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**DESIGNING ORGANIZATIONS
TO LEAD WITH KNOWLEDGE**

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SUSAN A. MOHRMAN

*Center for Effective Organizations
University of Southern California
Marshall School of Business*

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Susan A. Mohrman

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Organizational development practitioners in the knowledge economy must bring frameworks and development processes that help organizations build and sustain knowledge leadership. Today's sustainable competitive advantage is knowledge: creating it, importing it, and leveraging it to deliver higher value to the market place than one's competitors can provide. For example, financial services firms depend on broad and deep expertise in various kinds of financial instruments, models, and transactions, on growing that knowledge through data collection and analysis, keeping current the understanding of laws and regulations in many countries, and on combining this technical knowledge with deep knowledge of customers' needs to guide the development of products and services that yield high value. Product, process, and service innovation in all industries is based on technical, organizational, and customer knowledge. Knowledge defines and is embedded in the competencies of the corporation—yet sustaining knowledge leadership requires explicit focus and the intentional building of an organization's knowledge capabilities. Knowledge management—the building of a context that brings knowledge into the firm, utilizes it, grows and enhances it, and leverages it for competitive advantage—is a key strategic competence in today's organizations.

This chapter goes beyond the perspective that knowledge is a key resource and that the organization needs to take steps and develop programs to attain it and leverage it. It looks carefully at how knowledge translates into organizational value, builds on the perspective that knowledge is practice-based, and makes the case that the work structures and work processes of

the organization should be designed with knowledge management in mind. It is argued that all elements of an organization should be designed with an eye to how knowledge underpins the firm's capabilities and translates into organizational value.

Knowledge and Capabilities

Almost any product or process can be copied and/or improved by competitors. Strategic leadership requires ongoing innovation, creativity, learning and improvement that yield distinctive product, solution, and service offerings and effective and efficient technical and organizational processes that leave competitors behind. The corporate world has been full of companies that have struggled on this dimension, some of which no longer exist. Digital Equipment Corporation, for example failed to detect the full significance of the trend toward small computers. Despite its wealth of technical talent, it did not develop knowledge and capabilities to respond to that trend. Bell laboratories produced a great deal of ground-breaking scientific and engineering knowledge, but failed to utilize much of that knowledge to develop services and products to deliver value to customers. These two companies no longer exist. Eastman Kodak, despite being the early developer of digital photography, failed to build the capability to turn this into a viable business until much later--after competitors had staked out the market. Hewlett Packard, despite having impressive advanced research laboratories, has recently experienced problems with its innovation capabilities and its ability to deliver solutions that customers value. These examples illustrate the extreme consequences of not developing and leveraging knowledge effectively—of not building knowledge into new and enhanced organizational capabilities.

The knowledge-based theory of competitive advantage focuses on the ability of firms to obtain sustainable advantages through the creation of knowledge-based resources and routines. These may include search routines, decision routines, and operating routines that are argued to constitute organizational capability (Nelson and Winter, 1982). Knowledge based views of the firm also stress the importance of transforming old capabilities into new ones both by sharing and recombining existing knowledge (Kogut & Zander, 1992), and by absorbing knowledge from outside the organization (Cohen & Levinthal, 1990).

Rather than being single discrete skills, capabilities are composite bundles of competences, skills, and technologies, and are coherent when various organized activities combine to enable particular salient performances (Hamel, 1994; Tell, 2000). Recent research in the pharmaceutical industry, for example, finds that a firm's success in introducing new drugs to the market is dependent not only on advancing particular specialized technical skills and knowledge, but also on the firm's organizational facility at combining capabilities such as research, clinical testing, and marketing (Henderson, 1994; Liyange, Greenfield & Don, 1999; Pavitt, 2003). Organization designs and work processes that enable the organization to grow, share, and combine knowledge from many disciplines and functions underpin new drug discovery, development, and commercialization.

Despite considerable corporate and academic attention to the topic of knowledge management, continually grow knowledge, leveraging it, and embedding it in the performance capabilities of the firm remains a challenge. In part this is because the management of knowledge has been treated as separate from the management of the organization—indeed there are often special groups that are tasked with knowledge management. Much of the knowledge management literature has dealt with specific knowledge management programs and topics, such

as organizational memory (Cross & Baird, 2000), knowledge transfer (Dixon, 2000; Szulanski, 1996), the technology infrastructure for knowledge sharing (Davenport and Prusak, 1998); building the social networks that foster knowledge (Brown and Duguid, 1991; Wenger, 1998); developing the relational skills to collaborate effectively across boundaries (Liedtka, Haskins, Rosenblum & Weber, 1997), and developing a knowledge strategy (Zack, 1999). The success of these knowledge management approaches depends on a supportive organizational context (Davenport, DeLong & Beers, 1998). Such a context is often lacking because firms tend to be focused on current performance requirements and are designed to support current capabilities, at the expense of focusing on the growth and leverage of their underlying knowledge-creating capabilities as a core competence. Knowledge management programs are often seen as add-ons to the work processes that “get the work done.”

Because capabilities are tightly embedded in the routines and design features of the organization, the task of increasing the organization’s ability to compete on knowledge cannot be handled through add-on programs. One study of knowledge in new product development firms finds that the knowledge outcomes of the firm—innovative products and services and improved processes—are linked to four core knowledge processes that are tightly embedded in the way work is carried out in the firm (Mohrman, Finegold & Mohrman, 2003). These are: 1) focusing members’ attention on overall system performance; 2) dynamic embedding of knowledge in standard processes which then become the platform for improvement; 3) sharing and combining knowledge across the organization; and 4) experiential learning--trying out new approaches and learning from them (innovating). Core organizational and work design features, not special knowledge management programs, create the dynamics of knowledge sharing and knowledge

combination that underpin these four core processes and lead to innovation and process improvement.

