ($p<.001$), video conferencing/internet ($p<.010$), having formal meetings ($p=.05$), the use of memos and formal reports ($p=.005$), spreadsheets and numbers ($p<.001$) and pictures and diagrams ($p=.004$). Finally perceived impedance of knowledge significantly differentiates between members of different departments ($p=.001$).

These results support and extend three important organizational theories. Firstly, the theory that structure and process set boundaries on individual rationality is supported and extended to organizational knowledge transfer-related behaviors and events. For example, it was clear that members of different types of department have different attention habits, and utilize different sources of meaning when making sense of organizational events. Furthermore, there were no department types who's members used all sources of meaning equally, or focused their attention on all locations. That is, everyone used a reduced set of sensemaking devices, even those that perceived their department as a prospector.

Secondly, I find support for neo-institutional theory (see DiMaggio and Powell, 1983;

Scott, 1987). It seems clear that the forces of institutionalization impact even firms in fast-growing high-technoloy industries that depend upon innovation to create competitive advantage. This can be deduced from the fact that members of the same type of department, but in different firms, can be accurately classified by cognitive and communication. behavioral tendencies. For example, when it comes to behaviors and preferences that impact knowledge transfer, members of operations in one high tech firm are much like members of operations in another high tech firm. However, while institutional forces are certainly operating, they do not entirely limit a firm's ability to be more or less innovative or successful than others within their institutional field.

Thirdly, the results support the existence and importance of Mintzberg's (1979) coordinating mechanisms "standardization of skills" and "standardization of values," and I can extend this theory by using it to help explain lack of coordination at the firm level of analysis. The empirical results indicate that Mintzberg's coordinating mechanisms, as Smith and Peterson's (1988) sources of meaning, operate at the level of individual's within types of functional departments. I have also shown that members of different types of departments use different sources of meaning, and/or have different standardized skill and values than members of other department types. Thus, coordinating mechanisms actually help to create one of the problems they are meant to resolve. Specifically, while coordinating mechanisms and source of meaning increase coordination within a department and within a department type, they may actually work to impede coordination across department types.

It is not certain if any of these theories plays a larger or lesser role in the determination knowledge transfer style. It is also unclear whether knowledge transfer style

is more a matter of nature or nurture. That is, not only do we have theoretical evidence that individuals enter departments with some of these style habits and preferences already in place, but we also have evidence that knowledge transfer style evolves as members spend time within the rational bounds imposed by department types.

On the nurture/developmental side, when social actors enter department types, they interact with rules, processes and other rational boundaries that filter external events and coordinate action. Path dependencies are created, such that the more the coordinating mechanisms and local cultural norms are experienced, the more similar the members who share these rules and routines become in their subsequent cognitive outlook and their behavior.

Arguing the nature side is also easy. Professional and university training institutions are cognitive and behavioral breeding grounds, and they serve as coordinating mechanisms. The human inputs into those institutions are pre-screened for fit and likelihood of success. Those who do well get jobs in their field. One computer hardware designer is likely similar to another in the cognitive characteristics that matter for transferring knowledge pertaining to computer hardware design. These are skills, habits and techniques that are deeply ingrained prior to entry in the firm, and thus are part of the *nature* of the employee. These designers end up in research and development departments, and by their common nature communicate in particular ways, using particular sources of meaning, and so on.

What I can say with confidence is that applying institutional theory, coordination theory and bounded rationality theory to knowledge management systems design should help increase both effectiveness and efficiency of knowledge transfers. Systems will be more

effective when they are adjusted for the differences between organization members that operate in the different department types. Efficiencies can be realized by grouping organizational members into departmental knowledge transfer styles, even across firms or divisions within the corporation, reducing the need for individual customization.

5.1.2 KTS tendencies of specific department types

I have already made it clear that there are knowledge transfer style differences between members of different department types. The obvious next question is, what exactly are the differences? The greatest differences in knowledge transfer style between members of different department types seems to be between members of accounting and finance type

Figure 94 KTS Facets Impacted by Department Type Membership

Department Type	KTS Facet Significantly Impacted by Department Type Membership	P-value
Research and Development	Attention to deductive arguments	<.01
	Use of social collaborating sources of meaning	<.01
Accounting and Finance	Attention to deductive arguments	<.01
	Attention to inductive arguments	.014
	Use of traditional sources of meaning	.041
	Use of secondary sources of meaning	.022
	Complexity of knowledge	<.001
	Importance of knowledge	.026
	Email preference	.001
	Formal meeting preference	.031
	Preference for memos and formal reports	.011
	Preference for spreadsheets and numbers	<.001
	Preference for pictures and diagrams	<.01
Operations	Attention to deductive arguments	<.001
	Use of social collaborating sources of meaning	.047
After Sales Support	Importance of knowledge	.011
Information Systems	Attention to deductive arguments	<.01
	Preference for video conferencing and internet	0.05

departments and other members of any other department type.

Figure 95 lists the department type and the p-value from MANCOVA for any knowledge transfer style facet that significantly separates members of that department type from members of all other department types in the study.

The discriminant analysis results are more descriptive, yet somewhat difficult to translate into specific department differences. However, some department-type knowledge transfer style tendencies are apparent. Please refer back to **Figure 65** on page 275. A correlation analysis between (dummy coded) department types and KTS facets provides a more straightforward display of significant department type knowledge transfer characteristics and differences between

department types. **Figure 95** contains a Pearson correlation statistics and 2-tailed p-values.

Between the analysis of variance, the discriminant analysis results and the correlation analysis there is enough information to begin to forming general profiles for each of the department types. While these profiles can be considered 'right opinion' for the research sample, they should be included in the realm of beliefs and opinions (short of right opinions and certainly not yet called 'knowledge') for the broader population.

Accounting and Finance. Members of accounting/finance type departments make significantly use of secondary socialization sources of meaning. That is, they use their professional group and previous professional experiences to a great extent when making sense of organizational events. This matches the expectation that standardization of skills and norms is a powerful coordinating mechanism for the accounting and finance professions. This is supplemented by their use of explicit internal sources of meaning, such as policies and procedure, and supervisors. Also notice the strong negative correlation with external task environment sources of meaning. While accounting and finance members seem to make strong use of their professional training, they do not tend to use customers, suppliers or competitors to make sense of events.

Accounting and finance members indicate that they do not find organizational knowledge to be complex (or equivalently that they find it mostly simple), a perspective shared only by research and development members. They also have the highest propensity to pay attention to deductive presentations of knowledge and the lowest propensity to attend to inductive formulations of organizational knowledge.

Information systems support. Members of information systems support, who are

Figure 95 Correlation Between Department Types and KTS Facets

		Accounting/ Finance Type	R & D Type	Operations Type	After Sales Support Type	nfo Systems Support Type
Traditional Sources of Meaning	Pearson Correlation	150	-.019	049	-.095	062
	P-value (2-tailed)	104	841	599	308	508
Superiors as Source of Meaning	Pearson Correlation	-.007	004	-.091	156	-.032
	P-value (2-tailed)	940	963	330	092	732
Secondary Socialization Sources of Meaning	Pearson Correlation	238	026	-.059	-.142	024
	P-value (2-tailed)	009	779	526	124	798
External Task Environment Sources of Meaning	Pearson Correlation	-.221	037	105	019	107
	P-value (2-tailed)	016	689	259	840	248
Social Collaborating Sources of Meaning	Pearson Correlation	-.199	221	141	-.039	-.090
	P-value (2-tailed)	031	016	129	673	333
Explicit Internal Sources of Meaning	Pearson Correlation	208	116	-.026	-.153	-.033
	P-value (2-tailed)	024	212	784	098	722
Implicit Internal Sources of Meaning	Pearson Correlation	-.116	157	-.012	115	-.154
	P-value (2-tailed)	0.209	0.089	0.896	0.216	0.096
Unimportant knowledge	Pearson Correlation	169	-.105	-.155	242	011
	P-value (2-tailed)	067	256	093	008	906
Complexity of knowledge	Pearson Correlation	-.401	005	012	187	024
	P-value (2-tailed)	000	953	896	043	801
Embeddedness of knowledge	Pearson Correlation	-.086	029	-.013	148	-.019
	P-value (2-tailed)	355	755	891	111	839
Deductive Propensity	Pearson Correlation	420	125	-.010	-.279	071
	P-value (2-tailed)	000	176	916	002	446
Inductive Propensity	Pearson Correlation	-0.179	-.102	-.092	178	123
	P-value (2-tailed)	0.054	274	321	054	183
Department Strategic Orientation	Pearson Correlation	-.117	0.181	002	-.215	119
	P-value (2-tailed)	207	0.052	983	019	200
E-mail preference	Pearson Correlation	-.418	127	077	-.103	216
	P-value (2-tailed)	000	172	411	269	019
Regular or Overnight mail preference	Pearson Correlation	124	-.143	-.086	032	089
	P-value (2-tailed)	182	123	356	735	342
Telephone/Voice-mail preference	Pearson Correlation	033	-.012	-.135	-.079	135
	P-value (2-tailed)	724	898	147	399	146
Fax preference	Pearson Correlation	126	017	-.106	-.002	044
	P-value (2-tailed)	176	853	257	980	640
Video Conference/Internet preference	Pearson Correlation	126	086	-.153	-.164	201
	P-value (2-tailed)	176	357	100	077	030
Formal Meeting preference	Pearson Correlation	303	-.132	-.031	015	-.119
	P-value (2-tailed)	*001*	155	740	871	203
Informal Meeting preference	Pearson Correlation	-.010	-.071	-.025	117	101
	P-value (2-tailed)	911	449	786	208	280
Memos/Formal Reports preference	Pearson Correlation	320	-.221	-.107	091	017
	P-value (2-tailed)	*000*	017	250	331	858
Spreadsheets/numbers preference	Pearson Correlation	490	-.010	-.182	-0.179	-.167
	P-value (2-tailed)	*000*	914	051	0.054	072
Pictures/Diagrams preference	Pearson Correlation	-.269	0.179	-.069	-.001	046
	P-value (2-tailed)	*003*	0.054	460	995	619
Overall Location of Attention outside firm	Pearson Correlation	0.013	0.055	-0.017	0.15	0.18
	P-value (2-tailed)	0.885	0.557	0.856	0.106	0.053
Attention to other department types	Pearson Correlation	-0.043	0.069	0.111	-0.03	0.119
	P-value (2-tailed)	0.644	0.459	0.232	0.804	0.199
	N	117	117	117	117	117

often in control of distributing the large portion of organizational knowledge, love to use email to transfer knowledge. This does not bode well for the already isolated members of

accounting and finance (at least in terms of KTS). Information systems support members also have a preference for using video conferences and the internet to transfer organizational knowledge. Unfortunately, that preference is currently shared with none of the other department types.

Furthermore members of accounting and finance department types have a strong negative correlation with social collaborative sources of meaning, indicating that they do not look to their own subordinates or experts outside of their department type. This is just the opposite of members of research and development, who show a significant positive correlation with social collaborative sources of meaning.

Research and Development. Aside from utilizing from collaborating with coworkers, subordinates and experts from other departments, members of research and development have a strong aversion to the use of memos and formal reports to transfer knowledge. They would much prefer the use of pictures and diagrams. This is in direct conflict with members of accounting and finance departments, who prefer formal reports and are averse to pictures and diagrams. It is no wonder that the financial control process often fails to reign in R&D expenses when the feedback mechanisms between accounting/finance and R&D depend heavily upon formal financial reports.

Research and Development members also perceive their department type as a prospector. They believe that they should continually search for new markets for their products, and that they should seek new knowledge to help innovate both products and processes. This perspective clashes with members of the after sales support department type.

After Sales Support. Members of after sales support department types see their

department as a defender, already possessing most of the knowledge they need, and having processes and clients pretty much in place. From their perspective, a lot of organizational knowledge is overly complex, and is really not very important to what they do. When it comes to solving problems, they have an aversion to deductive presentations of knowledge, so one should avoid using theory during training programs when attempting a knowledge transfer.

Production/Operations. Members of operations department types, have a strong aversion to the use of spreadsheets and numbers. So the very folks who need to add value through efficiency are receiving critical knowledge from members of accounting/finance in the very format they abhor, damaging the degree of knowledge discernment. Members of operations are also likely to look to their colleagues, their subordinates, available experts and other internal social sources of meaning when trying to make sense of challenging work situations. This propensity should help them work together with members of research and development, who also like to use these social collaborating sources of meaning.

5.2 The impact of knowledge transfer style upon the discernment of organizational knowledge

As I stated in the first chapter, I am generally addressing the problem of controlling the flow of critical resource within the firm. The resource I have focused upon is organizational knowledge, and the capability I am trying to enhance is managing organizational knowledge flows. Knowledge that is not discerned does not move. I have described a number of variables that management can observe, and to some extent adjust, that will enhance or inhibit the flow of knowledge resources by impacting the likelihood of

full discernment.

Knowledge that needs to be protected from flowing across department-type borders may be encoded in a format that deters discernment. For example, knowledge that is encoded for transfer via inductive logic will more likely be discerned by members of all departments except members of accounting and finance. Therefore, storing sensitive knowledge in a theoretical format (requiring deduction) will better protect it from unwanted transfer. On the other hand, recoding knowledge stored in a theoretical format into an inductive format (eg. examples of action, critical incidents, stories, or experiential training exercises) will enhance the likelihood of organizational knowledge discernment.

Contrary to common belief that embedded knowledge is harder to transfer (e.g. see Teece, 1986; Winter, 1987; Hamel, Doz & Prahalad, 1989) this particular example implies that embedding organizational knowledge in work processes may *not* protect organizational knowledge from flowing, since embeddedness may be trumped by employees' preference for inductive constructions, and the relationship between induction and discernment. To the extent that firms depend upon proprietary knowledge for competitive advantage, it may be best to store that knowledge in a theoretical format, and to limit observation by outsiders of the related technical processes.

