Work Design Theory: A Review and Critique with Implications for Human Resource Development

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Six theoretical perspectives on work design are examined for their contributions to our understanding of how work is organized and designed in organizations: sociotechnical systems theory, process improvement, adaptive structuration theory, the job characteristics model, technostructural change models, and activity theory. A critique of these theories raises concerns about their ability to explain the design of work in new work environments. The critique highlights the need to eliminate the discontinuity in how theory explains the structure and articulation of work among system levels. The implications of this study for further research on work design theory and for human resource development practice are discussed.

Work design is tightly woven into the structure and function of organizations. The nature of work and how it is structured and related to human activity affects every aspect of the organization. Work design is the basis for how work is conceived in broad terms, translated across organizational levels, and structured for the units and the individuals who perform the work. The structure, technology, and resources available in one's work environment are fundamental to the meaning and value one places in work. As such, the organization and design of one's work environment significantly shape the contribution one makes to the organization.

The nature of work continues to change (Howard, 1995; Cappelli, Bassi, Katz, Knoke, Osterman, & Useem, 1997), and the rate of change in work design and technology continues to accelerate (Adler, 1992; Tenner, 1996). With the instant availability of information and reduced geographical distances (Schick, Gordon, & Haka, 1990), today's work processes are fundamentally different from those routinely used just a decade ago (Barley & Orr, 1997; Luff, Hindmarsh, & Heath, 2000; Norman, 1998). New work requirements have

brought about major changes in how work is designed (Parker & Wall, 1998) and accomplished (Osterman, 1994). This raises important questions about the adequacy of our understanding of work and work design. Has work design theory kept up with the reality of practice? Do the theories we rely on to explain how work is organized accurately reflect today's fluid work environments? An important development in work design is the increasing opportunity for virtual work and the emergence of alternative locations for work (Apgar, 1998). How well do existing theories explain work design in virtual and other nontraditional work environments? Have the realities of practice outstripped the capacity of theory to provide an adequate understanding of these issues? The problem addressed by this article is that many features of emerging work designs are not adequately explained by existing work design theories, which means that managers, human resource development (HRD) professionals, and others may be relying on outdated models for making decisions about work design, job requirements, and the employee skills needed to meet these requirements.

This article paper reviews and critiques existing work design theories and then uses this critique, to stimulate new ways of thinking about work design that explain more effectively the challenges and opportunities for employees in today's workplace. HRD professionals are concerned about work design because those who are responsible for employee development cannot afford to lose sight of these recent developments in work design since many new skills in need of development emerge from changes in work requirements and work design. John P. Campbell and colleagues reminded us of the importance of linking training design with work design: "Training contents do not just fall out of some big training bin in the sky" (Campbell, McCloy, Oppler, & Sager, 1993, p. 38). The nature and design of the work itself will always be an important determinant of the composition of employee skills needed to perform the work.

As the basis for a critique of how well existing work design theories explain the realities of today's workplace, this article reviews six theoretical perspectives on work design: sociotechnical systems theory, the job characteristics model, process improvement, technostructural change models, activity theory, and adaptive structuration theory. Each theory is examined for its ability to explain work design in new work environments and is shown to offer a different perspective on the design of work. Finally, the implications for further research on work design theory and for the practice of HRD are discussed.

Work design shapes the context of work through traditional structural means and through the reciprocal relationship of structure and human agency (Miller & Droge, 1986). New work environments are characterized by complex, nonlinear dynamics (Weick, 1990) in which the mutual dependence on structure and action means that structure is both a medium and outcome of practice (Giddens, 1979). Action triggers change, intended and unintended, that influences interdependent actors and creates structure. Work activity

unfolds within a context that reflects the residuals of prior work activities. In other words, actions are embedded in the structures they generate. In this sense, the term *structure* is used synonymously in this article with *context* as they apply to the work environment. Work design is a primary catalyst of context, and, conversely, the context of work reflects structural dimensions. The role of structure in creating context is similar to adaptive structuration (DeSanctis & Poole, 1994), in which rules and resources from technology and other structures are incorporated into action. Within this broader meaning of structure, *work design* is defined as the systemic organization, design, and articulation of work activities at one or more levels of the organization: systemwide, process, group, job, and task. Work design can occur at any point along the continuum between systemwide work structures and the design of individual tasks. The environment or context within which work design occurs is the work environment.

Theories Selected for the Review

Six theoretical perspectives on work design were selected for review and critique in this study. Three criteria were used to select theories for the study:

- The theory's main purpose includes explaining the organization and design of work.
- The theory applies to one or more of the following domains of work: systemwide, process, group, job, or task.
- The theory includes both human and technical concepts to explain work design.

Theories were selected that address work design ranging in scope from task design to organization-wide work design and that range in age from ten to more than fifty years old. The theories reviewed are sociotechnical systems theory, the job characteristics model, process improvement, technostructural change models, activity theory, and adaptive structuration theory.

Work design is central to the purpose of these six theories and provides the basis for the interaction of key conceptual elements of them. Sociotechnical systems theory, the job characteristics model, process improvement, and technostructural change models are work design frameworks that have been discussed frequently in HRD and related literatures. Activity theory has only recently been considered as a potentially valuable theory for HRD and related disciplines (Ardichvili, 2003; Engestrom, 2000). Adaptive structuration theory has received little or no attention in the HRD literature despite its power to explain adaptations to technology as key factors in organizational change (DeSanctis & Poole, 1994). Other theories were eliminated from consideration for this study because their primary theoretical domains did not include work design. Among them were human capital theory (Becker, 1993), institutional

theory (Zucker, 1987), agency theory (Eisenhardt, 1989), and transaction cost theory (Jones & Hill, 1988). The domains over which these theories apply would have to be artificially stretched to include work design. Conversely, the theories supporting organizational transformation (Miller & Friesen, 1984; Tushman & Romanelli, 1985) and contingency theory (Schoonhoven, 1981) embrace all dimensions of the organization and its environment (philosophy, culture, strategy, environmental contingencies, and structure) and exceed the scope of work design theory. Each of the six theories chosen for this study is reviewed next.

