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THE CHALLENGE OF DESIGNING
KNOWLEDGE WORK

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White Paper
The Challenge of Designing Knowledge Work

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This white paper describes the critical importance of work design in the knowledge economy. It illustrates the cost of poorly designed work systems, and suggest an updated paradigm for designing work that meets the needs of complex and dynamic knowledge work and of knowledge workers. The existing paradigm has been driven primarily by images of work breakdown, clarity of responsibility and accountability, and fit of the individual with the knowledge requirements of the job. Trying to achieve these specifications leads to poor utilization of knowledge workers and their time, and to turnover or lack of engagement. The new paradigm must address the realities of dynamic and complex work, and be built on a logic of integration and collective capability, with the capacity to continually grow the knowledge base of the firm and its employees.

In Today's Knowledge Economy is characterized by the unrelenting performance pressures of global competition. This poses a number of challenges for designing work:

- Many, if not most, organizations rely fundamentally on their ability to import, generate and grow, effectively utilize, and leverage knowledge—to support innovation, process and product improvement, and execution.
- Pressures for speed and quality, and the unrelenting pace of change demand:
 - integration and timely decision making across complex, often geographically dispersed, organizations,
 - the capability to rapidly integrate highly specialized and broad knowledge,
 - individuals and teams that can operate effectively with a great deal of self-management, and
 - individuals and teams that can effectively take on the challenge of ongoing learning required to be effective through time.
- Work increasingly takes the form of projects and initiatives rather than tasks that fall neatly within a well-defined job in a well defined department, and change implementation is an ongoing part of the work load.
- One individual cannot have all the knowledge required to be effective in complex tasks. Collaboration involving the exchange and combination of knowledge

across multiple specialties and between specialists and generalists is inherent in most knowledge work.

- New knowledge must be shared and must rapidly become embedded in work processes and tools—the organization can not afford to rely on trial and error, rediscovering the wheel, and sink or swim approaches to developing talent.
- The work of managers has changed fundamentally, away from reviewing and coordinating the work of others to building capabilities for performance and for addressing changing performance demands.
- Organizations having to do more with less in a much more demanding environment cannot afford work designs that rely on multiple levels of management approval and review. Knowledge and the ability to make decisions and operate effectively must be built into the operational levels of the organization.

Every one of these imperatives means that the work designs of the last half century no longer work optimally. Yet work design research has all but ceased, and corporate leaders and their HR partners continue to apply old principles and search for the control and predictability that was once easier to achieve. This despite the hefty costs in terms of company performance and employee fulfillment and engagement that stem from poorly designed work.

The Costly Symptoms of Poorly Designed Work:

- Employees work longer hours while often feeling that they're doing the "wrong work"—and that the company makes work harder than it needs to be.
- People don't feel that their skills and knowledge are being well utilized.
- Specialists and generalists alike say "it's not my job", or, "whose job is it?"
- The same problems are "solved" repeatedly—the wheel is rediscovered continually.
- "Working the matrix" and "dealing with bureaucracy" are commonly cited barriers to getting work done effectively.
- Motivation wanes and frustration builds.
- Turnover (or the desire to turn over) grows.
- Line employees are not trusted to carry out complex tasks and feel the need to get approvals and/or reviews of their work.

- Work gravitates upward.
- Managers become obstacles to timely performance—approvals, reviews, and decisions grind to a slow crawl because of complexity, overload, and “politics”.