5.2.1 The multivariate model

The collection of KTS facets were effective in accounting for variance in the discernment of organizational knowledge. Analysis of the empirical measurements suggests that there is a very small chance (p=.001) that rejection of the null hypothesis is mistaken. The evidence shows that strategic orientation, locus of attention, sources of meaning,

communication media dysfunction and impedance characteristics together explain a good portion of discernment's variance (r^2 = .514/adj r^2 .413).

Results indicate that four factors significantly impact the level of discernment of organizational knowledge above and beyond all the other variables measured: Membership in the R&D department type (positive impact), inductive propensity (positive impact), location of attention outside of the firm (positive impact), and the embeddedness of the organizational knowledge (negative impact). The construct with the strongest impact upon organizational knowledge discernment is the embeddedness facet of the impedance measure, accounting for a drop of half a step in the discernment process for each one point increase in embeddedness.

As an experiment, I also ran a control test including the communication media preference measures into the regression model, rather than only the communication media dysfunction measure. The result of a stepwise regression analysis lead to a somewhat surprising indication. Negative signs on significant beta scores indicates that department members with preferences for formal meetings (see accounting and finance types above) and the use of telephone/voicemail tend to have lowered organizational knowledge discernment. These 'old-fashioned' communication media are perhaps avoided in high technology firms as cumbersome and frustrating. For example, in a follow up interview, an Intel manager explained that telephone use is sometimes frustrating because of "phone tag" and formal meetings are avoided if possible. Apparently, there is at least one meeting room in one of Intel's Hillsborough facilities with the sign "If you are not contributing to this meeting, get up and go back to work."

5.2.2 Bivarite relationships

5.2.2.1 Strategic Orientation

Department types and perceived strategic orientation. I find that both strategic orientation of the firm and strategic orientation of the department are valid constructs. Organizational members do meaningfully distinguish between the two, and I found a significant difference between measures of strategic orientation of the firm and strategic orientation of departments. That is, it makes sense to speak of the strategic orientation of departments and work-groups, as well as strategic orientations of firms. Using strategic orientation of the department scores, I was able to correctly classify 33.7% of cases into the correct department, when average prior probability is only 20%. This improvement over chance has a p-value of .044. Furthermore, results from this sample indicate that those rating their department two points more than another toward prospector on the 7-point scale are likely to move approximately one step further along the discernment process in any organizational knowledge transfer situation.

However, although significant differences were found between department and firm strategic orientation, and statistical psychometric validity for the two constructs was established, the practical difference between the two was small. An average of less than half a point difference on a 1 to 7 Likert scale may not represent a very difference in strategic orientation, regardless of statistical significance.

Figure 96 ANOVA: Departmental Membership on Strategic Orientation Scores

Variable	Source	F	p =
Firm Strategic Orientation	contrast	1.955	.048
Department Strategic Orientation	contrast	3.046	.002

Each F tests the simple effects of department code within each level combination of the other effects shown. These test are based on the linearly independent pairwise comparisons among the estimated marginal means.

Because the practical difference between the strategic orientation of the firm and the department was found to be so small, it begs the question: do departments project there own strategic orientation onto the firm's strategic orientation? If this is true, then the departmental membership would explain a significant portion of the variance in the strategic orientation of the firm scores.

As expected, analysis of variance (see Figure 105) shows that strategic orientation of the department explains a significant portion of the difference between departments ($p=0.002$). However, I also find that departmental membership can be explained in terms of the reported strategic orientation of the firm ($p=0.048$). There is evidence then for the curious finding that *organizational members see the strategic orientation of their firm from the distinct perspectives of their own departments.*

The impact of strategic orientation upon organizational knowledge discernment. There was no evidence that perceived strategic orientation of the department impacts the discernment of organizational knowledge, at least not when using the continuous scale conception of it. There are at least three good explanations for this finding. First, other simpler yet related constructs in the model, such as location of attention and importance of organizational knowledge are likely capturing variance that might have been captured by the strategic orientation construct. For example, a statistical test in which discernment of organizational knowledge is regressed only upon perceived strategic orientation of the department shows a significant relationship in the correct direction.

Secondly, there is no real reason to expect that defenders will less fully discern *organizational* knowledge than prospectors. If I were asking about industry knowledge, or

knowledge in general, the finding might have been different. After all, organizational knowledge resides within the firm, and defenders are inward looking organizations. Analyzers also may discern organizational knowledge well, but will not act on the knowledge until after careful consideration of the risks.

Thirdly, the use of the continuous scale for perceived strategic orientation rather than a categorical description may have altered the results of the hypothesis test. Department types perceived as defenders may discern organizational knowledge differently, but perhaps this relationship cannot be described on a numeric scale. Furthermore, it may be the case that defenders discern different areas of knowledge than analyzers and prospectors. However an investigation by area of organizational knowledge was not conducted in this study.

Future research on strategic orientation. Now that the department level strategic orientation construct has been validated, a number of hypotheses may be tested that were not included in this study. As discussed above, department types with different strategic orientations will likely discern different organizational knowledge well. That is, the discernment process in one department type may not include organizational knowledge that is habitually processed by another department type, due to differences in their strategic orientation.

Thompson's (1967) theory implies that it is not strategically effective behavior for a defender department (e.g. the technical operations core in a classic value chain) to discern knowledge outside of the rational boundaries implied by that strategic orientation. Knowledge can be a dangerous thing. However defenders will likely be highly efficient at discerning the knowledge that defenders need; internal knowledge, especially concerning

their current customers and research and development innovations that lead to cost reductions. These are core characteristic of defenders. This leads to propositions that describe more carefully the knowledge transfer and discernment skill of the members of different departments. For example, one might test if organizational members with different strategic orientations will have high levels of knowledge discernment in different areas of organizational knowledge.

Further more, Pfeffer and Salancik (1978) describe why social actors scan according to their perception of the necessity for information. This necessity has been describe herein as a function of strategic orientation. It is likely then, that a broad locus of attention is found more in prospectors than in analyzers and defenders. In future research, this might be examined by testing if a consistent and narrow locus of attention is found more in defenders than in prospectors and analyzers. Another test of the impact of department strategic would be to observe whether prospector departments demonstrate discernment successes over a broad range of organizational knowledge, while analyzer departments and finally defender departments will demonstrate knowledge discernment successes over an increasingly narrower ranges of organizational knowledge.

5.2.2.2 Locus of attention

The evidence from hypothesis KTS2.3 supports the contention that department types cause department type members to display systematic and relatively unique attention patterns. Discriminant analysis was very successful using just the locus of attention variables to predict department membership. Over 44% of respondents were correctly classified by locus of attention into the department of which they are a member. Members of the

accounting/finance department type have the lowest propensity to look outside of the firm and to pay attention to organizational knowledge that resides in an inductive format. They also pay most attention to organizational knowledge that is in deductive formats, using explicit internal sources of meaning. That is, they like general explicit knowledge. *Unfortunately, it is inductive propensity and attention to areas outside of the firm that are predictors of organizational knowledge discernment.*

This discrepancy in knowledge transfer style between accounting and finance department members and members of other types of departments helps explain the commonly reported lack of coordination between the accounting and finance folks and the rest of the firm. In a smoothly functioning organization, strategy, structure and control systems must be well coordinated (Hill and Jones, 1997, Ch 1). A seamless control process includes regular measurement of important goal related variables, analysis of the measures, and feedback of the analysis into the system, resulting in a continuous adjustment process. Without feedback, adjustments are blind and measures are somewhat of a waste of organizational resources. It is therefore frustrating that accounting departments play a dominant role in the internal control process, while showing clear evidence of knowledge transfer style differences that impede the feedback process.

Do location and logic of attention impact discernment of organizational knowledge? The contention that location of attention causes variance in organizational knowledge discernment was supported. Department type members tending to look outside of their department in general (including outside of the firm), do rate at higher levels of organizational knowledge discernment. However, I was surprised to find that organizational

members reporting a higher propensity to look to other departments within the firm for new knowledge did not report significantly higher levels of discernment of organizational knowledge.

The less obvious argument – that a propensity to attend to one logical form of knowledge or another is both department type dependent and impacts knowledge discernment – turned out to have very strong support. I have found that inductive propensity has a direct predictive relationship with the level of organizational knowledge discernment. That is, higher inductive propensity leads to higher levels of discernment. The data show that the majority of organizational members prefer inductive reasoning to deductive reasoning, i.e. they prefer examples and repeated experience to theory and deduction. If much organizational knowledge does in fact reside primarily embedded in routines and processes, then it makes sense that induction is necessary for organizational knowledge to transfer.

Follow up interviews about finding this left contacts at the sample firms intrigued. Each interview confirmed that the vast majority of employees prefer to learn via induction, i.e. example, experience, and trial and error. However, they reported that the majority of training programs at their firms use teaching methods that emphasize theory, thereby forcing employees to use deduction in order to learn the material.

Furthermore, while there have been many discussions in the literature about implicit and explicit knowledge, it had not previously been understood that social actors preferences for inductive or deductive reasoning would interact so clearly with the discernment of embedded and explicit organizational knowledge. This study has laid this relationship bare and exposed a seemingly paradoxical situation. Inductive propensity increases organizational

knowledge discernment. Embeddedness reduces organizational knowledge discernment. Yet embedded knowledge is said to be learned through experience, i.e. the via induction. This leads me to question whether embeddedness is necessarily related to induction. Is there reason to suppose that deductive skills are less appropriate for discerning embedded knowledge?

My current belief is that deductive reasoning skills may be more efficient for discerning organizational knowledge that is embedded in routines and processes. However, most employees spurn deduction and rely on induction. This explains why embedded organizational knowledge is not well discerned – employees tend to use less efficient inductive methods rather than more efficient deductive methods.

I remain uncertain whether or not to recommend combining the location of attention and the logic of attention into one construct (locus of attention). The study began with the two combined into a single construct that described a general 'breadth' of attention. However, psychometric analysis led me to break them apart for the majority of the statistical analysis of the measures. It seems that they may be more than orthogonal facets – they may be fundamentally different constructs. In future work I recommend speaking of these dimensions separately, and aggregating them only when the study specifically indicates the need for a measure of pure breath of attention.

5.2.2.3 Sources of meaning

Different cultural groups have propensities to look to alternative sources of meaning to make sense out of very similar events. Smith and Peterson (Smith, Peterson, Wang, and Zhong, 1996; Peterson, Smith et al, 1995; Smith, Peterson, and Misumi, 1994; Peterson,

Smith, Bond, and Misumi, 1990; Smith and Peterson, 1988) argue that this effect varies with national cultural. Harris (1994) further suggests that schemas vary with organizational culture. This research pushed the case for such culture propensities to operate at the department type level.

As stated earlier, sources of meaning are systems of ideas and beliefs embodied in social systems and social actors (Smith and Peterson, 1988). When a department member appeals to a different source of meaning than members of another department, it creates inconsistency in the sense of the event or situation they are both referencing. Furthermore, specific sources of meaning are used to make sense of different situation types depending upon cultural or sub-group membership. That is, not every organizational member will access the same source of meaning when facing the same situation.

The general hypothesis about department types and sources of meaning (KTS3.2) was that members of different department types will draw from different sources of meaning. There was strong support for this hypothesis ($p<.001$). Four related, but more specific hypotheses were then tested KTS 3.2 a, b, c and d.

The a-hypothesis is that members of accounting & finance department types will use explicit internal sources of meaning, and also that they will use secondary socialization sources of meaning. Both legs of this hypothesis were supported. These employees show strong use of formal rules, financial reports and their professional associations as sources of meaning.

The b-hypothesis concerns members of R&D departments. It was postulated that these employees make use of social collaboration sources. This hypothesis is also supported.

Members of the R&D department type will tend to make use of coworkers and experts from outside of their department as sources of meaning.

The c-hypothesis predicts that members of the operations department-type will tend to use their superiors as a source of meaning. This hypothesis is also supported, implying that direct supervision remains a critical coordinating mechanism for production operations. Coworkers as a source of meaning did not come up as significant, despite the widespread use of work teams within manufacturing operations in the sample firms.

The d-hypothesis predicts that members of after sales support departments will set themselves apart by using external task environment sources of meaning to a great extent. There was no statistical support for this hypothesis. Recall that use of customers as a source of meaning is one of the predictors of above average discernment of organizational knowledge. It is not surprising then that members of after sales support department types scored among the lowest on the discernment scale.

The impact of sources of meaning upon the discernment of organizational knowledge. When sources of meaning were entered last into the hierarchical moderated regression, three sources came up as significant. Use of implicit internal sources of meaning, such as organizational culture, had a significant negative impact upon the discernment of organizational knowledge (p=.027/beta=-.164) . External task environment sources of meaning, which includes customers and suppliers as a source of meaning, has a significant positive impact upon organizational knowledge discernment (p=.027/beta=.156). This variance accounted for by this category of sources was dominated by customers as a source of meaning. Finally, traditional sources of meaning, (includes family, religion and national

culture) has a significant positive impact on discernment of organizational knowledge (p=.037/beta=.147).

Hypotheses D3.1 testing if use of external sources of meaning leads to improved discernment of organizational knowledge was supported, since both traditional sources and task environment sources are external sources of meaning. Furthermore, the use internal sources of meaning seem to lower knowledge discernment. Given the results, I would suggest to managers that they train employees to use customers as a source of meaning when making sense of work situations. I also found evidence that organizational knowledge related to those sources of meaning frequently utilized by organizational members is better discerned than knowledge that is unrelated to frequently accessed sources of meaning.

One of the encouraging results of this dissertation was the usefulness of sources of meaning to predict what areas of knowledge will likely be well discerned and have transfer success. For example, I presented evidence that social actors who frequently think about customers in order to make sense out of typical work-related situations are the same folks who are likely to completely discern knowledge in the firm that is about the firm's customers. I also found that members who use organizational culture (implicit internal) as a source of meaning will better discern organizational knowledge about management practices. The findings were the same for other topically linked areas of knowledge and sources of meaning.