Sociotechnical Systems Theory. As first conceptualized by Eric Trist during his work at the Tavistock Institute for Human Relations in London, sociotechnical systems (STS) theory was clearly influenced by an early publication of von Bertalanffy's open systems theories (Trist & Bamforth, 1951). STS theory seeks to enhance job satisfaction and improve productivity through a design process that focuses on the interdependencies between and among people, technology, and the work environment (Emery & Trist, 1969). The recognition that production processes were systems fundamentally composed of human and technological elements led to work designs based on STS theory that were responsive to both the task requirements of the technology and the social and psychological needs of employees (Trist, 1981; Trist, Higgin, Murray & Pollock, 1963). The overarching goal of this approach is the joint optimization of the social and technical aspects of work design.

Early implementations of the STS approach to work design demonstrated its value for enriching jobs and improving productivity in coal mining (Trist & Bamforth, 1951; Mills, 1976), automotive plants (Junsson & Lank, 1985), an Indian weaving mill (Rice, 1953), the shipping industry (Thorsrud, 1968), and other industrial environments (Rice, 1958; Macy, 1980). Also relevant to HRD are subsequent applications of STS that served as the basis for conceptualizing self-managed teams, (Pasmore, Francis, Haldeman, & Shani, 1982), the redesign of work for productivity improvements (Cummings & Molloy, 1977), and as a framework for understanding the dependencies among ideal work design features and the relative impact of choosing not to implement one ideal feature on the effectiveness of other ideal features (Majchrzak, 1997). Recent applications of STS theory underlie innovative work designs and team-based structures that are now prevalent in organizations (Cherns, 1987; Lawler, Mohrman, & Ledford, 1998; Reese, 1995).

Sociotechnical systems thinking has also been applied at the macrolevel to community and environmental issues. According to Heller (1997), Eric Trist first conceptualized STS theory in extraorganizational terms as a model for integrating human and technological elements for environmental and ecological purposes. However, the macrolevel application of STS research was hindered by the exigent priorities imposed by the opportunities and demands of fieldwork in three British coalmines. Nonetheless, extraorganizational applications are evident in early STS theory research (Emery & Trist, 1969) and in Emery and Trist's book, *Toward a Social Ecology* (1973).

Despite the persistence of STS theory, it has been criticized for offering little in the way of prescriptions for how to design work, relying instead on general principles for achieving sociotechnical work environments (Kelly, 1992). In addition, new organizational paradigms suggest that the application of sociotechnical principles alone is insufficient, since design innovations at the subunit level are unlikely to survive if the organization as a whole is not aligned systemically in the same way (Frei, Hugentobler, Schurman, Duell, & Alioth, 1993). According to critics of the theory, more explicit attention to organizational culture and values is needed (Parker & Wall, 1998).

Job Characteristics Model. Among the models of work design derived from STS theory, perhaps the most influential is the job characteristics model (Hackman & Oldham, 1980). The job characteristics model (JCM) is among the most well-known and complete theories for explaining job design characteristics and their relationships to work motivation. According to this theory, any job can be described in terms of the following five core job dimensions: skill variety, task identity, task significance, autonomy, and feedback. Seen as being more motivating and satisfying to workers who perform jobs with these characteristics, the five core job dimensions influence psychological states of workers that are more likely to lead to favorable work outcomes: high work productivity and low absenteeism and turnover. The theory further asserts that people with high growth needs are more likely to experience the psychological states with motivating jobs than are people with weaker growth needs. In addition to the JCM itself, Hackman and Oldham (1980) developed the Job Diagnostics Survey, an instrument for measuring the motivation potential of jobs and for guiding work redesign projects.

Since its development more than twenty-five years ago, the JCM has spawned an impressive body of related research on work design. Campion and Thayer (1985) extended Hackman and Oldham's work by developing the Multimethod Job Design Questionnaire (MJDQ), a job design instrument with scales to assess the motivational, biomechanistic, and perceptual-motor aspects of jobs. Other extensions and refinements of the JCM include modifications of the original job diagnostics survey to produce more reliable data (Fried, 1991; Johns, Xie, & Fang, 1992), studies of the relative effects of job redesign on attitudinal versus behavioral outcomes (Kelly, 1992; Parker & Wall, 1998), the addition of achievement motivation and job longevity as moderators to the JCM (Arnold & House, 1980), cross-cultural applications of the JCM (Welsh, Luthans, & Sommer, 1993), revisions to the critical psychological states component of the model (Renn & Vandenburg, 1995), studies of the effects of work context (for example, lack of privacy, high worker densities) on job satisfaction (Parker & Wall, 1998), a framework for job design in which employees actively craft their jobs (Wrzesniewski & Dutton, 2001), and meta-analyses of the effects of the JCM on motivation, satisfaction, and performance (Fried & Ferris, 1987; Loher, Noe, Moeller, & Fitzpatrick, 1985). As these studies demonstrate, the JCM has had a persistent influence on work design thinking and has catalyzed an impressive array of related research.