Human and social capital are key elements of the effective knowledge firm. The leaders of today's knowledge firms face a basic tension. At the same time that they are dependent on their knowledge workers to create value by applying and growing knowledge, these workers are more mobile than ever before and they sense decreased loyalty from their firms. Unlike other corporate investments, such as in capital improvements, information technology, or brand identity, knowledge workers can literally walk out the door at any time, taking their knowledge and their social network connections with them. Nonetheless, if companies do not invest in the development of human and social capital for fear of losing the investment, they run the risk of falling behind in their knowledge-based capabilities. This dilemma exists because the scarce resource in the knowledge economy is talent. In today's economy, knowledge workers are keenly aware if their knowledge and skills have value in the labor market; and are focused on working in an environment where they can continue to develop marketable skills (Finegold, Mohrman & Spreitzer, 2002). They actively work to build their professional networks, which provide valuable linkages for knowledge access, but also for becoming aware of career opportunities and making job changes. At the same time that the firm is concerned with deploying and developing their competencies effectively to attain firm performance, the workers are striving to utilize their knowledge in a setting where they can best achieve their personal goals.

Given this tension, the effective organization and management of knowledge workers is central to the success of knowledge enterprises in general (Quinn, Anderson & Finkelstein, 1996), and of the knowledge creating capabilities of an organization in particular (Leonard-

Barton, 1995; Nonaka & Takeuchi, 1995; Dougherty, 2001). At any point in time a firm has access to a workforce with a particular array of knowledge, and a limited number of knowledge hours. The firm faces several business challenges with respect to its human capital: 1) to deploy knowledge workers and utilize their hours most effectively to accomplish the its mission; 2) to continue to build the human capital available to the firm by sourcing employees and/or partnering with other organizations that have new needed knowledge; 3) to continually grow its human capital by the development experiences and enhanced tools and work processes that are provided to knowledge workers; and 4) to retain the human capital it builds and needs by creating a “fit” between the personal goals of key knowledge talent and the needs of firm.

This depiction of the knowledge firm makes evident that organizational development professionals must go well beyond the general interpersonal, teaming, task integration, and change capabilities of the organization. They must understand the business in terms of the key expertises and knowledge processes that underlie organizational capabilities and their enhancement, and develop interventions that optimize the value the organization derives from knowledge. The rest of this chapter describes the organization and work design issues of competing on knowledge. It takes the position that the management of knowledge is integral to the functioning of the knowledge firm, and as such must be a major criterion in the design of all facets of the organization, not just of special programs. It first provides a perspective on knowledge and knowledge processes to frame the work and organizational design approaches that constitute the main contribution of the chapter.

Knowledge in Practice

We start with the perspective that knowledge is contextual and relational—people construct knowledge as they interact in a social context, such as a work setting, and this knowledge in turn influences their behaviors, perceptions, and cognitions (Berger and Luckmann, 1966).

Knowledge has been defined as “information combined with experience, context, interpretation, and reflection” (Davenport, DeLong & Beers, 1998). The knowledge that exists in a firm is rooted not only in the formal education and training of employees, but is grounded in and developed through practice and is influenced by the context in which work is carried out. Knowledge grows as employees individually and collectively interpret their experiences, and as they reflect on and derive meaning from those experiences. Sensemaking (Weick, 1995) is the process by which meaning is attached to a stream of experiences, data, information, insights, and ideas. Sensemaking underpins individual and collective learning and the creation of new knowledge.

Because of the active sense-making role of employees in the apprehension, utilization, and creation of knowledge, the knowledge management approaches of the firm cannot be separated from the organization’s business management and operational processes .

Comprehension of knowledge is both intellectual and practical. Although knowledge may be explicitly articulated in the form of methods, systematic processes, frameworks, and guidelines, in use the explicit always possesses an implicit, or tacit, dimension (Polanyi,1966). Acquiring formal knowledge does not necessarily lead to being able to use it (Dixon, 2000). We learn how through practice. Practice-based learning theorists describe learning as situated and claim that learning and doing cannot be separated (Duguid and Brown 2002; Schon, 1983; Polanyi, 1966). Information yields knowledge when it becomes “anchored in the beliefs and commitments of its holder” (Nonaka & Takeuchi, 1995, p.58) through active involvement in its creation, and/or

through collective sense-making and local learning as it is applied (Orlikowski and Robey, 1991).

Nonetheless, knowledge-based firms are particularly dependent on expert knowledge bases that come from formal education and training. For example, scientists, engineers, accountants, logistics and supply chain experts, physicians, and many others bring to their work formal and articulated discipline expertise: content and methods knowledge that has been socially constructed through time by a particular professional or academic community. This discipline-based knowledge frames what employees attend to when they approach a problem. But by making sense of particular problems and of the information they encounter in the particular context they are dealing with, and by taking action, seeing what is effective, and revising their interpretations and understandings, these knowledge workers develop tacit knowledge that greatly extends their formal discipline knowledge. This combination of discipline-based and experience- and firm-based knowledge underpins the capabilities of the firm, and constitutes the knowledge base of the firm.

Although most firms are characterized by a “work-breakdown” logic that aims to divide work processes into individual jobs and responsibilities, the effective knowledge-based organization is far more than a collection of knowledge workers with their individual stocks of knowledge, tools, and methods that they apply to individual tasks. The intersection of the knowledge of the individual practitioner and the knowledge of the firm through collective processes is paramount in deriving value from knowledge. Collaboration enables the sharing of the tacit and explicit aspects of knowledge, and the development of new routines that become part of an organization’s extended capability (Hamel, 1991; Ingram & Baum, 1995; Raff, 2003; Pavitt, 2003). By talking with other engineers, an individual may become aware of warning

patterns in test results that indicate a potential structural breakdown. An accountant well versed in the definitions and substance of fraud, may learn from a colleague to pay attention to certain subtle (perhaps tacit) indicators in financial records that such fraud may exist. The knowledge-creating firm has been characterized as having a cycle of activity through which an individual's often tacit knowledge becomes explicit and shared with others. Both the accrual of tacit knowledge and the process of sharing may occur as work is carried out. The individual's knowledge becomes organizational knowledge as it becomes accessible to the larger team or unit going about solving its problems, and is combined with the knowledge of others to yield new knowledge that can then be shared throughout the organization in the form of new methods and frameworks (Nonaka & Takeuchi, 1995; Liedtka et al, 1997).