This finding, together with the finding that members of the same department tend to utilize similar sources of meaning (discriminant analysis hit rate using sources of meaning was a very high 54%) helps us understand why some areas of organizational knowledge seem

to have a difficult time penetrating certain departments in the firm. The knowledge that will be discerned is closely linked to characteristic source(s) of meaning used by members of a type of department.

5.2.2.4 Communication media preferences and communication media dysfunction

Department type membership and communication media. The tests determining if members of different departments prefer different communication media confirmed my suspicions. Hypothesis KTS4.1 was supported at $p<.001$, and the discriminant analysis predicted department membership based upon communication media preferences at a 54% hit rate, with average prior probability of 20%. Section 5.1.2 (above) includes a description of the different communication means preferred by members of different types of departments.

The impact of communication media dysfunction on discernment of knowledge. The results of hypothesis test D4.2 offer evidence that communication media dysfunction causes a significant portion of the variance in the discernment of organizational knowledge. When entered last in a hierarchical moderated regression model, communication media dysfunction accounts for an increment of 1.8% of the variance ($p=.047$, beta = -.128). When entered third into the model (controlling for department type, then entering inductive propensity and deductive propensity) it accounts for and incremental 8.3% with a beta of -.250 ($p=.001$).

So we find evidence that when senders fail to utilize the communication media preferred by receivers in different situations, both the quality of discernment of the

knowledge and the performance of the knowledge transfer suffer. While this is not a surprising outcome, the fact of the matter is that much organizational communication is sent in the format preferred by the senders. I liken this phenomenon to a firm promoting its products using media that customers do not use. In a organization with an explicit 'learning organization' strategy, continuance of this bad habit is nothing less than foolish.

Tests also confirmed hypothesis D4.1, that a preference for richer communication media is associated with higher levels of organizational knowledge discernment (p=.05). It is likely that the lower stages of the discernment process are not highly dependent upon rich communication media. However the understanding and recontextualizing phases of the process may be aided by richer communication media, such as formal and informal meetings.

I ran a post hoc test to find out if any of the communication media I measured have a direct impact upon knowledge transfer performance. I hypothesized that some media may have a technological edge. That is for example, email is simply faster than the post, and the internet is faster and richer than a fax. This posterior test indicated that a preference for use of video conferencing and internet is strongly correlated with increased knowledge transfer performance. Furthermore, it is the only communication media that is significantly and positively correlated with knowledge transfer performance. This finding is significant at the .05 level after applying either Tukey, Sheffe, or Bonferonni adjustments. Those groups who do prefer to use the internet and video conferencing expose themselves to rather rich forms of media that have the ability of delivering fast messages (Hall and Hall, 1990).

5.2.2.5 Organizational knowledge impedance

While impedance primarily addresses qualities of different areas of organizational

knowledge, it is also dependent upon the perspective of departmental members. An area of knowledge that is implicit in one department may be very explicit in another. An area of knowledge that is deemed unimportant in many departments may take on exceptional importance in another, and so on. Unfortunately, using the aggregate measure of knowledge impedance, I was not able to successfully discriminate between members of different types of departments (p=.064, hit rate =29%).

However, using the three factors of organizational knowledge impedance, I was able to successfully discriminate between members of different departments (p =.007, hit rate = 46%). As discussed above, more embedded organizational knowledge was far less likely to be well discerned than more explicit organizational knowledge (p=.001). There was not adequate support for hypotheses D5.5 and D5.6, which test for an impact of unimportance (p=.281) and complexity (p=.742) upon the discernment of organizational knowledge.

Hypothesis D5.2 tests if department members who have a strong preference for induction have improved discernment of embedded knowledge. This hypothesis was not supported. We now have the curious combined result that 1) embedded knowledge tends to be less fully discerned, 2) a preference for induction aids the discernment process along and 3) induction does not improve the discernment of embedded organizational knowledge. This combination causes me to be very suspicious of the supposedly tight relationship between learning by repeated experience (induction) and organizational knowledge that is embedded in processes and routines (see Polanyi, 1966).

The final two hypotheses regarding the impedance of organizational knowledge, D5.7 and D5.8, were both supported. The first tested if there is an inverse relationship between

the general impedance measure and the level of organizational knowledge discernment. This was supported p=.004, beta =-.385, r^2 = .041.) However, as implied by above, the variance accounted for by the general impedance measure is dominated by the variance controlled by the embeddedness factor.

The empirical evidence supports hypothesis D5.8, indicating that impedance has a very strong influence upon what organizational knowledge gets put to use, and what does not (p<.001, r^2 = .174). The beta of -17.87 implies that as for each increase of one unit on the 1 to 5 general impedance scale, the amount of organizational knowledge perceived as potentially useful that is actually put to use drops by nearly 18%. This is certainly a strong argument for taking the time to translate embedded organizational into an explicit format before attempting knowledge transfer between departments.

5.3 Can organizational knowledge transfer performance be explained by the discernment of organizational knowledge?

While there are probably a handful important factors explaining both the efficiency and the effectiveness of intra-organizational knowledge transfer, discernment is one of them. Even using course aggregate measures of discernment and a general measures of knowledge transfer performance across five different areas of knowledge transfer, multiple regression results indicate that organizational knowledge discernment impacts knowledge transfer performance (p=.001, r^2=.105).

When using a finer microscope, associating areas of knowledge discernment with transfer knowledge withing those same areas, results jumped to discernment explaining between 30% and 50% of the variance in knowledge transfer performance.

There were two more findings that I believe are especially important for organizational theory. Firstly, organizational members very frequently fail to implement well discerned organizational knowledge that they admit would be useful. This is different than saying that they do not discern the knowledge. I found that only about 57% (+/- 10%) is actually put to use, and I sampled from two very successful companies. Although well discerned knowledge is more likely to be used, still the percent of usage is under 60%.

Secondly, I found no technical core, or line and staff effects. Thompson (1967) had emphasized the difference and importance of having boundary spanning roles withing the firm while also protecting (buffering) the technical core. I found no evidence in high technology firms that manufacturing operations are buffered from outside knowledge to any greater (or lesser degree).than any of the other departments. The rational boundaries in the technical core are no more or less constrained in these successful companies, than in the rest of the firm.

5.4 Epistemological Assumptions and Defining Organizational Knowledge

5.4.1 The naturalist perspective.

Research concerning knowledge, of any kind, is difficult. Knowledge researchers have tended toward ethnographic methods, probably due to the difficulties associated with specification of the objects of study, and creating workable empirical measures and scales. In this study, I use questionnaire surveys to conduct knowledge research. More specifically, I have treated organizational knowledge as an object that may be observed, tracked, measured and recorded. I imagine that this epistemological approach needs to be specified and justified.

A quasi-natural (McKelvey, 1997) view of the organization combines intentionally and naturally caused behavior. Middle range theories (Weick, 1974) of organizations under this view should help explain intensional (strategic) organizational effects, natural organizational effects (naturally evolving path dependencies, adaptive routines, etc.) and the modulation mechanisms and forces linking those other two together (McKelvey, 1997). Mckelvey calls for the use of idealized models of scientific realism, the use of "instrumental conveniences to translate ideosyncratic events into probabilistic distributions of occurrence rates..." (p 353) and micro-level analysis to understand how varying, often random seeming phenomena emerge into organized aggregate structures. (McKelvey, 1997). The general argument against scientific realism by post-positivists and post-modernists (Clegg and Hardy, 1996) is that world of subjectivism and relativism make conventional realist methods both unnecessary and unreliable (McKelvey, 1997), whether working up from micro levels, or from macro levels downward. Like McKelvey, W.V. Quine (1951, 1991) offers a variant of realism, sometimes called "scientific naturalism" that accounts for both relativism and subjectivism in science, yet emphasizes the importance of empirical reference, measurement and analysis in the creation of generalized theories.

A view of the organization as quasi-natural assumes that organizational member actions are free in some dimensions and determined in others. It also allows idiosyncratic individual cases to yield generalizable results, and validates the use of statistical techniques for data analysis. Generalizability is critical if one believes in the opening line of Thompson's (1967) seminal work *Organizations in Action*, "No useful theory can rest on the assumption that everything is unique." (Thompson, 1967, p vii).

Using McKelvey's (1997) idea of a quasi-natural organization science, we understand that there are both intentionally created and naturally determined aspects of organization. For example, post-modernists are in general choosing not to play the game of positive science -- so are the clergy and the artist. If a postmodern deconstruction leads to useful theory that is a good thing. I believe problems arise in how we decide to use the term "useful." When we admit to a scientific life, which by definition precludes absolute truth, the best remaining measure of the game is what works in the physical world of events, *the only world there is* in the scientific ontology.

It is my opinion that, in science, if anyone argues that you shouldn't judge a business theory by whether or not it works or *would* work at some future time, hide your wallet. That being said, there is then no choice but to admit empirical evidence into any version of the game, be it positive science or postmodern deconstruction. My caveats are judging theories only at the macro level in a statistical manner – i.e. speaking of a theory as *'true* with *x* percent certainty' – and admitting that a micro-level proposition by proposition verification requirement is a useless relic of the myth of logical reduction and the existence of *a priori* TRUTH.

5.4.2 What is organizational knowledge and can it be measured?

My definition of organizational knowledge follows from this less stringent requirement of truth. Organizational knowledge will never hold up to carefully logical reduction, will not be entirely internally consistent, nor will it generalize with complete validity. This operationalization of organizational knowledge worked very well in the study. Participants had little difficultly understanding the concept or discriminating between

information, opinions/understandings and organizational knowledge.

> *Organizational knowledge is a set of internal organizational theories and propositions, assigned truth-values, somewhat verifiable through observation, generally socially accepted by the in-group, and systematically fit into an existing 'web of beliefs' about the firm, it's processes, its stakeholders and its businesses. It implies no absolutes, and is subject to a change in truth-value as internal and external environments change.*

This definition, allowed me to identify, observe and measure organizational knowledge as opposed to information and the other related constructs. Participants were instructed that good examples of organizational knowledge include *only those propositions that are generally agreed upon as true and that can be empirically confirmed.* Examples included constructions derived directly from audited financial reports, findings of repeated marketing research, management practices and work processes that are tried and true within the firm, existing instructions, recipes and procedures that are explicitly documented or "implicitly common knowledge."

It is still not clear if organizational knowledge itself is different when it is tacitly understood or explicitly understood. For example, I did not find a strong relationship between inductive and deductive learning preferences and embedded or explicit knowledge. However, I still contend that it is more appropriate to speak of tacitness as a function of our understanding, and embeddedness or implicitness as a function of the knowledge.

To summerize, adopting a naturalist perspective allows for a somewhat less restrictive view of truth and objectivity about the world, while still holding that speaking of

'the world' and of 'the world of objects' is the same thing. Cognitions are no less natural than extened physical objects, they are just more difficult to observe and measure given the technical limitations of contemporary observation equipment and our scales.

Still, a naturalist in the face of these challenges, does the best that one can to observe and measure. Therefore, this project has attempted to work within a closely defined ontology, and has utilized quantitative methods of data acquisition and statistical analysis to test probabilistic statements about a broad population. In a positivist vein, hypotheses were carefully constructed from theory and previous observations prior to data acquisition. Are these tools perfect lenses through which the world may be described? No. Are they useful tools through which the world may be described? Yes.

5.5 Limitation of the study

The statistical results of this study are limited in generalizability to large communication and computer technology firms similar to those from which the sample was drawn. The sample size from the population is not large. It does in fact border between sufficiency and insufficiency for certain statistical manipulations. The typical result of low sample size is reduced power, or said another way, increased propensity for type two error. Type two errors are failing to reject the null hypothesis when a significant relationship does in fact exist. For this dissertation, this type of error is probably less damaging, because of its tendency yield results that are somewhat conservative. However, it would seem prudent to take multiple regression coefficients as less reliable than the p-values offered by analysis of variance. That is, we can be more confident in the reports of significant differences than statistics of exactly what are the quantity of the differences on some continuous scale.

There are forces that impact organizational knowledge transfer that were not measured or mentioned in this dissertation. Therefore, the KTS model should not be considered all inclusive. The results should rather be understood as supporting the contention that these particular variables seem to impact intra-organizational knowledge transfers.

It is important to remember that R^2 is a measure of the percent of variance in the dependent variable accounted for by the independent variable measured in the current sample. Adjusted R^2 is a more useful measure indicating expected variance accounted for when another sample is taken from the population. Where useful and when available, measures of adjusted R^2 have been reported.

Intel Corporation is structure differently from many other companies. Intel makes very extensive use of cross-functional teams, and employees move about the company (both vertically and horizontally) more frequently than in other firms that I have observed. Cross functional teams and frequent rotation have the propensity to minimize interdepartmental differences. Siemens ICN, on the other hand, is structured around a more classic division/department, line & staff bureaucratic form. Because of these structural differences between Siemens and Intel, firm differences found in the study should be taken with perhaps less confidence, since structure may explain these differences as well, while findings of department membership differences should be taken with greater confidence, since the inclusion of Intel will bias these findings downward.

Same source data. As discussed in the research methods section, when same source data are used systematic response bias may be introduced into the analysis. Hypotheses regarding the impact of department type membership upon knowledge transfer style are all

free from this concern. It is the hypotheses relating knowledge transfer style to discernment and knowledge transfer performance that are at risk. Steps are taken to limit the exposure of statistical results to systematic measurement error. The first defense is building measurement variety into the questionnaire survey instrument. A large assortment of scales, item styles, and question are presented to respondent. Scale anchors change, items are reversed, and scale items are scattered across different pages. Dual measurement techniques are used to measure the same variable. Sometimes very direct wording is used, and other times the respondent will be unaware of the underlying variable being measured. All of these techniques are used to help create variance in across the measures. Runs tests were conducted to make sure that respondents were not auto- correlating the scales.