Figure 1
The Consequences of Poor Work Design

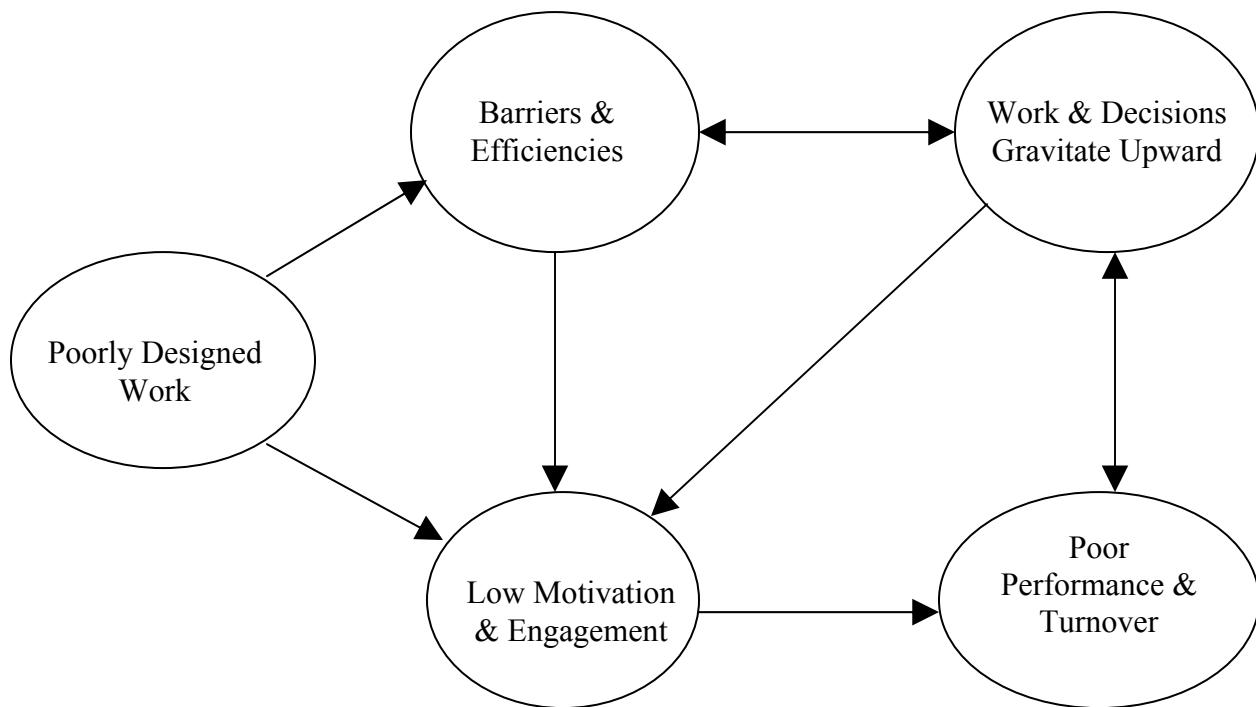


Figure 1 shows that poorly designed work sets up two mutually reinforcing paths that reduce the performance capabilities of the organization. One path is a direct impact on the motivation and engagement of employees and on their performance and retention. The second path reflects the negative impact of poorly designed work on work process effectiveness and efficiency, and on the ability of knowledge workers to carry out their tasks without ongoing management direction and intervention. The organization gets into a negative spiral that constrains the ability of the organization to effectively utilize and retain its talent.

In the knowledge economy, the Scarce Resource is Knowledge Hours--the number of knowledge worker hours available to the firm to carry out its mission. Yet we often fail to use these hours effectively:

The organization needs access to particular sets of knowledge in certain quantities. For example, it needs sufficient good project management skills to ensure that its major projects, programs, engagements, and initiatives are well managed. It needs a certain amount of knowledge of deep specialties and a certain amount of broad integrated knowledge. At a particular point in time, each individual has a certain set of knowledge and a finite number of hours to contribute. The work design challenge is to optimally employ those hours to accomplish the organization's strategy, to contribute to effective performance, and to foster the engagement of knowledge workers and the growth and development of their knowledge set and their capacity to contribute.

The firm's performance/productivity depends on organizing knowledge work to:

- 1) Deploy as large a percentage as possible of knowledge worker time to assignments and tasks that effectively apply the worker's knowledge to strategic and operational priorities;
- 2) Continually leverage knowledge so that the organization and its employees benefit from sharing and combining knowledge;
- 3) Embed knowledge in the organizational routines and tools so that individual knowledge becomes organizational knowledge—available to all;
- 4) Continually grow the knowledge of the firm; and
- 5) Retain, evolve, and enhance the knowledge of the firm's talent.