In today's world, many of the most important problems and consequently much knowledge creation and innovation occurs at the intersection of multiple disciplines and functions, and of deep discipline knowledge bases with the world of applications (Iansiti, 1995; Brown & Duguid, 2001). As a consequence, practice entails work processes that cut across disciplines and functions. For example, using modeling and simulation capability to greatly increase the speed of such diverse advanced knowledge work as oil exploration or running a hedgefund requires deep substantive content knowledge about what is being modeled (e.g., about geology, petrochemistry, economics, and finance); mathematical knowledge to build algorithms to underpin models and analyses; and computer science knowledge to build software architectures that can take advantage of large-scale computing capabilities. These knowledge bases must be combined in practice to generate an effective modeling approach. Collaboration across boundaries in shared problem solving and knowledge creation is core to creating value from knowledge (Boland & Tenkasi, 1995; Brown, 1991; Kanter, 1988; Leonard-Barton, 1995).

The importance of collaboration has grown as customers demand more integrated solutions—for example devices that can not only measure health indicators but can simultaneously input to an electronic medical record and into a population level data base. Integrated solutions increase the interdependencies in the knowledge system. Joint sense-making and knowledge combination occurs through sharing of knowledge within and across teams, and through the “creative abrasion” (Leonard-Barton, 1995) and “mutual perspective taking” (Boland and Tenkasi, 1995) that occurs when individuals with different knowledge successfully join forces to solve a problem or create an innovative approach. In today’s world, where no one organization is likely to have cutting edge knowledge in all required fields, practice oriented communities and working relationships that extend across organizational boundaries also create a vital link between the organization and changes emerging outside the organization (Constant, 1987).

Organizations are complex systems that have been hierarchically broken into sub-systems, implying multiple traditions of practice, multiple forms of problem-solving behavior, and multiple communities of practice (Constant, 1987; Dougherty, 2001; Dosi, G., Hobday, M. & Mengo, L. 2003). The division of labor required to effectively create a complex technological system or deliver a complex service creates a system of interdependent communities (Constant, 1987). For example, Dougherty has described the new product development firm as an overall “practice” (2001; p. 624) in which practitioners with a variety of knowledge bases apply their knowledge to the solution of customer/market problems. She identifies four interrelated sub-practices, which are defined by the set of problems they have to solve: 1) the strategic practice that defines the overall value creation proposition of the firm and converts it into strategies, standards, and investment decisions to ensure long-term viability; 2) the product and service development practice, which concerns itself with the matching of technology and customer

requirements in the creation and delivery of products and services; 3) the business management practice, which worries about deploying resources, investing in projects, and creating a product portfolio to address market and competitive needs while making a profit; and 4) the competency management practice, which ensures that the firm has the expertise and organizational competencies required to carry out the strategy. The work of these four “practices” are highly related. They set the context for one another, interact in practice with one another, and a shared understanding and overlapping knowledge must be developed across them if the firm is to carry out its intended strategy and grow its intended competencies.

Shared understandings in the form of codified standards and organization-wide frameworks such as strategies, goals, and processes are one way in which bridges are built between the different practices of the organization, attention is focused, and broader meaning is attached to the work that is done in each. These may be shared with employees through formal human resource processes such as training and development and formal management driven processes such as strategic planning and goal-setting. Yet work experiences and person-to-person collaboration continually enrich the knowledge of the participants and yield knowledge that can update and supplement the formal frameworks and shared understandings based on what is being learned through the organization. The knowledge organization must be designed to enable the generation and leveraging of knowledge from within the organization and from external connection—knowledge that becomes embodied in the shared frameworks and routines that guide collective action. Thus, it is not enough for knowledge workers are simply to apply their formal knowledge and firm-specific processes. The organization is dependent on the collective and individual learning of its employees to generate knowledge to continually enrich and update

its formal processes with new knowledge. Organizations must be developed to enable and accelerate this relentless cycle of advancement of organizational knowledge.

Designing for Knowledge Leadership

Given the centrality of knowledge in today's economy-- its relationship to the capabilities and performance of the organization, and the fact that it is developed in practice through social processes--clearly the capacity to advance knowledge should be a major criterion for both organization and work designs. Embodying knowledge-enhancing approaches in organizational effectiveness interventions should be core to the practice of organizational development.

Organizing to compete on knowledge does not yield new forms of organization—rather, it means examining the organization through a knowledge lens and fine-tuning the organization's design so that each feature supports the functioning of the organization as a knowledge creating and knowledge leveraging system.

Perhaps the largest change of mindset for designers and managers is to think of work not only as the application of knowledge to carry out particular tasks efficiently and effectively, but perhaps more importantly as the venue in which knowledge is created and leveraged.

Knowledge outcomes such as innovations and improved processes are closely related to firm performance, and are attained by building knowledge processes into the fabric of the organization (Mohrman, Finegold, & Mohrman, 2003). The four knowledge processes mentioned earlier are particularly critical to performance, and can be used as design criteria for the organization (see criteria 1-4 on Table 1). Criteria 5 and 6 on Table 1 address the human and social capital imperatives that underpin and result from effective knowledge processes. They address the need for the organization to be designed in a way to attain, grow, develop, and retain

needed human capital, to keep knowledge workers up-to-date in their professions, and to promote the building of social capital by enabling the internal and external networks that foster accelerated access to needed knowledge and collaborators. Design features can be assessed as to whether they foster these criteria.

Table 1
Design Criteria Relating to the Knowledge Capabilities of the Firm:

Does the design foster the following knowledge processes?

1. Attending to overall system performance so that each individual and unit is carrying out its tasks with an eye to how they fit into the overall organizational strategy and mission.
2. Continually embedding new knowledge into updated processes and shared frameworks—turning individual knowledge into organizational knowledge.
3. Sharing and combining knowledge with co-workers both within and across boundaries;
4. Experiential learning--trying out and learning from new approaches (innovating).