The second step taken to limit systematic measurement error is the use of hierarchical moderated regression as a data-analytic approach. By focusing upon significance of incremental r2, the technique controls for auto-correlation problems.

5.6 Summary, contributions and directions for future research.

Why, when we all work together in a non-threatening learning community, do many of us have little or no idea what others are working on? Why do we have so little idea of what has been tried before? Why is human cognition understood and described so well in the arts, and so poorly in the organizational sciences? Why is organizational knowledge not integrated across the firm, why does it not flow efficiently where it is needed? Even in universities and firms that have a strong sense of community and a cooperative environment, the horizontal flow of organizational knowledge is often poor. *But most importantly, what could be done if knowledge were effectively shared across those soft boundaries that divide*

departments? What indeed.

Sharing organizational knowledge across departments and groups is a necessary, if not sufficient condition for the development of an *intelligent organization.* The transfer of organizational knowledge between departments within an organization, the leveraging of intellectual assets, and the efficient use of knowledge resources are intimately connected.

There is a difference between an organization of intelligent individuals, and an Intelligent Organization. There is a difference between individual knowledge, and knowledge that is shared by a community. In this dissertation, I have been attempting to describe in a scientific fashion what "organizational knowledge" is, and to discover how it flows within an organization. I am paying special attention to circumstances in which transferring organizational knowledge between departments leads to increasing organizational effectiveness and efficiency, or increased innovation. It is my contention that specific identifiable and measurable factors influence whether or not employees discern available knowledge, so that it may be put to new uses.

The research may be applied to designing an organizational knowledge management system that helps leverage the intellectual assets of the organization to the greatest extent possible. By unleashing the competitive advantage of superior intelligence at the departmental and organizational level, the productive capacity of a firm might increase dramatically.

Such a knowledge management system would (at least) be able to:

(a) Clearly and consistently distinguish and describe general knowledge, scientific knowledge, organizational knowledge and individual knowledge, their relationships to each

other and to other ontological objects such as information, opinions, right opinions and the like.

(b) Keep track of organizational knowledge

(c) Facilitate building organizational knowledge by transferring individually held employee knowledge to an organizational knowledge base

(d) Facilitate innovation by provoking combinations of distinct organizational knowledge (cross departments, cross professional groups, etc.).

(e) Recall and transfer knowledge where it may be needed

(f) Recall and transfer knowledge when it may be needed

(g) Not transfer knowledge where it is not needed, or where it may be indiscrete to do so

(h) Send knowledge in a form that is specifically designed to fit to the cognitive biases of end-users, so that it is actually discerned and used

There are many others conducting strategic management research in this area. This dissertation, however focuses upon issues related to the first item (a) and the final item (h) on the bullet list, areas which very few scholars are investigating. What are the conditions for success in this area of inquiry? First of all, at least for practical purposes, we need a working definition that lets us know what is, and what is not, organizational knowledge. Secondly, a well-designed knowledge management system must account for the fact that normal people, our managers and employees and our customers, are idiosyncratic and are often less than rational and homogenous in the ways they make sense of the information and events they face. An intelligent organization both accounts for this diversity, and through synthesis takes advantage of it.

KTP1 is the very simple hypothesis of the study: A significant portion of the variance in organizational knowledge transfer performance is expected to be caused by variance in the discernment of organizational knowledge. Organizational knowledge transfer performance is the degree that knowledge moves between departments and gets put to use. It is neither a complicated relationship nor is it an unexpected relationship. That knowledge which is not discerned is not likely to get turned into organizational action. The value of knowledge is in its potential for useful action.

The more complicated part of the dissertation has been discovering the influences upon discernment of knowledge. I hypothesized that some specific factors influence whether or not organizational members discern available organizational knowledge, so that it may be put to new uses. Insights into how organizational knowledge is best transferred in different situations may help create more effective end products, and more effective internal processes. Much knowledge goes undiscerned, and therefore unused by those who might be in a position to leverage that knowledge. The level of discernment of any area of organizational knowledge is measured by the scale below.

1. We DON'T PAY MUCH ATTENTION to that stuff
2. We NOTICE that information/knowledge, but generally don't make an effort to understand what it specifically means.
3. We notice or seek that knowledge, and try to UNDERSTAND what it means to the group who has it.
4. We spend some time trying to MAKE SENSE of what this information/knowledge could mean to our group
5. We specify actions this particular knowledge implies for our group/department, in terms of helping us perform better, and we either MAKE AN ACTION PLAN or we WRITE IT UP for inclusion in a manual or database.

This dissertation has described five relationships that significantly impact the level of organizational knowledge discernment measured on the scale above. Members of different departments prefer different communication media. Members of different departments have different sources of meaning through which they make sense of the world. They may have different attention biases, i.e. where they look for knowledge, and what logical form of knowledge they are most likely to attend. They have different orientations regarding the importance of finding new knowledge and new markets for their knowledge.

Another set of factors impacting the transfer of organizational knowledge are a function of the knowledge itself. The perceived complexity vs simplicity of the knowledge, the embeddedness vs explicitness of the knowledge and the importance vs unimportance of the knowledge combine to describe the degree of impedance (resistence) to organizational knowledge flow.

Spending time in a department and in a firm causes members to develop knowledge transfer styles that are characteristic of those departments or firms. For example, I have found that members of accounting departments tend to be systematically different from members of customer service, and from members of Research and Development and members of manufacturing operations. These differences are systematic, not random. This initial study of two high tech companies has provided support for these statements.

The dissertation has also been concerned with designing and refining a measurement instrument that is used to profile the knowledge transfer style of departmental members. The instrument in its current form uses an average per employee of 30 minutes time and deep concentration. Because many firms are reluctant to share so much employee time and

energy, gaining access to participants has been the most difficult portion of the study. Future work should certainly include reducing the average time and effort it takes to complete the measurement instrument while retaining the integrity of the scales.

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APPENDIX A: SUMMARY OF HYPOTHESES

Figure 97 Summary of Hypotheses, Tests and Results Grand Hypotheses		Statistical Test	Results
$HGrand_A$	If a department type's rational boundaries lead that department type's members to have a common and characteristic knowledge transfer style, then we can accurately predict what type of department an employee belongs to by observing their knowledge transfer style.	Discriminant Analysis, cross checked with MANOVA	Supported p = <.001 hit rate = 72.8%
$HGrand_B$	If a firm's rational boundaries cause the firm's members to have a common and characteristic knowledge transfer style, then we can accurately predict what firm an employee belongs to by observing their knowledge transfer style.	Discriminant Analysis, cross checked with MANOVA	Supported p = .002 hit rate = 88%
$Hgrand_C$	The perceived strategic orientation, locus of attention, characteristic sources of meaning, difference in communication media and knowledge impedance together predict a significant portion of the variance in an organizational member's knowledge discerning behavior.	General Linear Modeling Regression	Supported p < .001 r2 = .543 Adj r2 =.448
$Hgrand_D$	Higher knowledge discernment behavior leads to higher performance of knowledge transferred.	Regression	Supported p = .001 r2 = .218 Beta=.471
$Hgrand_E$	A significant portion of organizational knowledge that is identified as potentially useful is not actually put to use.	Single sample one tailed T-test	Supported p < .001 57% +/- 20%

Secondary Hypotheses			
	Strategic Orientation		
KTS1.1	Organizational members meaningfully distinguish the strategic orientation of their department from the strategic orientation of their firm.	Factor Analysis	Supported
KTS1.2	There is a significant difference between the strategic orientation of the firm and the strategic orientation of the department.	T-Test	Supported $p < .001$ Mean diff = .50
KTS1.3	We can accurately predict what type of department an employee belongs to by observing how they perceive their department's strategic orientation.	Discriminant analysis	Supported $p = .044$ hit rate = 33.7%
D1.1	Those who perceive their department toward the Prospector end of the scale will have a higher average level of organizational knowledge discernment than those who describe their department toward the middle (analyzer) or the opposite end (defender) of the scale.	Moderated Hierarchical Regression	Not Supported
D1.2	Those who score their department toward the Prospector end of the scale will have a higher average level of organizational knowledge discernment than those who score their department toward the middle (analyzer) of the scale, who will have a higher average level of organizational knowledge discernment than those scoring their department toward the defender end of the scale.	Moderated Hierarchical Regression	Not Supported
	Locus of Attention		

KTS2.1	On a continuous defender (low) to analyzer to prospector (high) scale, there will be positive correlation between perceived department strategic orientation and the use and breadth of loci of attention.	Correlation/ Covariance Analysis.	*Supported p <.001.*
KTS2.2	Members of different department types will utilize different loci of attention. Members of the same department type will use similar loci of attention.	MANOVA	Supported p =.001 r2 =0.228
KTS2.3	We can accurately predict what department type an employee belongs to by observing their loci of attention.	Discriminant analysis	Supported p < .001 hit rate = 48.1%
D2.1	A broader physical and logical range of attention predicts a higher average level of organizational knowledge discernment by department members.	Moderated Hierarchical Regression	Supported p=.001 Beta=.324 r2=.06
D2.2	Focusing more attention upon other departments within the firm will lead to a higher average level of organizational knowledge discernment by department members.	Moderated Hierarchical Regression	Not supported
D2.3a	Stronger inductive propensity predicts a higher average level of organizational knowledge discernment by department members.	Moderated Hierarchical Regression	Supported p=.024 r2=0.03 Beta=.205
D2.3b	Stronger deductive propensity predicts a higher average level of organizational knowledge discernment by department members.	Moderated Hierarchical Regression	Not supported

D2.3c	Stronger inductive propensity and deductive propensity predicts a higher average level of organizational knowledge discernment by department members.	Moderated Hierarchical Regression	Not supported
	Sources of Meaning		
KTS3.1	We can accurately predict what type of department an employee belongs to by observing their sources of meaning.	Discriminant analysis	Supported p=.001 hit rate=54%
KTS3.2	Members of different types of departments will draw from different characteristic sources of meaning.	MANOVA	Supported p<.001
KTS3.2a	Members of Accounting/Finance department types will make strong use explicit internal sources of meaning, (financial reports and formal rules), and of secondary socialization sources of meaning (professional associations and experience).	MANCOVA	Supported
KTS3.2b	Members of Research/Development department types will make strong use of social collaboration sources, such as coworkers, experts outside of their department and subordinates.	MANCOVA	Supported
KTS3.2c	Members of Operations department types will make strong use of superiors as a source of meaning.	MANCOVA	Supported
KTS 3.2d	Members of after sales support department types will make strong use of the external task environment as a source of meaning.	MANCOVA	Not supported
D3.1	Frequent use of sources of meaning external to the department will lead to improved discernment of organizational knowledge.	Hierarchical Moderated Regression	Supported p=.037 R2 change =.021

D3.1a	Frequent use of customers as a source of meaning is associated with a higher level of discernment of organizational knowledge about customers.	MANOVA	Supported p=.001
D3.1b	Frequent use of internal financial reports as a source of meaning is associated with a higher level of discernment of organizational knowledge in financial reports.	MANOVA	Supported p<.001
D3.1c	Frequent use of organizational culture as a source of meaning will be associated with a higher level of discernment of organizational knowledge about management practices.	MANOVA	Supported p=.001
D3.1d	Frequently use of specialists from outside the department as a source of meaning will be associated with a higher level of discernment of organizational knowledge about management practices.	MANOVA	Supported p=.046
	Communication media		
KTS4.1	We can accurately predict what department type an employee belongs to by observing their communication media preferences.	Discriminant analysis	Supported p=0.001 hit rate=.54.4
KTS4.1a	Members of accounting departments will report a communication media preference for spreadsheets and numbers, and for memos and formal reports	MANOVA	Supported p=.01 P=.001
KTS4.1b	Members of research and development departments will report a communication media preference for informal meetings.	MANOVA	Not Supported
KTS4.1c	Members of IT support will report a communication media preference for the internet and video conferencing.	MANOVA	Supported p=.05

D4.1	A preference for richer communication media predicts higher levels of knowledge discernment.	MANOVA Regression	Supported p=.05
D4.2	Larger discrepancies between the communication media used by the sender(s) and the preferred communication media of the receiver(s), lead to lower levels of knowledge discernment. Smaller discrepancies lead to higher levels of discernment.	Hierarchical Moderated Regression	Supported p=.047 r2=.018 Beta=-.128
	Impedance		
KTS5.1	We can accurately predict what type of department an employee belongs to by observing their perceptions of knowledge impedance.	Discriminant Analysis	**Average:** Not supported p=.064 hit rate=29% **3 facets:** Supported p=.007 hit rate=46%
D5.1	More explicit organizational knowledge predicts higher levels of discernment of organizational knowledge, more embedded organizational knowledge predicts lower levels of discernment of organizational knowledge.	ANOVA Regresson	Supported p=.001 r2=.349/.341 Std Beta=.591
D5.2	A propensity or preference for induction predicts a higher level of discernment of organizational knowledge that is perceived as deeply embedded.	MANOVA Regression	Not supported

D5.3	Organizational members more likely ignore discerned-as- useful knowledge rather than putting it to use to revise existing routines and processes.	Simple T-Test	Supported p=.002 actual mean=57.7 %
D5.4a	Line department members are less likely to put discerned knowledge to use than members of staff departments.	ANOVA	Not supported
D5.4b	Line department members are less likely than staff members to fully discern organizational knowledge	ANOVA	Not Supported
D5.5	Organizational knowledge that is perceived as more important by organizational members leads to a higher level of discernment than organizational knowledge that is perceived as less important by organizational members.	Regression	Not supported
D5.6	Organizational knowledge that is perceived as more complex will more likely be ignored or avoided (not discerned at all) while organizational knowledge that is perceived as less complex will more likely be fully discerned by organizational members.	Regression	Not supported
D5.7	There is an inverse causal relationship between the level of impedance perceived by a department member, and the member's level of organizational knowledge discernment.	Regression	Supported p=.004 r2=.041 beta = -.385
D5.8	There is an inverse causal relationship between the level of impedance perceived by a department member, and the frequently that discerned organizational knowledge is put to use.	Regression	p<.001 r2=.174 beta =-17.87