Work Design Principles of Yesterday are Not Sufficient in the Global Knowledge Economy:

The foundational work design research and literature was based largely on a motivational model developed by Richard Hackman, Edward Lawler, and Greg Oldham in the 1970's. Viewed through a lens of motivation, good work design contributed to motivation by creating jobs and team tasks that provide:

- Task identity -- responsibility for a “whole” task
- Variety – multiple horizontal and vertical tasks
- Feedback – from the work itself
- Significance – to customers and other stakeholders
- Autonomy -- responsibility and authority to carry out their work without close supervision

These principles remain vital. A motivating work design is associated with high effort, performance, and job satisfaction--it also contributes to retention of knowledge workers.

Yet, the models of the ‘70’s did not anticipate a world where: 1) co-workers and team-members change frequently; 2) many tasks are collectively performed and teams are temporary; 3) individuals and teams depend on knowledge from ongoing and often unanticipated interdependencies with others who are physically and organizationally distant; 4) responsibilities cannot be neatly defined by job descriptions with precise accountabilities; and 4) where they need to learn from and share knowledge with others both internal and external to their unit, their knowledge base, and indeed to the organization.

Our models of work design have not changed to address the changing nature of work. We still try to create individual jobs with clarity of task and authority, to break down work into self-contained units, to precisely measure and reward the performance of individuals, and to staff and define jobs as if the competencies are fixed. In the context of highly interdependent and dynamic knowledge work where ongoing learning is required, assignments and teams are temporary, and cross-boundary and cross knowledge-base activity is common, work designs that orient people to statically defined jobs or even to well defined, ongoing, work teams are no longer effective. We underestimate the amount of work content and knowledge hours that are spent trying to align and coordinate activities across the organization and beyond—the difficulty of “working the matrix”. We ignore or accept the amount of time wasted because of changing direction and information that arrives too late, too sparse, or not at all—about changes in requirements, priorities, and strategies, about what is being learned in other parts of the organization, and about related and interdependent tasks and activities, customer feedback, and market shifts.

Work must be designed to orient participants not only to the particular task they are performing, but also to the larger context and changing requirements and to others with whom they are interdependent. In the knowledge economy, motivating work characteristics have to be created in the context of the strategy, mission, and operating realities of the knowledge firm—the sales team in the field must be knowledgeable enough about strategy, priorities and resources to make commitments that the firm can uphold. The firm must attend to the core motivational principles of work even in work designs where assignments, co-workers, and team membership are dynamic, where people have multiple “bosses”, and where products and services change rapidly and some work becomes disposable. The new product development organization must be able to rapidly move talent to the projects that represent the critical technical and market trajectories, and to terminate those that are less promising—despite the fact that people identify with and derive meaning from their team and their project. Many “jobs” are no longer well defined tasks, accountabilities, and authority—they are a shifting bundle of assignments, tasks, interdependencies, and responsibilities that utilize and develop the knowledge of the employee. Even though many employees long for certainty and clarity, work design must be viewed as dynamic and reconfigurable—and driven by the demands of the task and by an understanding of its contribution to organizational success, not by formal and rigid definitions of jobs and highly specified deliverables, nor by hierarchical commands. The challenge for the organization is how to create compatibility that enables “plug and play” and results in reconfigurability that enables the dynamic mixing of talent

and opportunity, and to do this in a way that nevertheless creates meaning and motivation, rather than burnout and a sense of exploitation.

An expanded model of work design is required—one that addresses aspects of the design of work that contribute to the firm's effectiveness as a dynamic knowledge creating and processing entity, while at the same time motivating employees. It is no longer sufficient to attract and retain key talent and provide motivating jobs—not sufficient for the firm nor for its knowledge workers. New models of work design must acknowledge that the traditional motivating characteristics of work take new forms in the knowledge economy, ones that are not necessarily organized around jobs, and that new features are required.

Table 1 shows the key work design characteristics that are critical for knowledge workers and knowledge firms—and describes the form they must take in firms that compete based on knowledge.