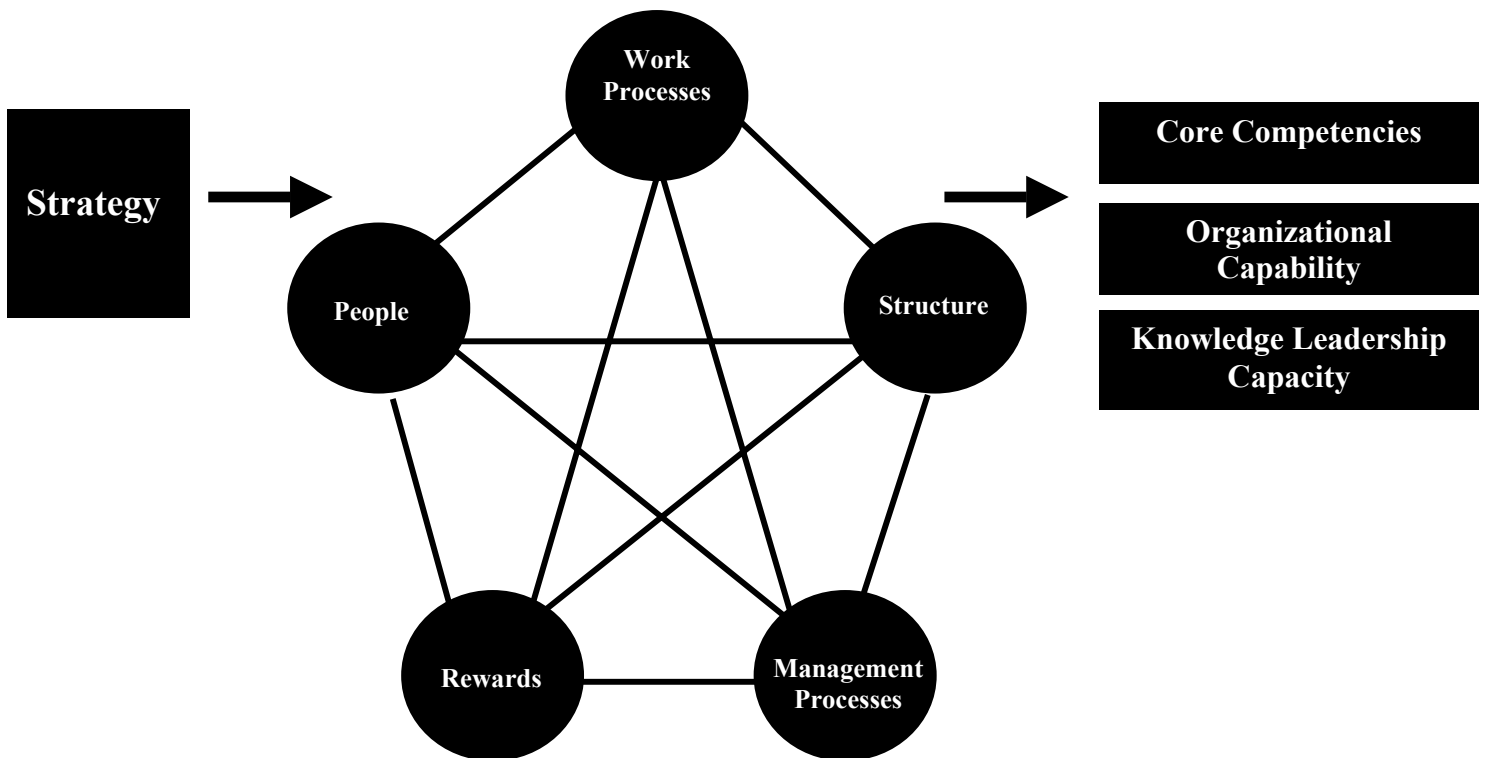
Does the design foster the stocks and flows of knowledge required for competitive leadership in its chosen domain(s), by:

5. Building human capital?
6. Building social capital?

Figure 1 presents an adaptation of the classic “star model” of organization design developed by Jay Galbraith (1994b). The major premises of this design framework are that the organization is a complex system, and that its design determines its capabilities to achieve desired outcomes. Organizational strategy is the major input to design decisions around the star,

as strategy determines what competencies and capabilities are required, how quickly they must be grown and evolved for market success, and thus how the organization is best configured for effective performance. In this figure, knowledge capacity is identified explicitly as an outcome of the design, consistent with the argument that the knowledge capacity of the firm is a critical competitive variable in today's economy. The design of each of the elements depicted on the star affects knowledge capacity in some manner. Design features may result in connecting or disconnecting knowledge, focusing employees on narrow aspects of the system or focusing them more broadly, building human and social capital or restricting them, and enabling knowledge processes and/or constraining them.

Figure 1
Strategy and Design



Adapted from Galbraith, 1994.

Each of the elements of the star will be discussed from the perspective of how the design of that element contributes to knowledge leadership capabilities.

STRATEGY: The organization's strategy is perhaps the most important of the frameworks that embody and create shared understandings in the organization. It focuses members' attention on what the organization is trying to accomplish in order to achieve competitive leadership, on the critical performances that are required, and on the problems that must be solved in order to carry out that strategy. Like the other core frameworks guiding behavior in the organization, the strategy must continually be infused with new knowledge. It must also identify new capabilities that are needed. It does not stop with the identification of the markets in which the company will compete, the kinds of new valued offerings that will be developed to surpass competitors' offerings and address customer needs, and the kinds of financial and market share targets that will be obtained. The strategy should identify strategically important knowledge including in the areas where the firm needs to build and sustain industry-leading capability, and should serve as the basis for knowledge objectives in areas in which the organization intends to achieve knowledge leadership (Zack, 1999). For example, a hospital system may have a strategy of maintaining global leadership in three developing therapies through knowledge generation and innovation, and of staying state-of-the-art in all related therapies by rapidly importing knowledge and building unparalleled experience-based expertise so that for the treatment of certain disease states the hospital system is second-to-none. Its strategy may also include maintaining sound, contemporary professional treatment competencies in other areas, although not investing to attain a leadership role in knowledge creation in these areas.

Knowledge strategies provide umbrella frameworks for decisions in each of the other star design features. The organization must facilitate the building of knowledge underpinning the

ongoing development and delivery of valued products and services by enhancing and connecting the required knowledge bases in the context of the market problem. The next two elements of the star are particularly important in this regard:

WORK PROCESSES: The strategy of the organization determines which work processes are particularly important to the firm, and what standards of performance are important for these processes. For example, a strategy that segments a financial services market into basic transactional consumers and larger institutional and/or high-wealth customers requires at least two different kinds of service delivery processes. One emphasizes low cost, efficient self-service, and providing clear information that enables customers to choose among standard products. The other emphasizes the provision of integrated “systems” of products and services that meet multiple and total portfolio needs of large customers and emphasizes customer relationship and understanding. The work processes to provide service to these two segments will be quite different from one another. As an organization moves from a strategy that emphasizes products and/or services to one that emphasizes solutions, integration processes become increasingly important.