APPENDIX B: PEARSON CORRELATIONS AMONG VARIABLES

	Firm Strategic Orient	Depart. Strategic Orient	Deductive Propensity	Inductive Propensity	Inductive vs. Deductive Propensity Scale	All internal to firm locations	All external to firm locations	Formal Rules as Source of Meaning
Firm Strategic Orientation	1.000	.392**	.205*	.175	.084	.257**	.232*	.038
Department Strategic Orientation	.392**	1.000	.134	.396**	-.025	-.026	.394**	-.044
Deductive Propensity	.205*	.134	1.000	-.064	.617**	.261**	.333**	.189*
Inductive Propensity	.175	.396**	-.064	1.000	-.324**	.070	.268**	-.219*
Inductive vs. Deductive	.084	-.025	.617**	-.324**	1.000	.065	.033	.200*
All internal to firm locations	.257**	-.026	.261**	.070	.065	1.000	.163	.129
All external to firm locations	.232*	.394**	.333**	.268**	.033	.163	1.000	-.099
Formal Rules as Source of Meaning	.038	-.044	.189*	-.219*	.200*	.129	-.099	1.000
Organizational Culture as Source	-.099	-.166	-.038	.078	-.130	.035	-.125	.201*
Subordinates as Source of Meaning	.190*	.080	.017	-.140	-.101	.218*	.011	.204*
Outside Specialists as Source	.283**	.266**	-.056	.037	-.065	.147	.197*	.208*
Co-workers as Source	.242**	.364**	.120	.142	-.009	.179	.112	.050
Superiors as Source of Meaning	-.083	-.152	-.039	.080	-.024	-.090	-.139	.213*
Internal Financial Reports as Source	-.062	-.046	.302**	-.176	.221*	.064	.144	.276**
Own Experiences as Source	-.085	.032	.211*	.114	-.026	.035	.070	.072
National Culture as Source of Meaning	.207*	.106	.063	.216*	-.215*	-.010	.237**	-.112
Religious Beliefs as Source of Meaning	.157	.140	.173	.043	.006	-.069	.219*	-.005
Family as Source of Meaning	.114	.098	.116	.105	.010	-.001	.245**	-.002
Customers as Source of Meaning	.174	.346**	.011	.427**	-.300**	-.044	.444**	.071
Professional Norms as Source	.032	.194*	.488**	.103	.257**	-.078	.293**	.205*
Suppliers as Source of Meaning	.277**	.320**	.170	.132	.043	.019	.475**	.234*
E-mail preference	.056	-.032	-.265**	.069	-.108	-.106	-.167	.135
Regular or Overnight mail	-.045	.119	.051	.020	.000	-.175	.190*	.005
Telephone/Voice-mail preference	-.043	-.077	-.050	-.009	-.025	-.112	-.001	-.005
Fax preference	-.041	-.139	.234*	-.087	.255**	.026	.100	.077
Video Conf / Internet preference	.063	.315**	.146	.191*	-.003	-.005	.481**	.014
Formal Meeting preference	-.063	-.160	.119	-.214*	.214*	.208*	-.038	.052
Informal Meeting preference	.148	-.020	.024	.202*	-.030	.134	.134	.075
Memos/Formal Reports preference	-.042	-.065	.255**	-.073	.298**	.098	.162	.075
Spreadsheets/ numbers preference	-.138	-.112	.342**	-.235*	.356**	.228*	.152	.095
Pictures/Diagrams preference	.143	.308**	-.076	.226*	-.148	.065	.444**	-.086
Communication Means Dysfunction	.200*	.129	-.004	.084	-.189*	.283**	.235*	-.161
Impedance	.161	.273**	.290**	.108	.099	.157	.264**	-.058
Important/ Unimportant	.170	.314**	.145	.090	.168	.192*	.193*	.103
Simple/Complex	-.055	-.048	.415**	-.122	.194*	.176	.138	.020
Explicit/Implicit	.220*	.402**	.012	.309**	-.203	-.057	.275*	-.399**
Discernment (avg.)	.340**	.406**	.245**	.312**	-.081	.126	.493**	-.114
Knowledge Transfer Performance	.212*	.183*	-.156	.101	-.243**	.150	.199*	-.326**
KTP: Effectiveness only	.282**	.199*	-.152	.194*	-.277**	.224*	.213*	-.262**
KTP: Efficiency only	.112	.140	-.136	-.005	-.172	.056	.155	-.337**

	Org Culture as Source of Meaning	Subordinates as Source of Meaning	Outside Specialists as Source of Meaning	Co-workers at Same Level as Source of Meaning	Superiors as Source of Meaning	Internal Financial Reports as Source of Meaning	Own Experiences as Source of Meaning	National Culture as Source of Meaning
Firm Strategic Orientation	-.099	.190*	.283**	.242**	-.083	-.062	-.085	.207*
Department Strategic Orientation	-.166	.080	.266**	.364**	-.152	-.046	.032	.106
Deductive Propensity	-.038	.017	-.056	.120	-.039	.302**	.211*	.063
Inductive Propensity	.078	-.140	.037	.142	.080	-.176	.114	.216*
Inductive vs. Deductive	-.130	-.101	-.065	-.009	-.024	.221*	-.026	-.215*
All internal to firm locations	.035	.218*	.147	.179	-.090	.064	.035	-.010
All external to firm locations	-.125	.011	.197*	.112	-.139	.144	.070	.237**
Formal Rules as Source of Meaning	.201*	.204*	.208*	.050	.213*	.276**	.072	-.112
Organizational Culture as Source	1.000	.068	.108	.167	.117	-.051	.119	.240**
Subordinates as Source of Meaning	.068	1.000	.321**	.377**	.152	.123	.253**	.252**
Outside Specialists as Source	.108	.321**	1.000	.343**	-.139	.243**	-.051	.267**
Co-workers as Source	.167	.377**	.343**	1.000	.164	-.156	.374**	.093
Superiors as Source of Meaning	.117	-.152	-.139	.164	1.000	.002	.299**	-.188*
Internal Financial Reports as Source	-.051	.123	.243**	-.156	.002	1.000	-.011	.055
Own Experiences as Source	.119	.253**	-.051	.374**	.299**	-.011	1.000	.111
National Culture as Source of Meaning	.240**	.252**	.267**	.093	-.188*	.055	.111	1.000
Religious Beliefs as Source of Meaning	.179	.288**	.277**	.075	-.418**	.185*	-.027	.605**
Family as Source of Meaning	.227*	.297**	.301**	.066	-.361**	.164	.085	.571**
Customers as Source of Meaning	-.012	-.047	.226*	.236*	.252**	.055	.224*	.184*
Professional Norms as Source	.018	.023	-.031	.247**	.320**	.077	.571**	.081
Suppliers as Source of Meaning	.194*	.248**	.414**	.311**	-.047	.181*	.165	.324**
E-mail preference	.062	-.106	.078	.062	.219*	-.116	-.081	-.250**
Regular or Overnight mail	.161	-.056	-.086	-.020	.182	.057	.050	.117
Telephone/Voice-mail preference	.150	-.062	-.022	-.162	.063	-.047	.088	-.087
Fax preference	.241**	-.119	-.012	-.032	.193*	.253**	.054	-.025
Video Conf / Internet preference	-.012	.051	.009	.018	-.030	.089	.035	.180
Formal Meeting preference	-.051	.128	-.054	-.214*	-.069	.256**	.004	.011
Informal Meeting preference	.112	-.044	-.033	-.168	.005	.040	.020	.027
Memos/Formal Reports preference	-.094	.000	-.008	-.255**	-.069	.388**	-.091	-.010
Spreadsheets/ numbers preference	.081	.146	-.068	-.047	-.052	.335**	.145	-.038
Pictures/Diagrams preference	.156	-.048	.251**	.097	-.023	-.164	-.036	.038
Communication Means Dysfunction	.029	.149	.154	-.088	-.219*	.038	-.028	.189*
Impedance	-.261**	.122	.214*	.177	-.023	.318**	.240**	.208*
Important/ Unimportant	-.179	.173	.170	.279**	.030	.221*	.136	-.037
Simple/Complex	-.109	.142	.055	.036	.033	.316**	.332**	.214*
Explicit/Implicit	-.307**	-.098	.202	.082	-.137	.168	.022	.250*
Discernment (avg.)	-.137	-.021	.255**	.169	-.079	.228*	.073	.298**
Knowledge Transfer Performance	-.088	.030	.172	.125	-.266**	-.071	-.011	.191*
KTP: Effectiveness only	-.008	.066	.194*	.160	-.235*	-.074	.063	.226*
KTP: Efficiency only	-.152	-.009	.124	.072	-.255**	-.056	-.081	.128

	Religious Beliefs as Source of Meaning	Family Lives and Members as Source of Meaning	Customers as Source of Meaning	Norms/Knowledge specific to Profession as Source of Meaning	Suppliers as Source of Meaning	E-mail preference	Regular or Overnight mail preference	Telephone/Voice-mail preference
Firm Strategic Orientation	.157	.114	.174	.032	.277**	.056	-.045	-.043
Department Strategic Orientation	.140	.098	.346**	.194*	.320**	-.032	.119	-.077
Deductive Propensity	.173	.116	.011	.488**	.170	-.265**	.051	-.050
Inductive Propensity	.043	.105	.427**	.103	.132	.069	.020	-.009
Inductive vs. Deductive	.006	.010	-.300**	.257**	.043	-.108	.000	-.025
All internal to firm locations	-.069	-.001	-.044	-.078	.019	-.106	-.175	-.112
All external to firm locations	.219*	.245**	.444**	.293**	.475**	-.167	.190*	-.001
Formal Rules as Source of Meaning	-.005	-.002	.071	.205*	.234*	.135	.005	-.005
Organizational Culture as Source	.179	.227*	-.012	.018	.194*	.062	.161	.150
Subordinates as Source of Meaning	.288**	.297**	-.047	.023	.248**	-.106	-.056	-.062
Outside Specialists as Source	.277**	.301**	.226*	-.031	.414**	.078	-.086	-.022
Co-workers as Source	.075	.066	.236*	.247**	.311**	.062	-.020	-.162
Superiors as Source of Meaning	-.418**	-.361**	.252**	.320**	-.047	.219*	.182	.063
Internal Financial Reports as Source	.185*	.164	.055	.077	.181*	-.116	.057	-.047
Own Experiences as Source	-.027	.085	.224*	.571**	.165	-.081	.050	.088
National Culture as Source of Meaning	.605**	.571**	.184*	.081	.324**	-.250**	.117	-.087
Religious Beliefs as Source of Meaning	1.000	.855**	-.027	-.019	.315**	-.103	-.034	-.017
Family as Source of Meaning	.855**	1.000	.016	.058	.295**	-.080	-.087	-.026
Customers as Source of Meaning	-.027	.016	1.000	.402**	.405**	-.045	.085	-.179
Professional Norms as Source	-.019	.058	.402**	1.000	.343**	-.093	.184*	.019
Suppliers as Source of Meaning	.315**	.295**	.405**	.343**	1.000	.084	.183*	-.047
E-mail preference	-.103	-.080	-.045	-.093	.084	1.000	-.195*	.246**
Regular or Overnight mail	-.034	-.087	.085	.184*	.183*	-.195*	1.000	.212*
Telephone/Voice-mail preference	-.017	-.026	-.179	.019	-.047	.246**	.212*	1.000
Fax preference	-.061	-.084	-.093	.200*	.086	.047	.505**	.429**
Video Conf / Internet preference	.197*	.175	.220*	.153	.309**	.002	.275**	.161
Formal Meeting preference	.068	.114	-.223*	-.074	-.084	-.144	-.159	.071
Informal Meeting preference	-.015	.025	.061	.030	-.016	-.072	-.058	.296**
Memos/Formal Reports preference	.074	.084	-.058	.085	.036	-.240**	.233*	.161
Spreadsheets/ numbers preference	.002	.125	-.248**	.110	-.003	-.244**	.164	.206*
Pictures/Diagrams preference	-.017	.103	.277**	.066	.260**	.057	.063	.238**
Communication Means Dysfunction	.069	.080	.051	-.127	.202*	.003	-.056	.135
Impedance	.163	.099	.168	.133	.131	-.120	-.044	-.086
Important/ Unimportant	.020	-.008	.118	.039	.147	.090	-.002	-.073
Simple/Complex	.143	.101	.014	.250**	.042	-.273**	-.050	.023
Explicit/Implicit	.169	.089	.284**	-.007	.018	-.097	-.061	-.192
Discernment (avg.)	.242**	.212*	.391**	.132	.267**	-.139	.068	-.201*
Knowledge Transfer Performance	.132	.140	.212*	-.116	.232*	-.153	-.208*	-.155
KTP: Effectiveness only	.129	.173	.247**	-.088	.224*	-.159	-.102	-.079
KTP: Efficiency only	.115	.087	.146	-.125	.204*	-.122	-.276**	-.202*