Process Improvement. An organization's work, whether product or service related, is accomplished through a series of phases, or processes, during which value is added. As a value chain for accomplishing work, the work process is a major component of the organization's structure and function and a key element in work design. Davenport (1993) defined a work process as "a structured, measured set of activities designed to produce a specified output for a particular customer or market. . . . A process is a specific ordering of work activities *across time and place* [italics added], with a beginning, an end, and clearly identified inputs and outputs: a structure for action" (p. 5). Davenport's notion that work activities can span across time and space is an important observation because it expands the scope of a work process beyond a single functional area. Indeed, major work processes such as customer order processing and new product development require activities that draw on multiple functional areas. Those that span the boundaries between organizational units are called cross-functional processes.

Process improvement, a major tenet of quality improvement theory, derives from the notion that understanding how work is accomplished during various phases of the process is the key to successful efforts to improve or redesign work. Quality improvement theory is based on the work of Walter Shewhart (1931), W. Edwards Deming (1986), and Joseph Juran (1974). Quality improvement theory espouses a management philosophy that orients all of an organization's activities around the concept of quality. Quality improvement is based on a diverse body of knowledge composed of theory and methods for continuous quality improvement, statistical measurement, process improvement, employee involvement, and education and training. According to quality improvement theory, in order for process improvement to occur, there must be agreement as to what constitutes a work process, that is, the work activities that are specifically included in the process. Work processes that have an identifiable flow or structure, whether they are small, discrete processes or more elaborate, cross-functional processes, can be analyzed and improved using methods such as statistical process control. Process improvement based in quality improvement theory provides employees with the information and decision-making power to make process changes, it is a continuous process (improvement efforts never end), and it increases both employee well-being and organizational productivity (Shetty, 1986). Indeed, continuous process improvement is the primary vehicle for work redesign in organizations that follow the quality improvement philosophy (Garvin, 1988).

Technostructural Change Models. Technostructural change models affect change by reconfiguring the organization's technology and structure. Technostructural change models evolved from consideration of the factors thought to be key determinants of organizational structure. Early theories explained that organizational structure was largely a function of contextual factors such as organization size, environment, technology, or scale of operation (Galbraith, 1970). These theories offered the simplest theoretical explanation of how

organization design was related to structural variables, which were assumed to be influenced by particular, primarily economic, constraints (Pugh, Hickson, Hinings, & Turner, 1969). Structural models then were developed based on research showing that organizations that faced dynamic markets and technological environments were more economically successful with flexible, organic organizational structures, while organizations in relatively stable environments were more successful with highly structured organizations (Lawrence & Lorsch, 1967). Early studies of the introduction of technology and its effects on organization design showed that computer-based automation promoted the specialization of expertise, facilitated the movement toward process technologies, increased ratios of supervisory and staff personnel, and decentralized authority away from headquarters to individual plant locations (Blau, Falbe, McKinley, & Tracy, 1976; Adler, 1992). Subsequent theories have emphasized the importance of strategic decision making as a necessary precursor to organizational structure and work design (Child, 1972; Miles & Snow, 1978; Mintzberg, 1994).

Technostructural change is receiving increased attention with the current emphasis on organizational effectiveness and sustained competitive advantage. Technostructural change is large-scale change brought about through deliberate attempts to change an organization or subunit toward a different and more effective state by altering its structure and technology (Cummings & Worley, 2001; Galbraith, 1977). Since they focus on structure and technology as major determinants of the environment within which people work, technostructural change models are frequently used to complement other interventions that affect change primarily through social processes and HRD. Technostructural change models are used to design or redesign major processes or work units or to restructure entire organizations; they are of broader scope than the work design models discussed previously. They embrace a set of interventions that include models for functional design, downsizing and work reengineering, and recent structural designs including self-contained units, matrix organizations, and network-based structures (Cummings & Worley, 2001).

Functional design continues to be the most widely used organizational structure in the world today. This is the pyramidal structure with senior management at the top, middle and supervisory management spread out below, and the rest of the nonmanagement workforce at the bottom. As seen in specialized functional units such as marketing and sales, engineering, and accounting and finance, functional design promotes the specialization of skills and resources, allows specialists to share their expertise, and enhances career development within one's functional specialty. Care must be taken with functional designs that departmental outputs are integrated with the contributions of other units to enhance the performance of the organization as a whole. Downsizing is a model for organizational restructuring intended to reduce the size of the organization and cut costs primarily through reductions in the workforce. Reduction in organizational size can occur through any one

or a combination of layoffs, attrition, redeployment, reduction in management levels, early retirement, outsourcing, reorganization, divestiture, or delayering (Cascio, 1993; McKinley, Sanchez, & Schick, 1995). In most cases downsizing is associated with greater use of the contingent workforce. Temporary or permanent part-time employees are needed since the reduction in the workforce is not matched by a corresponding reduction in workload; fewer employees must accomplish the same amount of work.

Work reengineering is a radical approach to organizational restructuring that replaces the existing work structure with a completely new design, and since jobs are eliminated through work reengineering, it also results in fewer employees (Hammer & Champy, 1993). Work is reengineered by literally starting over and redesigning it from scratch. It requires the redesign of work processes and the integration of tasks to eliminate the errors, delays, and rework that are associated with having different people do different parts of the same process. In order for work reengineering to result in fewer jobs, called the horizontal reorganization of work, vertical reorganization of work is also needed. Those who remain after jobs are eliminated are expected to handle broader tasks and make more decisions.