Much organizational knowledge is embedded in the work processes (Leonard-Barton, 1995) and one of the important design elements to support a knowledge strategy is the choice and use of systematic processes. These are the explicit and orderly approaches, often facilitated by information technology, for carrying out operational processes, conducting projects, solving problems, making decisions and trade-offs, and learning through practice. They are among the core frameworks of the organization that lead to shared understanding and guide integrated performance and shared sensemaking. Work processes should explicitly be designed to include the sharing of knowledge that is generated as work is done and as problems are encountered and

solved, including documentation of anomalies, periodic work-group exchanges, and sharing of lessons learned--so that existing knowledge can be leveraged and tacit knowledge can become explicit and become embedded in the shared knowledge of the system. These knowledge management approaches should be steps in the work processes rather than viewed as a separate set of activities—in essence meaning that the work processes are self-improving. Embedding knowledge in work processes and tools requires capturing learning from across the organization and creating and continually updating standard but appropriately flexible knowledge platforms to guide work. Flexibility in the processes stimulates the trying out of new approaches and the local adaptation and learning that is the source of new knowledge and of innovation. Systematic organizational processes are not only a way to leverage process knowledge and to create organizational memory, but they are also the foundation for process innovation. They create ease of communication and coordination within and across boundaries, access to knowledge, and improvement (Cross and Baird, 2000; Leonard-Barton, 1995).

Knowledge work processes are also closely related to the tools that knowledge workers use, especially to various kinds of information technology enablers. Knowledge is built into these tools, which are task enablers and knowledge worker productivity enhancers. The extent to which various kinds of work processes will be enabled by I.T. tools is a key aspect of the design of knowledge work processes. These tools play an important role in the knowledge system by facilitating the key knowledge processes and providing information and knowledge that influences how people do work and what they focus on (Mohrman, Finegold, & Mohrman, 2003). They are also important to the development and support of human capital, and so will be discussed further as part of the people star design point.

STRUCTURE. The structural challenge is that knowledge transfers more easily and work processes are more easily coordinated within boundaries than across boundaries. The most fundamental structural decision for an organization is: what should the core units of the organization be in order to foster ease of performance of the most strategically critical processes and growth of the most strategically and operationally critical knowledge and capabilities? Technical organizations that depend first on foremost on continually advancing the knowledge in technical disciplines may organize with technical disciplines as the core unit in order to facilitate ongoing advances of this critical knowledge, while secondarily focusing on the development of cross-discipline knowledge such as integration capabilities and/or innovation capabilities through the establishment of lateral linkages, networks, and teaming structures. Structuring to advance both kinds of knowledge, and to ensure collaborative cross-unit problem-solving requires that the organization structure simultaneously along multiple dimensions—discipline, customer, geography, product/service, and/or solutions (Galbraith,1994a). This requires sophistication in designing formal lateral structures and processes, and enabling informal ones to emerge.

Cross boundary work is particularly important in light of the breadth of knowledge and amount of technical integration required to solve many technical, market, and business problems in today's world (Iansiti, 1998). By implication many organizations have a critical need to grow complex, multi-disciplinary knowledge such as required to develop new drugs and to run manufacturing facilities for biotech drugs. Various kinds of teams should be designed that house members with the requisite knowledge to carry out these complex integrated processes and solve problems with cross-functional elements. For some organizations this cross-functional and cross-discipline knowledge is the key strategic differentiator, and cross-functional units such as customer- product- or solutions-focused units may be the core business units of the organization.

Alternatively, these cross-functional tasks may be carried out in lateral structures that “overlay” the core functional and discipline units and include members with different “home-bases” (Mohrman, Cohen & Mohrman, 1995). The new product development literature in particular has stressed the importance of integrating the organization by using a dynamic series of lateral structures that includes “heavy weight teams” (Clark and Fujimoto, 1991), “quasi-formal structures” (Jelinek and Schoonhoven, 1990), and “semi-structures” (Brown and Eisenhardt, 1997). Research in the pharmaceutical industry has stressed the need for rapid capability development through multiple within-company and cross-organizational networks (Powell, 1998), and for the ability to move information rapidly across the boundaries of the firm and across the boundaries of scientific disciplines and therapeutic areas within the firm (Henderson and Cockburn; 1994).

In the global economy, structures are likely to be geographically dispersed, and work is increasingly virtual, with key work processes flowing across locations. Underpinning the ability to structure dynamically along multiple dimensions is another “structural” element that is especially salient in such dispersed work systems—the architecture of the IT systems that support task performance, integration, management, and knowledge exchange. Indeed many knowledge management authors have stressed IT underpinnings and solutions to knowledge management challenges (e.g., Davenport, 1993; Davenport & Prusak, 1998)—and the simultaneous design of reengineered work processes and the supporting IT systems—in part to be able to take advantage of dispersed talent and capacity. Elements of the IT infrastructure—such as compatibility between sub-systems and geographies, how open or closed it is, how user-friendly the interface that permits access to various knowledge repositories, how easy it is to

update processes and knowledge, and how flexible and compatible the various modules are--will determine the extent to which it fosters or inhibits knowledge leverage and growth.

Lateral structure alone is insufficient to catalyze the knowledge system. Bringing people together in cross-boundary structures can only set the stage for knowledge-creating sensemaking by bringing together diverse experts to address common issues and solve common problems. In at least one study, participation in cross boundary structures has only weak direct relationship to knowledge processes and outcomes (Mohrman, Finegold & Mohrman, 2003). Without well-defined work processes and managerial processes, people will have trouble making sense of the importance of lateral work in the organization and operating effectively within lateral structures (Mohrman, Cohen & Mohrman, 1995). One can think of the structure as the “skeleton” of the organization that isn’t able to operate without the messages sent by and systemic integration enabled by the other messages that employees receive from the processes of the organization—which might be thought of as the “circulatory and neurological” systems. We have already described the important elements of work processes. The management processes are the next star design feature.

MANAGEMENT PROCESSES. On the “work processes” star point, we discussed one of the process elements of the organization—the processes by which the inputs of the organization are transformed into the products and services that are valued in the environment—the operational system of the organization. The management processes star point deals with the regulation, governance, and integration of the activities of the system as a whole. Again, a requirement to effectively compete on knowledge is to consider the management processes as regulating not only the operating characteristics of the system, but also its knowledge enhancing characteristics.