Note that the characteristics as described in Table 1 are dynamic and systemic—they are described over time and in context, not statically nor based on work break-down. For example:

- Variety is achieved not necessarily by being personally responsible for multiple tasks at any point in time, but by moving through a sequence of tasks that may expose one to a variety of customers and customer problems, to a variety of industries, or to a variety of kinds of projects.
- The deep specialist may be doing deep specialist work in each—but may be growing through the exposure to a variety of contexts. The computer architect who is world class in developing architectures for customized systems may move to a role architecting off-the-shelf modules for broad application.
- The broad systems integrator may have developed this capability by rotating through a number of roles, and may now be playing an integrator role in a progression of assignments with different integration challenges.
- Knowledge workers may experience variety by moving from a deep specialty into another area, thus becoming broader and/or “reinventing oneself”—the physician in a pharmaceutical firm may move from a clinical role in drug development to a clinical marketing role in which new skills and frameworks must be learned in order to influence the adoption of new treatment modalities.

The work design challenge is to simultaneously value and utilize the knowledge worker's knowledge and allow for its growth through time—in the process providing variety that underpins the growth of the knowledge pool of the firm and the engagement of the knowledge worker.

Table 1

Motivating Work Design Characteristics	Knowledge Work Forms
Task Identity	Sequence of assignments to well-defined tasks and projects—clear sense of contribution to project, team, and organizational success. Team designs that enable ready combining of knowledge to do “whole task or project”.
Variety	Application and development of deep skills in multiple contexts over time; and/or of broad skills through diverse assignments, and by performing more aspects of the process and/or systems integrating tasks.
Significance	Understanding the contribution to the business, to external customers, and/or to the larger knowledge community.
Feedback	Knowledge of performance of team, project and larger performing units; Individual feedback from job and from multiple co-workers, customers, and other stakeholders.
Self-Regulation (originally “Autonomy”)	Collective and/or individual self-regulation – heedful of and responsive to the needs of the larger context—to co-workers, customers, and to business success.
Growth and Development*	Enhancing personal competency and contribution potential through a sequence of work assignments, coaching, and development opportunities.
Access to state-of-the-art tools and communication infrastructure*	Mastery of state-of-the-art tools, enabling more efficient use of knowledge hours, easier coordination, and connection to the codified knowledge of the firm.
Network Building*	Building connections to broader knowledge community and communities of practice. Task connections—exposure through customer, product, and task teams, collaborations. Customer connections.

*Not included in original Hackman and Oldham (1977) work attributes framework

The systemic aspect of knowledge work design can be illustrated by examining some examples of how significance is achieved:

- Nurses once gained a sense of significance from attending to the needs of and developing a supportive relationship with particular patients—transactional significance that came from making a difference in one patient’s life. In the evolving world of health care, significance will come from playing a role that is more highly leveraged across many patients, and that results in the ability to experience good outcomes for a population of patients over time. This requires visibility to and organizational focus on patterns of treatment and patterns of outcome rather than transactional focus.
- The engineer in a fast growing field who works on a project that is terminated because of a market shift cannot experience significance from the success and impact of the product on users—rather, significance comes from participation in a simultaneous set of activities that constitutes the firm’s strategy for leading in the market place—and from an understanding of the role that that project played, for example, as a “hedge” in an uncertain market and/or as learning through experimentation.

Experiencing this significance requires visibility to strategy, and an organization that makes very transparent the value of the different elements of its portfolio of activities.

Similarly, all of the original characteristics of the Hackman, Oldham, and Lawler framework must be reinterpreted in today’s knowledge firm and these design features have to assume new forms.

The original work design characteristics dealt with how work is designed so that an employee can optimally apply his or her knowledge and skills. Three new characteristics are important because of the rapid growth in knowledge and the need for firms and individuals to stay current and continually learn:

1) Growth and Development: Continual enhancement of the knowledge and capabilities of knowledge workers—through formal development, and planned and unplanned experiences—and through organizational routines for sharing and combining knowledge within and across boundaries. Knowledge firms rely on the continual self-development of employees to handle new and uncertain work challenges, and to maintain currency. Knowledge workers increasingly think of themselves as having a portfolio of experience and competencies and understand that their value and marketability in the knowledge economy depend on the scope and quality of this portfolio. Professional services employees, for example, want to apply their skills in interesting contexts, but also want to make sure they are being challenged and growing the competencies that will ensure their ability to advance in their career and participate in their profession through

time. They are motivated by the opportunity to build their knowledge portfolio—and assure their marketability.