Recent structural designs include self-contained units, matrix organizations, and network-based structures. Self-contained units group organizational activities on the basis of products, services, customers, or geography. They are typically set up with all or most of the resources needed to accomplish their specific objectives and are often created, either temporarily or permanently, to handle a specific product, service, customer, or region. The matrix organization is an attempt to maximize the strengths and minimize the weaknesses of both the functional and self-contained unit structures. It superimposes the lateral structure of a product or project coordinator on a vertical functional structure. The matrix organization evolved to deal with environments in which changing customer demands and technological conditions caused managers to focus on lateral relationships between functions to develop a flexible and adaptable system of resources and procedures and to achieve multiple project objectives (Kolodny, 1981). Network-based structures redraw organizational boundaries and link separate organizations to facilitate task interaction. In network-based structures, functions that are traditionally performed within a single organization are performed by different network members. The essence of networks is the arrangement of relationships between organizations so that each organization handles what it does best (Powell, 1990). Often used as the basis for joint ventures and other collaborative relationships between organizations, networks are considered to be uniquely suited to deal with complex, dynamic interorganizational exchanges since they allow for vertical disaggregration and flexible coordination across participating organizations (Achrol, 1997).

Activity Theory. Activity theory explains purposeful behavior by focusing on the structure of the activity itself (Leont'ev, 1978, 1981). Rather than viewing the mind or behavior as the primary object of analysis, activity theory

focuses on the actual processes of interaction in which humans engage with the world and each other. It is rooted in the work of preeminent Soviet psychologist Lev Vygotsky and the concept of *deyatel'nost,* a term with meaning similar to that associated with the Western notion of activity. In a significant departure from Western views at the time, Vygotsky believed that mental functioning could be understood only by going outside the individual to examine the sociocultural processes from which it derives—a conception of cognition that removed the distinction between internal mental processes and the external world (Vygotsky, 1978). Leont'ev, one of Vygotsky's first students, developed a coherent and integrated framework for activity theory. Activity theory has recently been applied to work and can serve as a flexible framework for the conceptualization of work activity.

At the core of activity theory is the concept of activity as a unit of analysis that includes both the individual and his or her culturally defined environment. From Leont'ev's perspective, "the psychological experiment can no longer be set up entirely to model philosophical speculation: it must model the phenomena of everyday, practical activity" (Cole, 1981, p. ix). Leont'ev conceived of activity as systems of organized units for performing mental functions involving the individual and others engaged in the same activity within a culturally defined environment (Leont'ev, 1978, 1981). The environment is not seen simply as a means of getting access to the individual, but as an integral element of the activity itself. This multidimensional conception of activity, which takes the environment into account, is the basis of activity theory and is considered to be the appropriate unit of analysis for human behavior.

According to the theory, an activity can be analyzed at three levels. First, at the highest level of organization is the motivation of the activity itself, a broader concept than in Western thinking, closer in meaning to that of strategy than task. Activities are distinguished on the basis of their motive and the object toward which they are oriented. At the next level are goal-directed actions, a flexible system of actions for accomplishing the activity that can incorporate various methods and patterns. At the third level are operations, or the specific conditions under which goal-directed actions are carried out. For example, if our action is traveling from one place to another in the service of some activity (for example, pursuing leisure and recreation), whether we walk, drive, or use some other means of transportation is an operation that depends on distance and other conditions related to the action.

The dynamic relationships among these three elements of activity theory provide a flexible framework for better understanding the design of work environments. Activities, actions, and operations may change positions in the hierarchy relative to one another according to changing situations, new knowledge, and the intention of human agents. Since activities, actions, and operations are defined according to their functions rather than properties inherent in the elements themselves, an activity can lose its motivating force and become an action in the service of another activity (for example, losing interest in the

intrinsic value of one's job and performing it primarily for income). Hence, the theory allows work activity to be studied at different levels of analysis: the activity, the action, and the operation. Since activity is conceptualized as a dynamic system, methods of studying activity can change as the activity changes and as new questions about it emerge. Conceptualizing work activity using activity theory allows designers to use the work design process to bridge from the present to the desired work environment and to move easily across levels of activity as dictated by the design process. The malleability of activity theory provides a flexible framework for the study of work activity.

Although limited in number, applications of activity theory to the study of work design and HRD include Scribner's study (1984) of the practical thinking strategies used by workers to economize on mental and physical effort, Engestrom's examination (2000) of work redesign in a Finnish pediatric health care facility, and Ardichvili's proposal (2003) that activity theory be used as a basis for developing socially situated learning experiences considered to be especially useful for work-related education and training.

Adaptive Structuration Theory. Adaptive structuration theory is a framework for studying the variations in organizational change that occur as advanced technologies are implemented and used (DeSanctis & Poole, 1994). According to adaptive structuration theory, adaptation of technology by organizational actors is a key factor in organizational change that can be examined from two vantage points: the types of structures that are provided by advanced technologies and the structures that actually emerge in human action as people interact with these technologies. The term *structures* refers to the general rules and resources that guide human activity in organizations such as reporting hierarchies, organizational knowledge, and standard operating procedures. The act of bringing the rules and resources from an advanced technology or other structural sources into action is termed *structuration.* Since actual behavior when using advanced technologies frequently differs from intended use, adaptive structuration theory is embraced by researchers who believe that the effects of advanced technologies are as much a function of the properties inherent in the technologies as of how they are used by people. The theory focuses on the interplay between two types of structures, intended and actual, to gain a deeper understanding of the processes through which advanced technologies are implemented and the impacts of advanced technologies on organizations.