Direction-setting processes. The direction-setting processes of the organization (by which strategy is set and translated into goals and objectives, metrics and review processes) are the most critical determinants of where attention gets focused, and how information is interpreted. Because they provide standards of performance and define the problems that the organization must focus on, these direction-setting processes provide an important context for sense-making. Through the objective setting process a shared operating framework can be established that provides guidelines for the local interpretation and sensemaking that goes on as a natural part of doing work. Aligning objectives throughout the organization facilitates knowledge sharing and collective problem-solving, assuming that the objectives framework is openly shared, and that collective objectives guide collective work.

Iansiti (1998) and others have found that defining goals and problems broadly contributes to breadth of input and efficiency of integration in technical work, in part by fostering knowledge sharing and combination. The breadth of focus and of the embedded knowledge that systematically guides how problems are approached are prime movers leading both to absorptive capacity—the ability to absorb knowledge from other organizations and other organizational units (Cohen & Levinthal, 1990; Szulanski, 1996). These features enable the sharing and the absorbing of knowledge from elsewhere, and its application in new approaches. Sense is made of new knowledge in context of what is already known and in the process of systematically searching for new approaches that is driven by defining the problem in broad terms (Iansiti, 1998).

Communication. Communication is a key management process both for providing information that is needed for effective task performance and also for knowledge sharing and integration

purposes. There is a voluminous literature on communication processes, communication networks, and various modalities of communication. For our purposes the critical issue is broad and open communication that provides insight into the bigger picture within which tasks are being performed and knowledge is being utilized and leveraged. Communication paints the picture of the context in which knowledge workers are utilizing their skills and is a key focusing device—focusing not only the operational activities but also search and innovation processes.

Decision Making. The business decision making processes that determine how the organization will go about being profitable and sustainable constitute another key management process. This process includes how scarce resources will be distributed among the various parts of the organization, how the organization will position itself among the various possible environmental and market opportunities, and the organization's architecture, or design. These decisions create the context for the knowledge work that is carried out in the firm, and provide the resources for various organizational tasks, including setting the stage for the extent to which knowledge creation, leverage and leadership will be emphasized and supported. Investment decisions, for example, determine where there are “slack” (non-operationally constrained) funds and other resources available to build new capabilities.

The management processes in the knowledge firm reflect the complex and dynamic nature of the work and the changing environment in which the firm is competing. It has become impossible for the management of a firm to have access to all the knowledge required to successfully guide and glue together the activities of a complex firm. Individuals and teams are continually making sense of their situation, and determining a course of action, based on what they know of the context in which they are operating, and the strategic intent of the firm. Management processes must define the context clearly enough to allow such self-regulation, by

providing and encouraging the sharing of information, broad direction, and standards, and by providing the resources, competencies, and expectations to support and encourage ongoing local collective sense-making and knowledge creation. Motivational issues are closely related to self-regulation. Two additional design star features are particularly important in this respect: the rewards and human capital (people) practices of the firm. These are discussed next.

REWARDS. Much knowledge management literature mentions the need to align motivational practices, and rewards in particular, with the knowledge management goals of the organization (e.g., Davenport et al, 1998; Quinn et al, 1996). This is another area where there is a voluminous literature. Here only the reward issues pertaining to competing on knowledge will be discussed.

Because of knowledge worker mobility and the strategic value of knowledge to the firm, it is essential in the knowledge economy that the company's reward system accurately acknowledges the value of its human and social capital. Failure to do so runs the risk of losing key employees who may feel they are more highly valued in the labor market. They will take with them not only the professional and discipline competences they brought to the job but also the networks and experience- and firm-based skills they have developed (Finegold, Mohrman & Spreitzer, 2002). The amount of human capital represented by knowledge workers holding similar positions can vary dramatically based on their depth and breadth of professional training, the professional networks they have maintained that enable the importing and sharing of knowledge, and the tacit and explicit knowledge they have picked up through various experiences. Thus, the firm must have new ways to describe valued knowledge and skills that are independent of level, position, and even of educational attainment—through what the person knows and is able to do that has value for the firm.

An important aspect of rewarding knowledge workers is valuing the way in which they contribute to the knowledge capabilities of the organization. It is critical for knowledge workers to be rewarded for the knowledge they have, and for the generation of new knowledge, the effective application of knowledge to achieve objectives, and for sharing and leveraging knowledge. As was discussed earlier in the chapter, deriving value from knowledge involves collective behaviors. The individual must therefore be assessed in the context of technical or business problems being solved by the team, and the effectiveness of the product, service, or solution being produced—not simply for individual performance. Rewards for collective performance at the team, unit and/or organizational levels are important not only to recognize valued contribution, but also to focus individuals on the larger system, and open them up to the processes of collective interpretation and sense-making that are inherent in the generation, leverage and value derived from knowledge.

Rewarding performance is both a core business process and a critical human resource/people process. Our studies of knowledge workers and countless others have found that employee retention and commitment are affected by perceptions that one's individual and collective contributions are being justly rewarded. Pay for organizational performance is particularly linked to commitment, which may reflect a keen awareness of the dependence of the firm on the knowledge of its employees, and a sense that one should therefore share in the firm's success (Finegold, Mohrman & Spreitzer, 2002). Yet, despite this clear relationship of rewards to the retention and commitment of the firm's employees, there are other human resource factors that are equally important in the knowledge-based firm. These will be discussed next.

PEOPLE. The knowledge firm depends fundamentally on attracting, motivating, developing and retaining employees who possess the knowledge and skills it needs to carry out its strategies

and operate effectively as a knowledge system. One key people design element is the development approaches to ensure that the organizational employees are kept up to date with the codified discipline and cross-discipline knowledge and skills that underpin the organizational capabilities required to deliver on the company's value proposition. The development and updating of deep technical skills and of breadth skills that allow effective managerial, cross-discipline, and cross-functional problem-solving are both critical to the effective functioning of the knowledge firm (Iansiti, 1995). A development-rich environment promotes both employee retention and commitment (Finegold, Mohrman & Spreitzer, 2002; Mohrman, Boudreau, Levenson, & Benson, 2004), although both of these cited studies also found that knowledge workers believed that informal, on-the-job experiences provided more valuable development than formal training and development. This is evidence of the amount of knowledge acquisition that occurs through the experiences and related sensemaking involved in carrying out work. It also argues that designers should think more centrally of job experiences and job progressions as knowledge development tools, and be attuned to the different kinds of knowledge that are developed through different progressions.