The knowledge firm can no longer afford to see growth and development as separate and distinct from the work itself—and knowledge workers will no longer tolerate such a segmentation.

2) Access to State-of-the-Art Tools and Communication Infrastructures:
Knowledge work and its associated tools and processes cannot be separated.

Professional/technical tools and the more general communication infrastructure provide common pathways along which knowledge and information can flow and provide access to the evolving knowledge and methodologies of the firm and the profession. Mastery of state-of-the-art tools is part of the knowledge worker's portfolio, and is critical to effective utilization of knowledge hours. For example, the medical profession is currently going through a transition to electronic medical records that will require medical providers to more fully be aware of and take into account the patient's medical history, and at the same time is projected to save many professional hours in the form of reduction of redundant tests, more targeted diagnostic procedures, and better coordination between primary and specialty care. Issues of quality, protocols for integration, ease of use, compatibility, and reliability of tools and the IT infrastructure are critical to the effective use of knowledge worker time, both individually and collectively, and to the effective development of knowledge worker capabilities.

The development and evolution of the information technology and tools infrastructure, and the updating of methodologies must be viewed as part of the work, and must be integrated with the dynamic activities of the firm. This infrastructure cannot be viewed primarily as a way to control knowledge work—but rather as enabling knowledge workers to handle the variety, complexity, and the dynamic nature of the work.

3) Network building--easy connection with others within and outside the firm who can serve as sources of knowledge facilitates the combination and leverage of knowledge. In today's society knowledge workers are increasingly networked both internally and externally—and they find the knowledge they need and the opportunities they want through their network links. The organization needs to ensure that employees build rich internal networks to ease connecting to required knowledge, to be able to work effectively laterally in the organization, and so that they can continually grow and find opportunities internally.

Work must be designed to expand networks and ease connections. Work responsibilities must include responsiveness to and coordination with others in the network who can be providers of or consumers of mutually relevant knowledge and/or who carry out interdependent tasks.

Contextual Support: The Critical Importance of Speed

Virtual work and relentless market and customer pressures for speed call for work designs that:

- Build in predictability and repeatability *and*
- Enable quick problem detection and resolution and local response in uncertain conditions.

Several contextual aspects of the work system are particularly critical:

Work Processes: *The routines of the organization provide predictability and are the platform for effective work processes.* The application and ongoing improvement of repeatable work and coordination processes and of common tools underpin rapid knowledge dissemination and operational integration across the organization. As described above, work design is integrally related to processes and tools. Knowledge embedded in routines and tools is synergistic with and enables leverage of the tacit experience based knowledge and professional/discipline knowledge that resides in employees' heads. The routines and tools provide a basis for efficient work and coordination, and a springboard for the contribution of the knowledge worker. Therein lies an ongoing tension of knowledge work design—the need for repeatability and compatibility simultaneously with the need for knowledge workers to be proactive and to take initiative to address the demands of the situation at hand.

Capacity for Self-Regulation: *Self-management and self-design by teams and units at all levels allow the ongoing alignment of local activities with the strategic and operational objectives of the business.* The organization changes too quickly to be hierarchically controlled from the top or by rigid processes. It relies on continual local adjustment and learning in response to system-wide direction and to a myriad of unpredictable local events.

The capacity for self-regulation is not the same as autonomy. Self-regulation requires participants at all levels who are knowledgeable about the strategy and priorities, oriented toward meeting customer requirements, and have a network of connections and awareness of interdependencies with other parts of the organization. Knowledge workers need to think of themselves as responsible to all these demands—not simply to the technical requirements of a narrow task. For this to happen, the organization must provide visibility to the big picture and the whole system—and performance management systems must emphasize this ongoing self-adjustment.