The structuration process can be captured by isolating a group's application of a specific technology-based rule or resource within a specific context and at a specific point in time. The immediate, visible actions that indicate deeper structuration processes are called *appropriations* of the technology. By examining appropriations, we can uncover exactly how a given rule or resource within a specific technology is brought into action. Technology structures become stabilized in the interactions of a work group if the group appropriates them in a consistent way, reproducing them in similar form over time. Once emergent structures are used and accepted, they may become institutions in

their own right and the change is fixed in the organization (DeSanctis & Poole, 1994).

Adaptive structuration theory posits that four major sources of structure—technology, task, environment, and the work group's internal system—affect social interaction. Work design features are present in these sources of structure. Work design is represented in technology structures that enable innovations or improvements to existing work methods (for example, technical innovations in electronic messaging or group decision support). It is reflected in a given work task, since existing work practices must be altered to allow for the use of new or modified resources. Resources and constraints afforded by the organizational environment (such as budgets, political pressures, history of task accomplishment, and cultural beliefs) also reflect the overall design of work. Since adaptive structuration theory identifies structures that emerge in human action as people adapt to technology, it can offer new insights into the relationship between work design as intended by designers and how a new design structure influences the work practices that emerge over time. Workers naturally discern the valuable features of new designs while bypassing other features made available by designers. Work practices evolve as users modify their activities to technical innovations.

Empirical studies using adaptive structuration theory include Orlikowski, Yates, Okamura, and Fujimoto's study (1995) of the implementation of a computer conferencing system in a Japanese research and development project; Chin, Gopal, and Salisbury's development and validation (1997) of a measurement scale to assess the appropriations of advanced technology structures by users; and Griffith's use (1999) of adaptive structuration theory as the basis of a model of sense making of new technologies. Adaptive structuration theory and subsequent empirical studies based on the theory have advanced our knowledge of organization development and change and the role of technology implementation in change processes.

Discussion

Each of these six theories—STS theory, the job characteristics model, process improvement, technostructural change models, activity theory, and adaptive structuration theory—serves a particular purpose for explaining the organization and design of work. Each emerged during a different time period to address needs related to particular concerns about the organization and design of work at that time:

Responding to mid-twentieth-century concerns about the effects of advancements in manufacturing technologies on people and productivity, STS theory offered a fundamentally new perspective on the organization of work—work design for joint optimization of its social and technical dimensions.

The job characteristics model established specific task design characteristics and the conditions under which they enhance work motivation and work-related outcomes.

Grounded in quality improvement theory, process improvement derives from the notion that understanding how work is accomplished and flows through the organization is the key to successful efforts to improving or redesigning work processes.

Several technostructural change models have emerged to address the need for different types of work structures, including traditional structural and functional designs. Recent designs such as matrix organizations and network based structures address complex organizational and environmental dynamics.
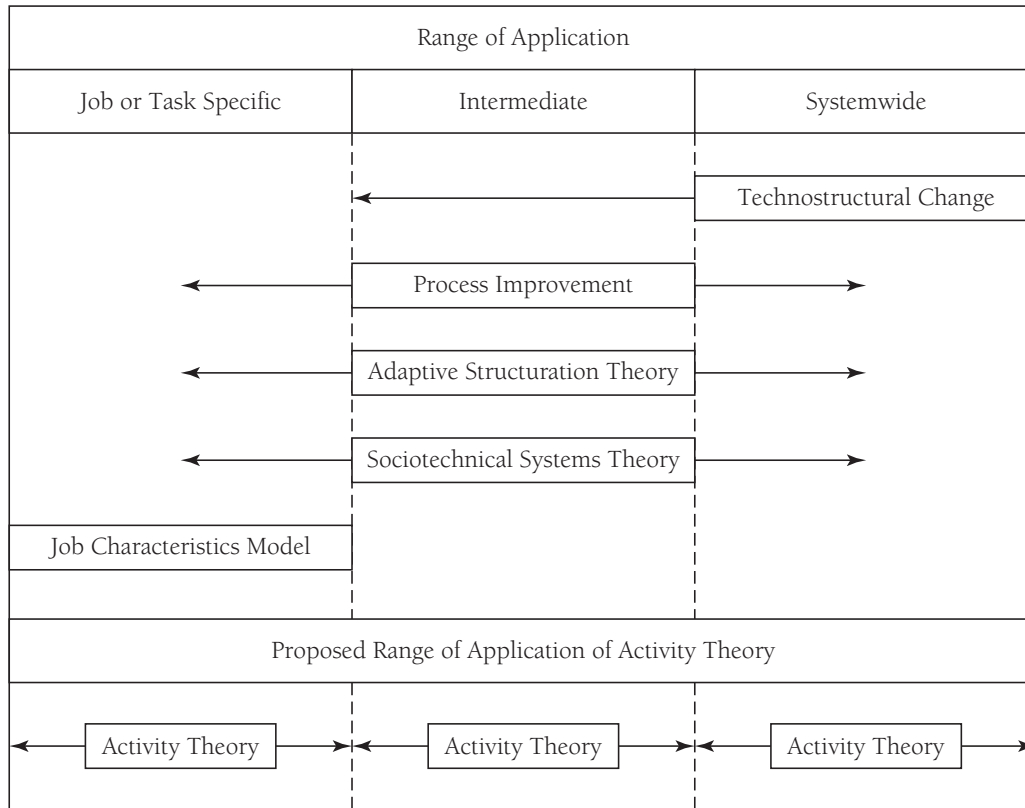
Adaptive structural theory attempts to explain variations in organizational change that occur as new technologies are introduced and adapted for use.