Many knowledge workers are highly dependent on advanced analysis, modeling, and communication tools. Knowledge workers, tools, and tasks are linked together to deliver value (Argote & Ingram, 2000). Tools that embody knowledge have become extensions of the knowledge worker and the knowledge work team, and may be significant productivity enhancers. For example, powerful tools have been created for actuaries to model risk and determine net present value, embodying sophisticated mathematical and statistical algorithms. 3-D models and system simulation tools incorporate sophisticated engineering knowledge and serve as powerful productivity enhancers. Having the opportunity to master up-to-date tools is critical to the

professional identity and employability of knowledge workers. Just as important is the relationship of such tools to the collective knowledge capabilities of the firm. Knowledge workers depend on their tools to be able to tap into knowledge communities, work teams, and projects from remote locations and with a shifting group of co-workers. These professional tools, combined with sophisticated groupware capabilities, have also made it possible for knowledge workers to physically locate anywhere in the world and still work interdependently with teammates in other locations, to have access to dispersed knowledge, and to participate in dispersed knowledge generating interactions and experiences.

Career paths and career advancement opportunities are another key element of the human capital framework in the knowledge firm. Finding new ways to describe career advancement that acknowledge contribution to the knowledge system may be the most important human capital measure the firm can take. The opportunity for career advancement has been found to relate to retention and commitment for employees of all ages (Finegold, Mohrman, & Spreitzer, 2002). This poses tricky career pathing design challenges, however, since the employee's knowledge value and contribution can be unrelated to years of experience and/or hierarchical level in the firm, or to managerial versus non-managerial contribution. Some kinds of knowledge are not enhanced by progression through managerial levels, and managers at various levels may find the need to develop knowledge that naturally is created at lower levels in the firm. This is well illustrated in a research laboratory, where employees fresh from the university, with state-of-the-art knowledge and training, may bring new knowledge that, alone or combined with the existing expertise in the firm, is required for the breakthroughs the labs seeks (Mohrman, Galbraith, & Monge, 2004). Such employees are not senior nor managerial, and indeed may not have the necessary interpersonal or managerial skills for rapid advancement, but may have brought a

contribution to a team that moved the work of the project forward immensely, and may as a result have career expectations that cannot be met in a traditional hierarchical progression. Conversely, managers in the organization may need to develop an understanding and appreciation of the new approaches being brought by these younger knowledge workers, and may find themselves gradually becoming obsolete if they are constrained to an environment in which they focus exclusively on the use and development of managerial knowledge. Dual ladders for progression—technical and managerial—are one way to provide a more varied concept of career pathing and valuing of employees than is possible with a uniform managerial hierarchy, but even dual ladders may not be adequately flexible to address the human capital requirements necessitated by dynamic waves of strategically important knowledge-based capabilities.

The proper valuing of rotational sequences, retraining, and other kinds of lateral movement and broad exposure are critical aspects of the people systems of knowledge firms. Lateral moves may bring far more value to a knowledge firm than our traditional human resource systems acknowledge—and hierarchical level may be much less closely associated with value than is traditionally assumed. The networks and multiple knowledge bases that come from rotational experience may be as or more critical to the firm and its integration capabilities than managerial and leadership skills gained by hierarchical progression—in part because having broad knowledge and being able to draw on the knowledge of others in broad networks provides the knowledge foundation for self-regulation and for knowledge combination.

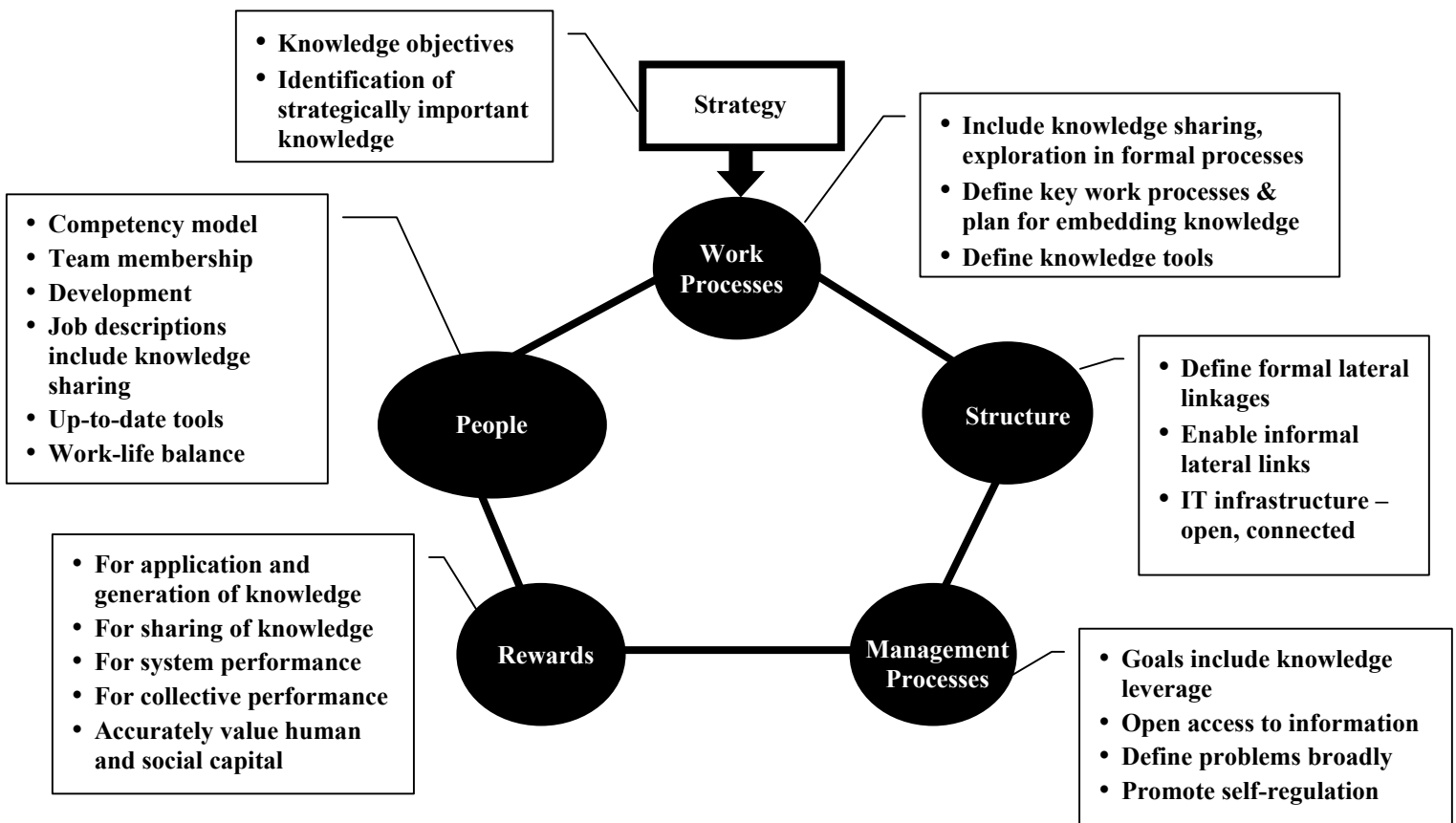
Recent studies also point out the importance of work-life balance, especially for employees in their early career stages (Finegold, Mohrman & Spreitzer, 2002; Mohrman, Boudreau, Levenson & Benson, 2004). This employee concern relates to the knowledge