	Fax preference	Video Conference/Internet preference	Formal Meeting preference	Informal Meeting preference	Memos/Formal Reports preference	Spreadsheets/numbers preference	Pictures/Diagrams preference	Communication Means Dysfunction
Firm Strategic Orientation	-.041	.063	-.063	.148	-.042	-.138	.143	.200*
Department Strategic Orientation	-.139	.315**	-.160	-.020	-.065	-.112	.308**	.129
Deductive Propensity	.234*	.146	.119	.024	.255**	.342**	-.076	-.004
Inductive Propensity	-.087	.191*	-.214*	.202*	-.073	-.235*	.226*	.084
Inductive vs. Deductive	.255**	-.003	.214*	-.030	.298**	.356**	-.148	-.189*
All internal to firm locations	.026	-.005	.208*	.134	.098	.228*	.065	.283**
All external to firm locations	.100	.481**	-.038	.134	.162	.152	.444**	.235*
Formal Rules as Source of Meaning	.077	.014	.052	.075	.075	.095	-.086	-.161
Organizational Culture as Source	.241**	-.012	-.051	.112	-.094	.081	.156	.029
Subordinates as Source of Meaning	-.119	.051	.128	-.044	.000	.146	-.048	.149
Outside Specialists as Source	-.012	.009	-.054	-.033	-.008	-.068	.251**	.154
Co-workers as Source	-.032	.018	-.214*	-.168	-.255**	-.047	.097	-.088
Superiors as Source of Meaning	.193*	-.030	-.069	.005	-.069	-.052	-.023	-.219*
Internal Financial Reports as Source	.253**	.089	.256**	.040	.388**	.335**	-.164	.038
Own Experiences as Source	.054	.035	.004	.020	-.091	.145	-.036	-.028
National Culture as Source of Meaning	-.025	.180	.011	.027	-.010	-.038	.038	.189*
Religious Beliefs as Source of Meaning	-.061	.197*	.068	-.015	.074	.002	-.017	.069
Family as Source of Meaning	-.084	.175	.114	.025	.084	.125	.103	.080
Customers as Source of Meaning	-.093	.220*	-.223*	.061	-.058	-.248**	.277**	.051
Professional Norms as Source	.200*	.153	-.074	.030	.085	.110	.066	-.127
Suppliers as Source of Meaning	.086	.309**	-.084	-.016	.036	-.003	.260**	.202*
E-mail preference	.047	.002	-.144	-.072	-.240**	-.244**	.057	.003
Regular or Overnight mail	.505**	.275**	-.159	-.058	.233*	.164	.063	-.056
Telephone/Voice-mail preference	.429**	.161	.071	.296**	.161	.206*	.238**	.135
Fax preference	1.000	.211*	.054	.143	.378**	.326**	.096	-.182*
Video Conf / Internet preference	.211*	1.000	.008	.037	.073	.171	.307**	.247**
Formal Meeting preference	.054	.008	1.000	.407**	.349**	.367**	-.111	.171
Informal Meeting preference	.143	.037	.407**	1.000	.261**	.149	.231*	.077
Memos/Formal Reports preference	.378**	.073	.349**	.261**	1.000	.463**	.000	.160
Spreadsheets/ numbers preference	.326**	.171	.367**	.149	.463**	1.000	.210*	.205*
Pictures/Diagrams preference	.096	.307**	-.111	.231*	.000	.210*	1.000	.317**
Communication Means Dysfunction	-.182*	.247**	.171	.077	.160	.205*	.317**	1.000
Impedance	-.108	.213*	.196*	.024	.089	.046	-.106	.244**
Important/ Unimportant	-.113	.227*	.029	-.128	.122	.034	-.006	.180
Simple/Complex	.064	.122	.336**	.148	.150	.228*	-.204*	.117
Explicit/Implicit	-.243*	.065	.055	.012	-.097	-.206	-.009	.221*
Discernment (avg.)	-.113	.254**	-.102	-.073	.035	-.047	.104	.297**
Knowledge Transfer Performance	-.257**	.066	-.126	-.093	-.053	-.135	.189*	.375**
KTP: Effectiveness only	-.185*	.038	-.112	-.015	.031	-.091	.171	.416**
KTP: Efficiency only	-.284**	.083	-.120	-.153	-.125	-.155	.176	.277**

	Impedance	Important/Unimportant	Simple/Complex	Explicit/Implicit	Discernment (avg.)	Knowledge Transfer Performance	KTP: Effectiveness only	KTP: Efficiency only
Firm Strategic Orientation	.161	.170	-.055	.220*	.340**	.212*	.282**	.112
Department Strategic Orientation	.273**	.314**	-.048	.402**	.406**	.183*	.199*	.140
Deductive Propensity	.290**	.145	.415**	.012	.245**	-.156	-.152	-.136
Inductive Propensity	.108	.080	-.122	.309**	.312**	.101	.194*	-.005
Inductive vs. Deductive	.099	.168	.194*	-.203	-.081	-.243**	-.277**	-.172
All internal to firm locations	.157	.192*	.176	-.057	.126	.150	.224*	.056
All external to firm locations	.264**	.193*	.138	.275*	.493**	.199*	.213*	.155
Formal Rules as Source of Meaning	-.058	.103	.020	-.399**	-.114	-.326**	-.262**	-.337**
Organizational Culture as Source	-.261**	-.179	-.109	-.307**	-.137	-.088	-.008	-.152
Subordinates as Source of Meaning	.122	.173	.142	-.098	-.021	.030	.066	-.009
Outside Specialists as Source	.214*	.170	.055	.202	.255**	.172	.194*	.124
Co-workers as Source	.177	.279**	.036	.082	.169	.125	.160	.072
Superiors as Source of Meaning	-.023	.030	.033	-.137	-.079	-.266**	-.235*	-.255**
Internal Financial Reports as Source	.318**	.221*	.316**	.168	.228*	-.071	-.074	-.056
Own Experiences as Source	.240**	.136	.332**	.022	.073	-.011	.063	-.081
National Culture as Source of Meaning	.208*	-.037	.214*	.250*	.298**	.191*	.226*	.128
Religious Beliefs as Source of Meaning	.163	.020	.143	.169	.242**	.132	.129	.115
Family as Source of Meaning	.099	-.008	.101	.089	.212*	.140	.173	.087
Customers as Source of Meaning	.168	.118	.014	.284**	.391**	.212*	.247**	.146
Professional Norms as Source	.133	.039	.250**	-.007	.132	-.116	-.088	-.125
Suppliers as Source of Meaning	.131	.147	.042	.018	.267**	.232*	.224*	.204*
E-mail preference	-.120	.090	-.273**	-.097	-.139	-.153	-.159	-.122
Regular or Overnight mail	-.044	-.002	-.050	-.061	.068	-.208*	-.102	-.276**
Telephone/Voice-mail preference	-.086	-.073	.023	-.192	-.201*	-.155	-.079	-.202*
Fax preference	-.108	-.113	.064	-.243*	-.113	-.257**	-.185*	-.284**
Video Conf / Internet preference	.213*	.227*	.122	.065	.254**	.066	.038	.083
Formal Meeting preference	.196*	.029	.336**	.055	-.102	-.126	-.112	-.120
Informal Meeting preference	.024	-.128	.148	.012	-.073	-.093	-.015	-.153
Memos/Formal Reports preference	.089	.122	.150	-.097	.035	-.053	.031	-.125
Spreadsheets/ numbers preference	.046	.034	.228*	-.206	-.047	-.135	-.091	-.155
Pictures/Diagrams preference	-.106	-.006	-.204*	-.009	.104	.189*	.171	.176
Communication Means Dysfunction	.244**	.180	.117	.221*	.297**	.375**	.416**	.277**
Impedance	1.000	.666**	.781**	.746**	.500**	.178	.145	.183*
Important/ Unimportant	.666**	1.000	.277**	.184	.279**	.140	.129	.129
Simple/Complex	.781**	.277**	1.000	.366**	.265**	.038	.017	.051
Explicit/Implicit	.746**	.184	.366**	1.000	.591**	.283**	.213	.309**
Discernment (avg.)	.500**	.279**	.265**	.591**	1.000	.325**	.377**	.225*
Knowledge Transfer Performance	.178	.140	.038	.283**	.325**	1.000	.917**	.925**
KTP: Effectiveness only	.145	.129	.017	.213	.377**	.917**	1.000	.696**
KTP: Efficiency only	.183*	.129	.051	.309**	.225*	.925**	.696**	1.000

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix C: The Knowledge Transfer Style Survey

Thank you for administering the KTS Survey.

The KTS survey is designed to measure both group and organizational tendencies which affect what is learned and how it is learned. The KTS Survey also measures the degree to which knowledge that could *potentially* be transferred between departments within organizations is *actually* transferred. This is the idea of knowledge transfer performance. Please date the top survey before dropping them off.

Known administration difficulties:

A: This survey has been designed primarily for managers. However, we would like to measure as many non-managers as possible as well. Some subjects may have a harder time than others. The survey addresses some complex issues, and demands careful thought and attention. While most finish in less than 35 minutes, a few have actually taken over 40 minutes. You may want to give them 35 minutes timed, and then have those who did not finish complete the items later on. Be aware that the items become easier to answer (faster) as the survey goes on. It is also critical that the back (last) page is filled out.

B: The surveys are meant to be anonymous. Please explain that no one should put there own name on the survey, just their company, department and (where applicable) sub group within a department.

C: If a subject works with more than one group or department, have them keep the primary group/department in mind. If there is no 'primary' group/department, then they should just pick one to keep in mind throughout the survey. Administrative assistants should think of the group/department they primarily assist.

D: Subjects must remember to CIRCLE one of the choices of Knowledge Transfer Events.

E: The questions about preferred communication means have been very successful. However, we also need to measure the *discrepancy* between the communication means a group likes in different situations, and what others departments actually used in those situations during a knowledge transfer. It has become apparent that a percentage of respondents have been confused about the meaning of "when appropriate" in the first column of those items (using a scale of 1 to 5). It is important that we explain to the subjects what we want them to do.

No other difficulties reported. Please use this form to report any additional difficulties or comments concerning the administration of the survey.

Administrator:_____ Date:_____

Comments/Issues:

The Knowledge Transfer Style Survey

This questionnaire survey is part of a research project conducted by Florida Atlantic University and the University of Portland. The project is trying to advance the science of *Knowledge Management*. We are trying to figure out what we can do to customize the format of company knowledge so that each different group can make better use of it. The survey takes about 25 minutes to complete. Your responses on this form are secure and completely anonymous. Answer every item as best as you can. Please try not to exaggerate. Thank you for participating.

Print your company's name:_____

Print your company's location:_____

Some clarifications, read carefully:

Knowledge Transfer	**When something that is known for sure by one member is learned by another member and put to use.**
Discernment	**Discernment is noticing something, separating out what's most important from it's surroundings, and making sense of it.** ***Knowledge discernment*** **starts with 1) noticing something, 2) identifying that there is knowledge in it 3) understanding it 4) conceiving what it might mean for you.**
Organizational Knowledge	**Please contemplate only those transfers of practices, techniques, routines, recipes or information to your department or group that were or are generally considered "tried and true" within another area or other areas of the firm.**
Groups/Departments	**Organizations are usually divided into departments.** ***Groups*** **and** ***individuals*** **are members of departments. We are mostly interested in how knowledge is transferred between different departments and between members of different professions.**
Customers	**All businesses have customers. Customers are the folks or other organizations that make use of the work that is done by your firm. One firm can the be the customer of another firm.**

When you see: Y! Y O N N! use the following scale:
Y! = Yes Y = yes, I think so O = in the middle N = I don't think so N! = No!

1. **The following are IMPORTANT to our group:**

		Important?				
1.	Cost and financial performance information	Y!	Y	O	N	N!
2.	Marketing, sales and customer satisfaction information	Y!	Y	O	N	N!
3.	How different departments and groups are managed	Y!	Y	O	N	N!
4.	New technological innovations or new high-tech products and services	Y!	Y	O	N	N!

2. **The following things are SIMPLE to figure out:**

		Simple?				
1.	Cost and financial performance information	Y!	Y	O	N	N!
2.	Marketing, sales and customer satisfaction information	Y!	Y	O	N	N!
3.	How different departments and groups are managed	Y!	Y	O	N	N!
4.	Information about the development of new technological innovations	Y!	Y	O	N	N!

3. **The following are made OBVIOUS AND EASILY AVAILABLE to our department:**

		Obvious/Explict?				
1.	Cost and financial performance information	Y!	Y	O	N	N!
2.	Marketing, sales and customer satisfaction information	Y!	Y	O	N	N!
3.	How different departments and groups are managed	Y!	Y	O	N	N!
4.	Information about the development of new technological innovations	Y!	Y	O	N	N!

4. **Is your group's performance measured in terms of:**

1.	Customer Satisfaction?	Y!	Y	O	N	N!
2.	Financial Results?	Y!	Y	O	N	N!
3.	Good Management?	Y!	Y	O	N	N!
4.	Technological Success?	Y!	Y	O	N	N!

5. **Do you think company communications about the following are simple to understand or complicated?**

		Simple		Average		Complicated
1.	Customer preferences and satisfaction	1	2	3	4	5
2.	Financial and budget performance	1	2	3	4	5
3.	Management practices and policies	1	2	3	4	5
4.	High-tech research and innovations	1	2	3	4	5

6. **If you want to know if your group is over or under budget, is this hard to find out, or is it explicit and easy for anyone find out.**

1	2	3	4	5
Very hard to find out		moderately available		Very easy to find out

7. **Is *customer preference or customer satisfaction* information hard to find out, or is it very explicit and easy for anyone find out.**

1	2	3	4	5
Very hard to find out		moderately available		Very easy to find out

8. **Are the management practices/policies used in other groups understood "between the lines" or are they spoken of openly and directly.**

1	2	3	4	5
Understood "between the lines"		a bit of both		Always discussed openly

9. **Are explicit directions/instructions used for technological applications and equipment or do folks rely on experience and intuition.**

1	2	3	4	5
Rely only on experience		rely on both equally		Very explicit written instructions used

How does your department deal with organizational knowledge that resides outside of your department? Read the choices carefully and think about your department and not yourself.