Recently applied to work activity, activity theory and its conceptual levels—activities, actions, and operations—allow a flexible framework for the conceptualization of work activity.

In short, each theory arose within a particular sociohistorical context to meet a specific purpose related to concerns about the organization and performance of work at that time. These theories continue to guide our thinking about work design. Some do so by aiding our understanding of work design issues present in today's work environments (adaptive structuration theory, process improvement, technostructural change models), some earlier theories have shaped current thinking on work design (STS theory, the JCM), and some hold promise as future explanations of the design of work (activity theory).

Each theory varies in the scope of its application to work design in organizations. Work design theories can be construed broadly into categories according to their scope of application (Frei et al., 1993). Three levels of application that apply to all organizations are systemwide, intermediate, and individual (Rashford & Coghlan, 1994). The intermediate range of the scale lies between systemwide and job- or task-specific and encompasses teams, functional groups, departments, divisions, and other subunits of the system. A continuum using these levels to show the scope of application of work design theories appears in Figure 1.

Each work design theory was formulated to cover a domain of knowledge broad enough to support the theory's distinctive contributions to knowledge of work design. Consistent with its purpose, each theory varies in the scope of its application to work design from systemwide (technostructural change) to job- or task-design specific (job characteristics model). Technostructural change theory applies to entire systems (such as organizations) and major subsystems. The job characteristics model applies to the design of jobs and tasks. Thus,

Figure 1. Scope of Application of Work Design Theories

Range of Application		
Job or Task Specific	Intermediate	Systemwide

	← ————————————	Technostructural Change
← ———————	Process Improvement	——————— →
← ———————	Adaptive Structuration Theory	——————— →
← ———————	Sociotechnical Systems Theory	——————— →
Job Characteristics Model		

Proposed Range of Application of Activity Theory		
← [Activity Theory] →	← [Activity Theory] →	← [Activity Theory] →

technostructural change and the job characteristics model have different scopes of application to work design and are shown at opposite ends of the continuum in Figure 1.

Adaptive structuration theory is potentially relevant to any work setting affected by technology-triggered change. Similarly, STS theory supports work design intended to jointly optimize social and technical design issues in a broad range of workplaces. Each of these theories can be applied at the job or task, intermediate, or systemwide levels. Although they potentially apply across the organization, STS theory and adaptive structuration theory most often explain the design of organizational subsystems (intermediate range). Process improvement also applies to the intermediate range of the scale between systemwide and job or task specific since it is an approach to improving or redesigning work processes, a construct at the intermediate range. Since these three theories can explain both intermediate-range work designs and job or systemwide work designs concurrently (for example, explaining how a job fits with a cross-functional process to which the job contributes), arrows appear in Figure 1 pointing to the left and right indicating these scopes of application for the three intermediate-range theories.

The scope of application of activity theory to work design has not been addressed explicitly in the literature. It is proposed that this theory applies to the full range of the continuum shown in Figure 1. Since the domain of activity theory embraces activities, actions, and operations and can include one or more levels of work activity, the theory can potentially apply to work issues at the job or task, intermediate, or systemwide levels. Since activity can be used at any level or combination of adjacent levels in Figure 1, it can facilitate the integration of work design across levels. Conceptualizing work activity using activity theory allows designers to move easily across levels of activity as dictated by the design process.

Critique and Implications for Further Research

Two concerns emerge from this discussion about the explanations of work design offered by these theories. First, these theories do not provide an adequate conceptual foundation for work design in new work environments, including virtual and alternative work environments, that are increasingly common (Bailey & Kurland, 2002; Liker, Haddad, & Karlin, 1999). They explain work designs of the past better than they explain how to design work for some present and future settings. Second, since these theories were developed for particular purposes and applications (such as job design or restructuring), they explain work design in ways that allow discontinuities in how work is structured and articulated between and among organizational levels. These concerns and their implications for further research on work design theory are discussed next.

The Changing Nature of Work. The notion of work discussed in this article does not assume a separation of work from other aspects of life. Work-life integration brings one's work activities and life activities (nonwork) into a mutually reinforcing balance (Friedman, Christensen, & DeGroot, 1998). The distinction between work and nonwork has been blurred since the structure and location of work has been altered by the increasing prevalence of flexible work situations that are not time and place specific (Bridges, 1994; Smith, 1997). These new work situations include virtual work (Hill, Miller, & Weiner, 1998) and the emergence of the alternative workplace (Apgar, 1998). Flexible structures are appealing to organizations that are responding to hypercompetitive business environments (Volberda, 1998). Reflecting the movement toward more flexible employment relationships sought by both employees and employers, the alternative workplace represents a multitude of locations where work can be accomplished other than the traditional office or shop floor (Apgar, 1998). Virtual work is associated with the terms *telework* and *telecommuting,* although each of these has a different meaning. *Telework* is a broad term for doing one's job away from the office through the use of telecommunications equipment (Hill et al., 1998). *Telecommuting* (Potter, 2003) was introduced to emphasize

that telework could eventually replace the daily commute. Unlike most telecommuters who have a fixed alternative worksite at home, virtual work and the virtual office refer to situations in which workers have the flexibility to work from a variety of locations.