Ease of Working Across Interfaces: *Rapid problem detection and resolution requires designing work for easy interfaces between levels and units, with clear priority placed on responsiveness to strategic priorities.* Management processes that are the contextual enablers of such responsiveness include:

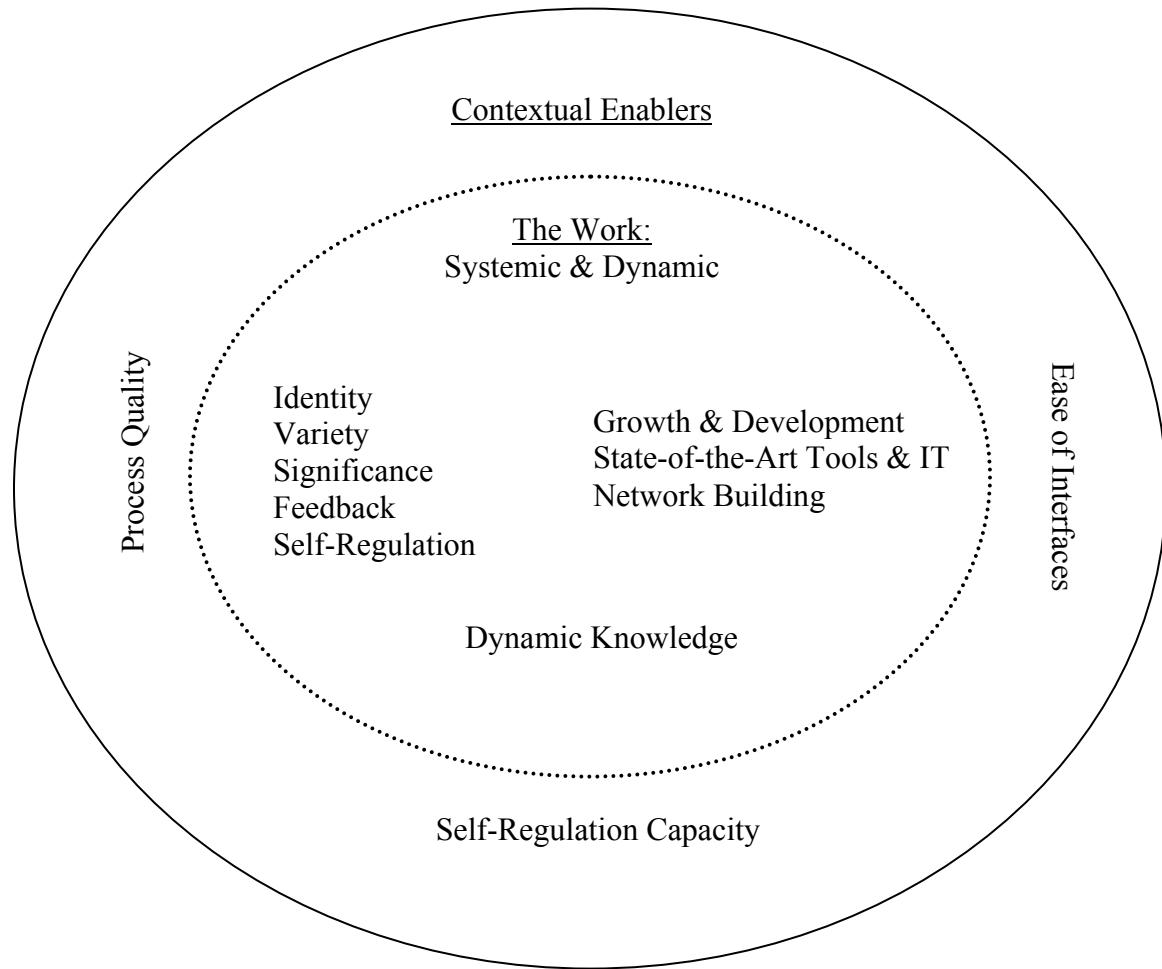
- Shared goals and priorities aligned with business strategy—knowing how one’s projects and tasks and their goals fit with and support the overarching goals of the business.
- Lateral integrating mechanisms such as integrator and link-pin roles, cross-functional teams, and communication and decision-making protocols.
- Boundary objects—common language, frameworks, and shared work objects such as prototypes and models that constitute the currency of exchange and transaction across boundaries-- common meaning and systemic focus.
- Responsiveness routines—organizational-wide routines for responding to unexpected issues and opportunities. Examples include the automatic convening of a quick response team when a serious customer problem develops, or of an “opportunity assessment team” with clear processes and criteria for rapid assessment of an opportunity and decisions about whether to redirect resources to it. Given the fast pace and complexity, “escalation paths” need to be defined—paths for quick, multi-functional resolution of issues that are holding up the work of teams and individual knowledge workers.