A **When new, successful management policies have been implemented *somewhere else within* the company, what does your department do?**

1 We DON'T REALLY GET TO HEAR ABOUT THAT sort of thing
2 We usually NOTICE, but mostly don't spend time tying to figure it all out.
3 We take time to understand why it is important TO THEM
4 We figure out what this new knowledge means FOR US
5 We FORMULATE A COMPREHENSIVE ACTION PLAN to implement this knowledge in our group.

B **How does your department deal with new products and innovations created by research and development?**

1 We DON'T REALLY GET TO HEAR ABOUT THAT sort of thing
2 We usually NOTICE, but mostly don't spend time tying to figure it all out.
3 We take time to understand why it is important *TO THEM*
4 We figure out what this new knowledge means *FOR US*
5 We FORMULATE A COMPREHENSIVE ACTION PLAN to implement this knowledge in our group.

C **When customer preferences are gathered into reports by sales and marketing, what does your group do?**

1 We DON'T REALLY GET TO HEAR ABOUT THAT sort of thing
2 We usually NOTICE, but mostly don't spend time tying to figure it all out.
3 We take time to understand why it is important *TO THEM*
4 We figure out what this new knowledge means *FOR US*
5 We FORMULATE A COMPREHENSIVE ACTION PLAN to implement this knowledge in our group.

D **When the information technology support group *(IT support)* learns how to use a new computer application, how does your department react?**

1 We DON'T REALLY GET TO HEAR ABOUT THAT sort of thing
2 We usually NOTICE, but mostly don't spend time tying to figure it all out.
3 We take time to understand why it is important *TO THEM*
4 We figure out what this new knowledge means *FOR US*
5 We FORMULATE A COMPREHENSIVE ACTION PLAN to implement this knowledge in our group

E **When the company's accounting group produces new quantitative reports, how does your department react?**

1 We DON'T REALLY GET TO HEAR ABOUT THAT sort of thing
2 We usually NOTICE, but mostly don't spend time tying to figure it all out.
3 We take time to understand why it is important *TO THEM*
4 We figure out what this new knowledge means *FOR US*
5 We FORMULATE A COMPREHENSIVE ACTION PLAN to implement this knowledge in our group.

F **When research and development comes up with a new high tech product, what does your group do?**

1 We DON'T REALLY GET TO HEAR ABOUT THAT sort of thing
2 We usually NOTICE, but mostly don't spend time tying to figure it all out.
3 We take time to understand why it is important *TO THEM*
4 We figure out what this new knowledge means *FOR US*
5 We FORMULATE A COMPREHENSIVE ACTION PLAN to implement this knowledge in our group.

G **When another group in the company implements a new management procedure that improves their work performance, what does your group do?**

1 We DON'T REALLY GET TO HEAR ABOUT THAT sort of thing
2 We usually NOTICE, but mostly don't spend time tying to figure it all out.
3 We take time to understand why it is important *TO THEM*
4 We figure out what this new knowledge means *FOR US*
5 We FORMULATE A COMPREHENSIVE ACTION PLAN to implement this knowledge in our group.

H **When quantitative budget and income statements are compiled, what does your group do?**

1 We DON'T REALLY GET TO HEAR ABOUT THAT sort of thing
2 We usually NOTICE, but mostly don't spend time tying to figure it all out.
3 We take time to understand why it is important *TO THEM*
4 We figure out what this new knowledge means *FOR US*
5 We FORMULATE A COMPREHENSIVE ACTION PLAN to implement this knowledge in our group.

I **When marketing research reports customer satisfaction and product usage numbers, what does your group do?**

1 We DON'T REALLY GET TO HEAR ABOUT THAT sort of thing
2 We usually NOTICE, but mostly don't spend time tying to figure it all out.
3 We take time to understand why it is important *TO THEM*
4 We figure out what this new knowledge means *FOR US*
5 We FORMULATE A COMPREHENSIVE ACTION PLAN to implement this knowledge in our group.

J **When new hardware, software or programming languages are adopted by the information technology support group:**

1 We DON'T REALLY GET TO HEAR ABOUT THAT sort of thing
2 We usually NOTICE, but mostly don't spend time tying to figure it all out.
3 We take time to understand why it is important *TO THEM*
4 We figure out what this new knowledge means *FOR US*
5 We FORMULATE A COMPREHENSIVE ACTION PLAN to implement this knowledge in our group.

What actually happens when new knowledge is transferred to your group/department?

10. **When your group determines that some newly received knowledge could be used, about what percent of the time does the knowledge *actually* get used?**

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

11. **Our group frequently communicates with other groups about our work.**

Y! Y O N N!

12. **On average, to what extent does knowledge, which seems like it might be useful to improve a product or a process, actually end up getting used for those type of improvements?**

1 2 3 4 5
a very small extent a moderate extent a very large extent

13. **When your group receives some knowledge from elsewhere in the company that seems important *concerning revenues or costs*, to what extent does the knowledge tend to get turned into action?**

1 2 3 4 5
a very small extent a moderate extent a very large extent

14. **In your group/department, to what extent of the time does new information that seems useful about your *customers* actually get turned into action?**

1 2 3 4 5
a very small extent a moderate extent a very large extent

For the next group of items, first circle ONE category (a-e) which describes a recent time when knowledge from elsewhere in the company led to your department to implement a new practice or process. Then for the rest of the items, focus carefully on that specific event.

(circle one)

a. **When we implemented a management practice learned from another department.**
From which department?_____

b. **When an innovation created by research and development led to trying a new practice.**

c. **When customer feedback or other related knowledge from marketing led us to try something new.**

d. **When internal accounting or finance reports led us to try a new policy or practice in our group.**

e. **When new computer technology/software was provided by the information technology (IT) support group**

On a scale from 1 (low) to 5 (high), rate how often each of the above events occur: a.___ b.___ c.___ d.___ e.___

Briefly describe in a bit more detail this new practice on which you are focusing in order to answer this section's questions:

_____

_____

1. **Initially our group 'spoon fed' the new process or practice with carefully selected personnel and raw material until it got up to speed.**
Y! Y O N N!

2. **At first our group measured performance more often than usual, sometimes reacting too briskly to transient declines in performance.**
Y! Y O N N!

3. **Some people left our group after having been trained for their new role in the new practice, forcing our group to hire hastily a replacement and train it 'on the fly'.**
Y! Y O N N!

4. **Some people turned out to be poorly qualified to perform their new role in the new practice, forcing our group to hire hastily a replacement and train it 'on the fly'.**
Y! Y O N N!

5. **The new practice had unsatisfactory side effects which our group had to correct.**
Y! Y O N N!

6. **By altering the new practice, our group created further problems which had to be solved**
Y! Y O N N!

7. **Our group's environment turned out to be different from that of the source of the knowledge forcing our group to make unforeseen changes to new practice.**
Y! Y O N N!

8. **Outside experts (from the source of the knowledge, other units, or external consultants) could answer questions and solve problems about their specialty but did not have an overall perspective on the new practice.**
Y! Y O N N!

9. **Teams put together to help our group to get up to speed with the new practice disbanded because their members had to attend to other pressing tasks.**
Y! Y O N N!

10 **Prior to this project, our group very often communicated with all the other main groups involved in us learning and implementing the process.**
Y! Y O N N!

The next group of items concern the same event but focus on the *usefulness* of the new practice.

1. **Our group has not yet solved all problems caused by the introduction of the new practice, because energy and resources were siphoned off by daily work pressures.**
Y! Y O N N!

2. **Some of the 'temporary workarounds' devised to help our group get up to speed became habitual.**
Y! Y O N N!

3. **For the new practice today, the roles are well defined**
Y! Y O N N!

4. **Our group personnel are content to play their roles in the new practice.**
Y! Y O N N!

5. **The appropriateness of performing the new practice in our group has been explicitly questioned after its introduction.**
Y! Y O N N!

6. **Our group has reconsidered its decision to adopt the new practice.**
Y! Y O N N!

7. **Our group's expectations created during the introduction of the new practice have been met.**
Y! Y O N N!

8. **Group values favor performing the new practice.**
Y! Y O N N!

9. **It is clear why our group needs the new practice.**
Y! Y O N N!

10. **The justification for performing the new practice in our group makes sense.**
Y! Y O N N!

11. **The activities accompanying the new practice are difficult.**
Y! Y O N N!

12. **The sender's expectations created during the introduction of the new practice have been met.**
Y! Y O N N!

13. **The activities accompanying the new practice are**
1 2 3 4 5 6 7
Arbitrary and unrealistic Obviously functional

14. **During this project, our group very often communicated with all the other main groups involved in us learning and implementing the process.**

Y! Y O N N!

We want to understand what means of communication your group prefers in different situations. We also want to know how well the other group's communication choices matched your preferences. Hopefully, the other group did not try to use a communication means that you don't use or don't like to use. For example, they may have sent email messages at times when your group would have preferred face to face meetings.

For every type of communication means listed in each question, circle the best response. Do not skip any. *If your group does not use one of the communication means at all, circle 'N'.* If the other group did not match your usage preferences for a communication means, then circle 1.

	When your group communicates something *important, does it prefer* to use:					**When communicating *something important*, did the other department match your preferences for using:**				
	YES!				NO!	COMPLETE MISMATCH				PERFECT MATCH
email	Y!	Y	O	N	N!	1	2	3	4	5
regular post or overnight mail	Y!	Y	O	N	N!	1	2	3	4	5
telephone or voicemail	Y!	Y	O	N	N!	1	2	3	4	5
fax	Y!	Y	O	N	N!	1	2	3	4	5
video conferencing or the internet	Y!	Y	O	N	N!	1	2	3	4	5
formal meetings	Y!	Y	O	N	N!	1	2	3	4	5
informal meetings	Y!	Y	O	N	N!	1	2	3	4	5
memos or formal reports	Y!	Y	O	N	N!	1	2	3	4	5
spreadsheets and numbers	Y!	Y	O	N	N!	1	2	3	4	5
pictures and diagrams	Y!	Y	O	N	N!	1	2	3	4	5

	When your group communicates something *complicated,* does it prefer to use:					**When communicating something *complicated*, did the other department match your preferences for using:**				
	YES!				NO!	COMPLETE MISMATCH				PERFECT MATCH
email	Y!	Y	O	N	N!	1	2	3	4	5
regular post or overnight mail	Y!	Y	O	N	N!	1	2	3	4	5
telephone and/or voicemail	Y!	Y	O	N	N!	1	2	3	4	5
fax	Y!	Y	O	N	N!	1	2	3	4	5
video conferencing or the internet	Y!	Y	O	N	N!	1	2	3	4	5
formal meetings	Y!	Y	O	N	N!	1	2	3	4	5
informal meetings	Y!	Y	O	N	N!	1	2	3	4	5
memos or formal reports	Y!	Y	O	N	N!	1	2	3	4	5
spreadsheets and numbers	Y!	Y	O	N	N!	1	2	3	4	5
pictures and diagrams	Y!	Y	O	N	N!	1	2	3	4	5

	When your group communicates something simple, *does it prefer* to use:					When communicating something simple to you, did the other department match your preferences for using:				
	YES!				NO!	COMPLETE MISMATCH				PERFECT MATCH
email	Y!	Y	O	N	N!	1	2	3	4	5
regular post or overnight mail	Y!	Y	O	N	N!	1	2	3	4	5
telephone or voicemail	Y!	Y	O	N	N!	1	2	3	4	5
fax	Y!	Y	O	N	N!	1	2	3	4	5
video conferencing or the internet	Y!	Y	O	N	N!	1	2	3	4	5
formal meetings	Y!	Y	O	N	N!	1	2	3	4	5
informal meetings	Y!	Y	O	N	N!	1	2	3	4	5
memos or formal reports	Y!	Y	O	N	N!	1	2	3	4	5
spreadsheets and numbers	Y!	Y	O	N	N!	1	2	3	4	5
pictures and diagrams	Y!	Y	O	N	N!	1	2	3	4	5

The following items help assess *where your group tends to look* for information and knowledge:

1. **Where does your group typically look for new knowledge: within your own group or outside your group?**

   1 Mostly Internally — 2 — 3 Both Equally — 4 — 5 Mostly externally

2. **When your group/department is trying to find a way to increase your group's productivity, it very often looks:**

A.	**Within our own group/department**	Y!	Y	O	N	N!
B.	**To another group/department in the firm**	Y!	Y	O	N	N!
C.	**To our customers**	Y!	Y	O	N	N!
D.	**To our suppliers**	Y!	Y	O	N	N!
E.	**To our competitors**	Y!	Y	O	N	N!
F.	**To our professional community and colleagues.**	Y!	Y	O	N	N!
G.	**To our joint venture or business partners.**	Y!	Y	O	N	N!

3. **To improve our work performance, my department tends to pay attention to events, news or sources:**

   1 Mostly within the department — 2 — 3 Both Equally — 4 — 5 Mostly external to the department

4. **When your group/department is trying find better ways to plan, organize, lead or control, it very often looks:**

A.	**Within our own group/department**	Y!	Y	O	N	N!
B.	**To another group/department in our firm**	Y!	Y	O	N	N!
C.	**To our customers**	Y!	Y	O	N	N!
D.	**To our suppliers**	Y!	Y	O	N	N!
E.	**To our competitors**	Y!	Y	O	N	N!
F.	**To our professional community and colleagues.**	Y!	Y	O	N	N!
G.	**To our joint venture or business partners.**	Y!	Y	O	N	N!