Recent research has compared virtual with traditional work environments on a variety of perceptual and business measures. Studies have found that resistance to telecommuting can originate from managers who rely on traditional line-of-sight management styles (Potter, 2003), that telecommuting can reduce costs but also may result in the need to alter management practices (Watad & DiSanzo, 2000), and that virtual reality systems can improve certain dimensions of the telecommuting experience (Venkatesh & Johnson, 2002). Hill et al. (1998) found that use of the virtual office was significantly related to higher productivity and greater flexibility, but not to work-life balance, morale, and other perceptions of employee well-being.

Studies of the consequences of organizational restructuring show that managers and subordinates should not be expected to have the same reactions to a new organizational structure (Luthans & Sommer, 1999) and that the sense of purpose felt by managers as a result of restructuring may not be shared by subordinates (McKinley & Scherer, 2000). Thus, although alternative work designs can reduce operating costs, this may occur at the expense of creativity (Amabile & Conti, 1999), innovation (Dougherty & Bowman, 1995), employee morale (Hill et al., 1998), organizational connectedness (Raghuram, Garud, Wiesenfeld, & Gupta (2001), and other indicators of employee well-being (Fisher & White, 2000).

Recent work design developments go beyond the notion of the alternative workplace. For an increasing number of workers, the work environment is characterized not only by alternative work settings but also by frequent change in setting and geographical location. Enabled by ever more sophisticated technology, many workers now migrate between several work settings depending on what setting is most advantageous for conducting the task at hand. One can work from home, from multiple office locations, and on the road virtually unbounded by geographical location. This represents a new polymorphic work environment in which continuous change is possible; the work setting can change frequently and continuously depending on business-related needs. This fluidity of work settings represents a fundamental departure from traditional work environments and from fixed alternative worksites, such as at home.

Organizations continue to respond to the appeal of these new, alternative work designs to get work done more efficiently. The time and cost savings from instituting alternative work designs are readily apparent to managers and have a significant influence on work design decisions. However, beyond their short-term effects, much remains unknown about these work environments, a situation exacerbated by the continually changing nature of these environments. Postimplementation studies to assess the merits of instituting new work

designs often show that the trade-offs and consequences of alternative work environments, both beneficial and detrimental, become apparent only after investing in these changes (Cascio, Young, & Morris, 1997; Fisher & White, 2000; Hill et al., 1998; McKinley & Scherer, 2000; Parker, Wall, & Jackson, 1997). This occurs in part because relevant theories and models for decision making are not yet available to inform work design considerations when they are initially conceived.

Indeed, the social reality of work design and technology implementation is quite complex (Liker et al., 1999). The efficacy of work redesign is influenced by many factors, including economics, management philosophy, labor-management relations, the degree of shared agreement about how the work is reorganized, and the process through which new work designs and technology are implemented (Salvendy & Karwowski, 1994). On what basis do we separate employees physically and temporally from the organization when considering the use of virtual and alternative work environments? How are those who work in environments that are not time and place specific expected to relate to their work, each other, and the organization? How should the design of work for these environments be conceived and implemented? How well does existing work design theory address these questions?

Although existing theory provides some insight into this area, it seems insufficient for providing a full understanding of these new work environments. The theories reviewed here do not adequately explain how to organize, design, and articulate work activities for flexible work situations that are not time and place specific:

STS theory emphasizes the design of work to optimize the match between the task requirements of the technology and the social and psychological needs of employees. But how are such work designs conceived in virtual environments where workers may experience physical and psychological separation from others?

Although the JCM shows how worker productivity and motivation can be enhanced by emphasizing five core job dimensions, this theory was never intended to explain how to design these job dimensions (skill variety, task identity, task significance, autonomy, and feedback) in work environments characterized by the geographical and temporal separation of the worker from supervisors and others.

The principles of process improvement were developed for service and manufacturing processes deeply rooted in the technology and infrastructure of specific commercial applications. Workers are now less reliant on the support and resources afforded by a fixed work environment.

Activity theory has been applied only recently to work settings, and although it may prove useful for explaining how to design work activities in the future, no known studies have applied activity theory to virtual or alternative work environments.

Traditional work design models were not developed for what, at the time of their development, would have been considered futuristic work environments. How should designers respond to the unpredictability and changing nature of these work settings? Would better work designs emerge from theory influenced by constructivist thinking (Gergen, 1999)? Could social constructionist theory offer a richer explanation of how work experience is created and given meaning by those who perform it (Turnbull, 2002)? What explanations can be offered for the effects these new work environments have on the worker, relevant others, and the performance of the work itself? Better theory is needed to support work design for these new environments.

The Need for Multilevel Work Design Theory. As defined in this article, work design can occur at any point along the continuum from systemwide work structures to the design of work at the job and task levels. Organizing and aligning work activities across organizational levels is a challenging endeavor due to the many considerations involved in the integration of these work activities. Translating strategic initiatives into operational terms involves accommodating contingencies and optimizing multiple, often competing requirements at several operational levels (Mintzberg, 1994). The mission and goals of the organization must be conceptually and operationally related to work design, even though the linkage of strategic goals to supporting work structures may not be immediate or complete (Holton, 1999; Miles & Snow, 1978). Nonetheless, when discontinuity occurs in work design across levels, it is readily apparent to employees. Staw and Boettger (1990) studied the problem of task revision and illustrated the relationship of work design to employee performance. They manipulated actual tasks to contain erroneous information and showed that participants had little natural tendency toward task revision and a high level of conformity to established procedures, especially those reinforced by organizational hierarchy and control systems, even when tasks contained obviously erroneous content. They demonstrated that inconsistencies across levels in work structures and requirements can impede employee performance.