Table Two

Supporting Contextual Features	Knowledge Work Forms
Well Designed Work Processes	Common Processes and Tools and Compatible IT Knowledge Rapidly Embedded in Processes Flexibility to Learn and Address Novel Situations
Capacity for Self-Regulation	Shared understanding of strategy and priorities Focus on the customer Network of resources Awareness of interdependencies with other parts of the organization.
Ease of Working Across Interfaces	Shared goals and priorities Interface Linkages and Boundary Mechanisms Responsiveness “routines”

Figure 2 shows the work system at two levels—the design of work and the contextual enablers of work. The dotted line between the work design and the contextual enablers, reflects the point that knowledge work has to be conducted with an eye to the context—and with an orientation to the larger system through time.

Figure 2
Knowledge Work Design in Context



Much is at stake. If the major resource in short supply is human capital—as measured by the knowledge of employees and the number of hours of their time that the organization can utilize, how work is designed and enabled is certainly a critical focus for and competitive differentiator of the knowledge firm. And, we argue next, it is a critical focus for the human function if it is to fulfill its strategic potential.

Implication for Management—the Integral Role of Human Resources

The line between human capital systems, work design, and organization design has become blurred.

We have argued that in the knowledge economy: 1) the development of increased capability is inherent in the work; 2) work must be designed to enable both performance and development; and 3) the context of the knowledge system must enable effective work design. The competencies to operate effectively in today's knowledge firm require the continual building of experience-based knowledge—knowledge that grows with the advancement of disciplines and that grows deeper and/or broader with exposure to a variety of assignments and active membership in knowledge networks.

The organization and the HR function cannot simply define jobs and hire and promote people into them. They cannot afford to create work systems that do not engage today's knowledge workers through time, or worse, that alienate them by making work far more difficult than is necessary and far less engaging than is possible. Given the deep embeddedness of knowledge and knowledge-creating capabilities in the way the organization functions and the criticality of experience based-learning to the contribution capacity of knowledge workers, it is not sufficient to attract, retain, and deploy the best talent. Knowledge workers can walk out the door and/or settle into a low level of performance if they continually experience barriers to high performance. Organizations find themselves competing for the same individuals—those who are good integrators, who have coveted deep knowledge, who take a systems perspective, and who are able to effectively self-regulate. Organizations must become better at growing these people, not simply compete for them. They are created through the way work is designed.

Organizations cannot manage themselves out of this problem—decisions cannot continually move up without undermining the motivational and performance requirements of work design, and slowing down the system considerably. Organizations must focus on the work system as a whole—and particularly on the capabilities of the core knowledge workforce.

The design of work in the knowledge economy simultaneously considers multiple levels of the system—the design of particular local work processes and activities, the design for coordination and reconfiguration that transcends this local level, and the design of the human resources systems that assures development of the human capital required to operate effectively in these systems. Knowledge work doesn't come in packets called jobs and work groups. Knowledge work design must incorporate a broad variety of lateral linkages and structure. Thus, work design and organizational design fuse.

Elegant designs will fail miserably if people can't or won't make them work effectively. In today's world, work designs must enable the dynamic utilization and integration of individuals with varying sets of knowledge in dynamic structures that reflect the

flexibility required in a complex global economy. They must also provide the pathways and opportunities for the workforce to develop the capability to operate effectively in the face of complexity. The most conceptually elegant organization and work designs still rely on the behavior of people—people who have finite knowledge and time.