5. **To what extent is your group told to improve itself by paying attention to different types of events, news and sources?**

1	2	3	4	5
a very small extent		a moderate extent		a very large extent

6. **Where does your group get most of its new knowledge?**

1	2	3	4	5
Mostly Internally		Both Equally		Mostly externally

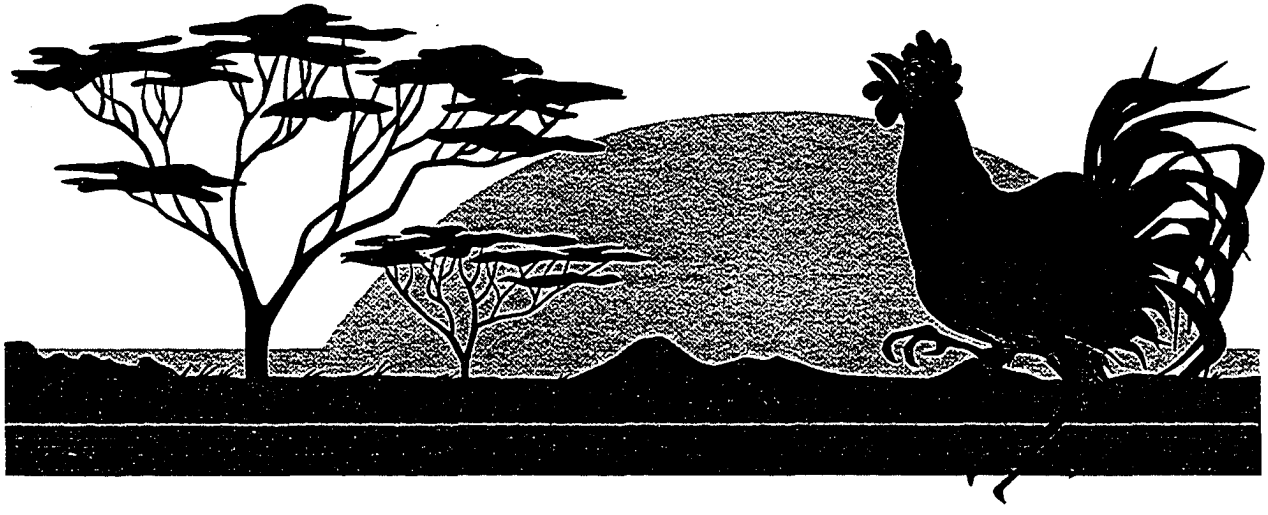
7. **When our group/department is trying to find ways to add more value to our group's product or service, we often look:**

A.	**Within our own group/department**	Y!	Y	O	N	N!
B.	**To another group/department in the firm**	Y!	Y	O	N	N!
C.	**To our customers**	Y!	Y	O	N	N!
D.	**To our suppliers**	Y!	Y	O	N	N!
E.	**To our competitors**	Y!	Y	O	N	N!
F.	**To our professional community and colleagues.**	Y!	Y	O	N	N!
G.	**To our joint venture or business partners.**	Y!	Y	O	N	N!

8. **To what extent would you say hunting for new knowledge is a group/department priority?**

1	2	3	4	5
a very small extent		a moderate extent		a very large extent

Keep it Up, you're 2/3 finished!



In this section, you are presented with three common situations in which your group may become involved that force your group to make sense of what is going on, and perhaps make a decision.

Situation 1 When there are differing opinions within your own group/department about how well your group is doing, to what extent are the actions taken affected by each of the following?

For each of the items from a to n, select one of the five possible responses.

		1 To a very large extent	2	3 to a moderate extent	4	5 To a very small extent
a.	Formal company rules and procedures.	1	2	3	4	5
b.	Unwritten rules about 'How we do things around here'	1	2	3	4	5
c.	Our subordinates	1	2	3	4	5
d.	Specialists outside this department	1	2	3	4	5
e.	Other people at our level	1	2	3	4	5
f.	Our superior(s)	1	2	3	4	5
g.	Internal financial reports (from accounting and finance)	1	2	3	4	5
h.	Opinions based on our own experiences and training	1	2	3	4	5
i.	Beliefs which are widely accepted in my country about what is right	1	2	3	4	5
j.	Religious beliefs	1	2	3	4	5
k.	Our family lives and members	1	2	3	4	5
l.	Our customers	1	2	3	4	5
m.	Norms/knowledge specific to our professional field	1	2	3	4	5
n.	Our suppliers	1	2	3	4	5

1. **How often have you faced a situation of this type over the past few months?**

   1- Very often 2-Often 3-Sometimes 4-Rarely 5-Never

2. **How well have differences of opinion within your department concerning how well your group is doing been handled in the short run?**

   1-Extremely well 2-Very well 3-OK 4-Moderately Poorly 5-Very poorly

3. **How well have differences of opinion within your department concerning how well your group is doing been handled in the long run?**

   1-Extremely well 2-Very well 3-OK 4-Moderately Poorly 5-Very poorly

Situation 2 **When you see the need to INTRODUCE new work procedures into your department, to what extent are the actions taken affected by each of the following?**

For each of the items from a to n, select one of the five possible responses.

		1 To a very large extent	2	3 to a moderate extent	4	5 To a very small extent
a.	Formal company rules and procedures.	1	2	3	4	5
b.	Unwritten rules about 'How we do things around here'	1	2	3	4	5
c.	Our subordinates	1	2	3	4	5
d.	Specialists outside this department	1	2	3	4	5
e.	Other people at our level	1	2	3	4	5
f.	Our superior(s)	1	2	3	4	5
g.	Internal financial reports (from accounting and finance)	1	2	3	4	5
h.	Opinions based on our own experiences and training	1	2	3	4	5
i.	Beliefs which are widely accepted in my country about what is right	1	2	3	4	5
j.	Religious beliefs	1	2	3	4	5
k.	Our family lives and members	1	2	3	4	5
l.	Our customers	1	2	3	4	5
m.	Norms/knowledge specific to our professional field	1	2	3	4	5
n.	Our suppliers	1	2	3	4	5

1. **How often have you faced a situation of this type over the past few months?**

   1- Very often 2-Often 3-Sometimes 4-Rarely 5-Never

2. **How well has the introduction of new work procedures been handled in the short run?**

   1-Extremely well 2-Very well 3-OK 4-Moderately Poorly 5-Very poorly

3. **How well has the introduction of new work procedures been handled in the long run?**

   1-Extremely well 2-Very well 3-OK 4-Moderately Poorly 5-Very poorly

Situation 3 **When the time comes to EVALUATE THE SUCCESS of new work procedures, to what extent are the actions taken affected by each of the following?**

For each of the items from a to n, select one of the five possible responses.

		1 To a very large extent	2	3 to a moderate extent	4	5 To a very small extent
a.	Formal company rules and procedures.	1	2	3	4	5
b.	Unwritten rules about 'How we do things around here'	1	2	3	4	5
c.	Our subordinates	1	2	3	4	5
d.	Specialists outside this department	1	2	3	4	5
e.	Other people at our level	1	2	3	4	5
f.	Our superior(s)	1	2	3	4	5
g.	Internal financial reports (from accounting and finance)	1	2	3	4	5
h.	Opinions based on our own experiences and training	1	2	3	4	5
i.	Beliefs which are widely accepted in my country about what is right	1	2	3	4	5
j.	Religious beliefs	1	2	3	4	5
k.	Our family lives and members	1	2	3	4	5
l.	Our customers	1	2	3	4	5
m.	Norms/knowledge specific to our professional field	1	2	3	4	5
n.	Our suppliers	1	2	3	4	5

1. **How often have you faced a situation of this type over the past few months?**

   1- Very often 2-Often 3-Sometimes 4-Rarely 5-Never

2. **How well has evaluating the success of new work procedures been handled in the short run?**

   1-Extremely well 2-Very well 3-OK 4-Moderately Poorly 5-Very poorly

3. **How well has evaluating the success of new work procedures been handled in the long run?**

   1-Extremely well 2-Very well 3-OK 4-Moderately Poorly 5-Very poorly

We would like you to describe first your *company* and then your *work group* in terms of its marketing orientation and its general stance on changing operating procedures. To do this, the first section of items are targeted at your *company* in general, and the second section just concerns your *work-group or department*.

1 **Does your *company* focus on a narrow or a broad market for your products?**

1	2	3	4	5	6	7
very narrow						very broad

2 **Does your *company* have a broad product line?**

1	2	3	4	5	6	7
very narrow						very broad

3 **Does your *firm* usually try hard to preserve old ways of doing things (1) or is there a push for innovation and change (7)?**

1	2	3	4	5	6	7
preserve old						constant change

4 **To what extent is your firm continuously looking for new ways of doing old things?**

1	2	3	4	5	6	7
A small extent						A great extent

5 **In your firm, is there more of an emphasis on efficiency (1) or creativity (7) or something in the middle?**

1	2	3	4	5	6	7
Efficiency						Creativity

6 **To what extent is your firm searching for new, alternative markets for your firm's products?**

1	2	3	4	5	6	7
A small extent						A great extent

7 **Is your company looking for new knowledge about work processes, consumer markets or competitors, or do you pretty much have all the information you need already?**

1	2	3	4	5	6	7
Have what we need						Constantly in need of new knowledge

8 **While you have been in this *firm*, to what extent has this *firm* been consistent over a long period of time in the above mentioned areas?**

1	2	3	4	5	6	7
A small extent						A great extent

The following items are very similar to those above, but ask you about your own sub-group instead of the whole company. Try to think of other department/groups in the firm as potential customers and suppliers in relation to your group as work and materials get processed. Your sub-group may operate differently than the firm as a whole.

1 **Does your *group/department* focus on a narrow or a broad group of users for the products, services or other outputs of your group?**

1	2	3	4	5	6	7
very narrow						very broad

2 **Does your *group* produce a lot of different things?**

1	2	3	4	5	6	7
very few						very many

3 **Does your work group/department usually try hard to preserve old ways of doing things (1) or is there a push for innovation and change (7)?**

1	2	3	4	5	6	7
preserve old						constant change

4 **To what extent is your group/department continuously looking for new ways of doing old things?**

1	2	3	4	5	6	7
A small extent						A great extent

5 **In your group/department, is there more of an emphasis on efficiency (1) or creativity (7) or something in the middle?**

1	2	3	4	5	6	7
Efficiency						Creativity

6 **To what extent is your group/department looking for new, alternative users/customers for your group's work/products?**

1	2	3	4	5	6	7
A small extent						A great extent

7 **Is your department/group looking for new knowledge about work processes, consumer markets or competitors, or do you pretty much have all the information you need already?**

1	2	3	4	5	6	7
Have all that we need						Constantly in need of new knowledge

8 **While you have been in this group/department, to what extent has this group/department been consistent over a long period of time in the above mentioned areas?**

1	2	3	4	5	6	7
A small extent						A great extent

The following items assess how your group likes to learn. Think about times when your group gained some new knowledge that has been useful.

1. In our group we are good at:

1. Logically deducing a solution to a job related problem.
   Y! Y O N N!

2. Using trial and error to find a solution to a job related problem
   Y! Y O N N!

2. My group would successfully learn to integrate profits, losses and costs into our decisions best by:

1. Observing similar situations, cases or examples
   Y! Y O N N!

2. Learning business and accounting theory
   Y! Y O N N!

3. We do a good job of finding and gaining new knowledge by

1. Learning a new theory and figuring out how it might be used
   Y! Y O N N!

2. Observing similar situations and examples
   Y! Y O N N!

4. How does your group tend to realize that a new practice or technique will probably work well?

1. We try it out a bunch different ways and bunch of different of times (use induction)
   Y! Y O N N!

2. We figure out if it is logical (use deduction)
   Y! Y O N N!

5. In our group, we tend to learn or figure things out by

1	2	3	4	5
Using examples		Use Both Equally		Using Theory

6. To what extent does your group tend to acquire knowledge through practice versus through theory?

1	2	3	4	5
Mostly Through Practice		Use Both Equally		Mostly Through Theory

7. Does your group tend to work with trial and error or with abstract theory?

1	2	3	4	5
Trial and Error		Use Both Equally		Abstract Theory

Circle the choices that best describe yourself and your work group

What is your age group?

18-22	23-29	30-39	40-49
50-59	60-69	70-79	over 80

What is your gender?

Male Female

Is English your first language?

Yes No

What is your highest academic degree so far:

Grade School	High School	2yr College
4yr College	Grad School	Doctor

Your primary profession or area of expertise (if more than one, indicate your 1st, 2nd and 3rd level)

Physical Sciences, Engineering _____
Computer Programming, Software _____
Social Sciences, Humanities _____
Business: Finance, Accounting, Economics _____
Business: Marketing, Management, other _____
Info. Systems, Networks, Hardware _____
Creative Design, Art _____
Medical Professional _____
Legal Professional _____
Other area of specialization _____

To what extent do you consider your work "high tech?"

1 2 3 4 5
a small extent moderate a large extent

Is your job in computer programming or software development?

Yes No

At about what level in the firm's organizational chart would you describe your current position?

Executive Level
Upper Level
Middle Level
Lower Middle Level
Grass Roots, Individual Contributors

CHOOSE CHECK THE BOX BELOW next to the title that best describes the department with which you are associated. ***If you are an administrative assistant, check the box with which those you assist are associated.***

STAFF DEPARTMENTS

- ☐ Accounting/Auditing
- ☐ Finance
- ☐ Information Systems Support
- ☐ Office Management, Records Management
- ☐ Human Resources related
- ☐ Legal/Compliance
- ☐ Purchasing/Receiving, Inventory Management
- ☐ Bldg/Equipment Maintenance
- ☐ Other Support Department

LINE DEPARTMENTS

- ☐ Research and Development
- ☐ Building/manufacturing the Product or providing the Service
- ☐ Business Operations
- ☐ Marketing and Sales
- ☐ Delivery, Shipping, Logistics
- ☐ After Sales Support, Customer Service,
- ☐ General Management
- ☐ After Sales Technical Operations, Repairs, etc.

Your work may be done in a sub-group or project team within the department you selected above. For example, ***accounts payable*** **is a sub-group of Accounting, but so is** ***internal auditing*****; a software project group may be part of business operations or a part of Research and Development; training is part of Human Resources. WHAT IS THE NAME OF YOUR SUB-GROUP?**

Name: _____

In one sentence, describe the function of your workgroup:

Are you in charge of your group or department?

Yes No

Do you directly supervise other people at your job?

Yes No