capabilities of the firm, because it relates to the ways in which employees can and will contribute. Both in the U.S. and in Europe, there are social forces--such as dual career families and an affluence level and exposure to information that permits broader horizons and interests--that work against members of this generation of employees becoming the totally committed company person. Furthermore, knowledge workers are hooked into broad social and professional networks so they better understand the value of their knowledge hours, are aware of job alternatives, and see themselves as able to sell their skills in the labor market and perhaps to move into other kinds of job settings where they may be better able to achieve their career and personal interests. They may be decreasingly willing to stay with a job if it requires them to expand their time commitment to the organization at the expense of their other interests, or to sacrifice their career values.

One approach a firm might take to deal with this work-life issue is to adopt policies and programs that emphasize work-life balance, such as providing help to the employee in the form of child-care and other services that help achieve such balance, and providing guidelines so that managers are encouraged to respect employees' personal time. Another approach is to make better use of the scarce resource—the hours of the firm's knowledge workers. Using knowledge worker time more effectively through such means as improving work processes and tools, creating more effective shared understandings in the organization that enable efficient coordinated action and the generation of increased self-governing capability is another approach to addressing the desire of employees to balance their work and personal life. These measures seek to enable balance by increasing productivity and decreasing the waste of time that is inevitable if the system is not well integrated, and if accountabilities and responsibilities are not optimally designed to enable self-regulation. Thus, we go full circle to work process and then

around the points of the design star, to make sure the organization is designed to optimally use its human capital. This underscores the necessity of a well-designed organization and well-designed work if the firm is to benefit optimally from the human capital it has helped developed, engage employees maximally in the knowledge processes of the firm, provide a careful use of knowledge worker hours, and retain talent. Figure 2 summarizes the major knowledge-related aspects of each of the star points that have been discussed in this chapter.

Figure 2
Design for Knowledge Enterprise



Adapted from Galbraith, 1994.

Conclusion

This chapter has described the nature of the knowledge firm and of knowledge processes, and has provided a framework for understanding how the design of the organization impacts knowledge in practice. It has argued that competing on knowledge demands work processes and organization design that fit that strategy. Attracting and retaining critical talent is not sufficient, since organizations can be significantly unequal in their ability to effectively utilize and enhance the knowledge of their talented workforce. These capabilities depend on how the workforce is deployed, and whether the organization and the work are designed to effectively derive value from, share, and combine knowledge, and to motivate employees to participate effectively in the knowledge system. Special knowledge management programs that are not related to the work processes of the organization will have limited impact and limited longevity. The effectiveness of the knowledge system depends on the creation of an organizational context that fosters the importing of knowledge, the generation of new knowledge, and the application and leverage of knowledge to deliver value to the customers.

Organization development practitioners working with companies that compete based on knowledge leadership must be alert to opportunities to help design their work systems and the organization to foster knowledge processes and the ongoing engagement of their human capital. The commitment of employees as well as the performance of the knowledge-based organization are closely linked to the effectiveness of the knowledge system, including employees' collective involvement in the ongoing sensemaking processes that underlie the use and generation of knowledge. Through collaboration in the generation of knowledge, employees may create innovations that define the future of the organization. They are, in a sense, recreating or rejuvenating the organization, and in the process they are creating meaning. The knowledge that

is created becomes embedded in their beliefs and actions, internalized in the organizational processes and routines, and available as a platform for further knowledge generation.

The business organization may be seen as a community guided by the shared meaning that is collectively created by employees in the process of doing work. The glue that holds the diverse activities of a firm together is the company's intent, as manifested in its strategy (Nonaka & Takeuchi, 1995), which shapes the shared meaning that develops as people work together toward desired outcomes for customers and for each other (Liedtka et al, 1997). Thus, the collective activities of knowledge workers both derive meaning from the purpose of the firm, and create meaning. This underscores how important it is that knowledge management researchers and organization development practitioners focus on how work is defined and carried out in the context of the business system and less on special programs. The design of work and of the organization are critical to the effectiveness of the knowledge-based firm.

Knowledge processes (sharing of knowledge, systems perspectives, embedding knowledge in processes, and trying new approaches) are easy to describe and easy to discourage through the creation of work contexts that do not enable and encourage them. Fortunately, many of the design variables over which managers have the most direct control can have a large impact on the effectiveness of the knowledge system. For example, a clearly articulated strategy, well-designed work processes, providing clear direction and system performance information, and emphasizing employee and organization development have significant impacts on the effectiveness of the knowledge system (Mohrman, Finegold & Mohrman, 2003). This chapter has described the criteria for the design of the knowledge firms and relevant characteristics of various design features. In today's knowledge economy, it is imperative for organizational development practitioners to incorporate these in organizational diagnoses and interventions

aimed at increasing organizational effectiveness, and to support organizational transformations that require the development of new and enhanced knowledge-based capabilities.

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