Figure 3
The Alignment Challenge

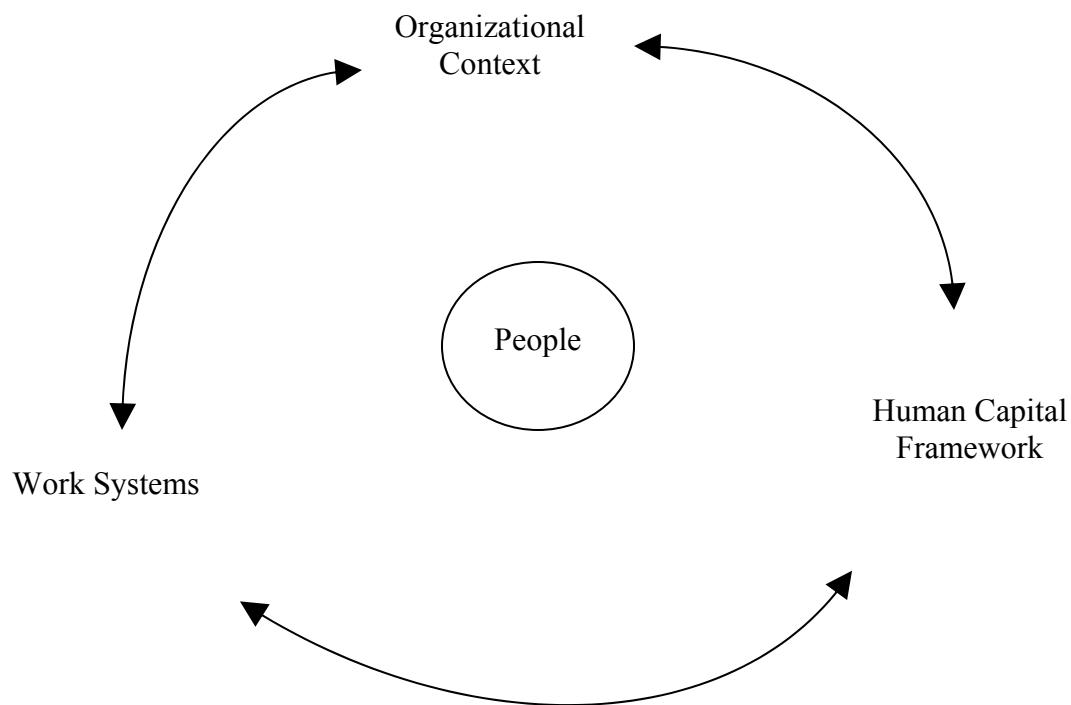


Figure 3 shows the reciprocal interdependence of these three elements of a complex organization—the design of work, the design of the organizational context, and the human capital framework of the organization. In the middle are the very people upon whom the firm relies. They may be engaged in highly motivating work and feeling that they are utilizing and developing their competencies, or alternatively, they may feel caught in a web of a poorly designed, inefficient work system that fails to use or develop their talents.

Knowledge workers have a second “world”—a world in which they are making ongoing sense of themselves as knowledge workers with career and personal aspirations and with a desire to apply and grow their competencies accordingly. Just as the big picture of the

organization and its work system must be clear to them, so must the human capital framework—what competencies will be valued and how, what work performances will result in a sense of accomplishment and appreciation, what opportunities lie ahead and what knowledge and competencies will be developed by sticking with this organization versus moving somewhere else?

Thus, the “strategic” human resources function must be in a new line of work—working with line management to design and align these three sub-systems, and making all three transparent to the knowledge worker. Rather than a static, two dimensional organization chart with jobs that have to be filled and through which a knowledge worker might progress, the human resource function must envision a living, breathing, dynamic organization—one governed more by complexity and change than by order and clarity. The human resource practices that are effective in this environment, like the work design and the design of the organizational context, must fit this new reality.