Unfortunately, existing theory explains work design in ways that allow inconsistency and discontinuity across system levels. This occurs when multidimensional phenomena are conceptualized in ways that ignore their systemic implications. Existing work design models were not developed for the systemwide organization and design of work. As shown in Figure 1, each of the six theories has a different scope of application. Technostructural change models address the systemwide organization of work, the job characteristics model addresses work design at the job and task levels, and the remaining theories in Figure 1 address intermediate levels of the system. Designs that are work unit-specific ignore systemwide interdependencies (Galbraith & Lawler, 1993), and fail to address the systemic alignment of reward systems with performance (Rummler & Brache, 1995). Other models of work design apply

to jobs (Ilgen & Hollenbeck, 1992) and groups (Hackman, 1990; Guzzo & Dickson, 1996). None of the theories provides the conceptual basis for work design frameworks that are integrated across system-level strategy, operations, and, ultimately, job and task requirements.

These concerns about the design and articulation of work across levels can be addressed by developing multilevel work design theory. Such theory provides a framework for the design of work that relates to multiple levels of the organization. Developing multilevel theory requires the consideration of both the structure and function of constructs as they apply to work design.

Joint Consideration of Construct Structure and Function. The development of multilevel work design theory requires consideration of both the structure and function of work design constructs since each dimension of the construct provides a different perspective on the construct's utility for multilevel theory (Morgeson & Hofmann, 1999). A focus on the structure of work design constructs tends to highlight the differences across levels. For example, job design, which reflects the task specification and resource needs of the individual, is structurally dissimilar from cross-functional process design, which must account for multiple, functional transactions and contingencies. The structure of the construct alone does not allow for the cross-level comparison of work design features since it emphasizes the differences between levels. Explicit consideration of the construct's function allows integration of functionally similar (but structurally dissimilar) constructs into broader networks of constructs. Since organizational structures can be purposefully designed to yield outputs (information, programs, products, services, and so on) that are compatible across levels regardless of the level at which the work occurs, work designs can be structurally dissimilar yet yield outputs that are consistent from level to level. Theoretical emphasis is placed on the joint consideration of construct structure and function when developing multilevel theory. Multilevel work design theory requires the analysis of both the structure and function of work design constructs.

Measurement is another important consideration in the development of multilevel work design theory since theorists must consider both conceptual and measurement issues when operationalizing constructs (Klein, Dansereau, & Hall, 1994). Since a multilevel theory of work design is expected to explain the organization of work across levels of the system, measures of work design are needed that can be applied to two or more system levels simultaneously. However, most measures of work outcomes and processes apply to specific levels of the system only (measures of job output, departmental performance, plant productivity, and so on). Existing instruments and measures of work design include Hackman and Oldham's job diagnostic survey (1980); Campion and Thayer's MJDQ (1985); the measures of job control, cognitive demand, and production responsibility developed by Jackson, Wall, Martin, and Davids (1993); measures of work design dependencies (Majchrzak, 1997); statistical measures to assess variance in process quality (Gitlow & Hertz, 1983); measures of work redesign for

information technology in advanced manufacturing (Parker & Wall, 1998); and assessments of the psychometric properties of the MJDQ (Edwards, Scully, & Brtek, 1999). Each of these measures has been developed to assess work-related phenomena at a specific level of the system only (Jackson et al., 1993). Measures of work design constructs that apply to two or more system levels simultaneously are needed to test and refine a multilevel work design framework. They may be based on the resources and materials needed for work, process requirements, cross-functional transactions, temporal considerations for work, information characteristics, structural requirements, work outputs, and other dimensions of the work. They will help to measure work design interrelationships across levels for a better understanding of this phenomenon.

Theorists need not start from scratch when developing multilevel work design theory. Activity theory provides a framework for work design that can potentially apply to any systems level or combination of levels. This theory embraces activities, actions, and operations and can be applied to work issues at the job or task, intermediate, or systemwide level. Conceptualizing work activity using activity theory allows designers to move easily across levels of activity as dictated by the design process. Thus, activity theory is proposed as a basis for the further development of multilevel work design theory.

Implications for Human Resource Development Practice. Those who are responsible for employee development cannot afford to lose sight of recent developments in work design since many new skills in need of development emerge from changes in work design. Ample evidence exists in the literature cited here of the discontinuity in theories that address multilevel phenomena. HRD scholars have also acknowledged the need for theory that reflects the multilevel integration of systemic phenomena in areas such as performance domains (Holton, 1999), organizational structure and strategy (Semler, 1997), individual and organizational learning (Confessore & Kops, 1998), learning and performance improvement (Torraco, 2000), and the vertical integration of HRD in organizations (Wognum, 2000). These studies demonstrate the importance of theory that enables the multilevel integration of systemic phenomena in HRD.

Multilevel work design theory can generate models for decision making that improve HRD practice. Coordination among work units for shared resources means that work design changes at one level affect the design of work in other areas. Organizational goals shape work processes requirements, which in turn influence the knowledge and capabilities needed by employees who contribute to these processes. Opportunities for HRD exist at all levels—individual, group, process, and systemwide. Since work design changes have multiple effects and important needs for HRD emerge from these changes, HRD practice can be more effective when framed as a systemic intervention informed by multilevel theory. Multilevel work design theory is needed that reflects the conceptual, analytical, and measurement issues discussed here.

Better theories of work design are also needed because of the negative implications for employee development of poorly articulated work designs. Engagement in learning by the most committed employees can be wasted when the application of what is learned to the workplace is hindered by poorly designed work environments (Tracey, Tannenbaum, & Kavanaugh, 1995). HRD scholars are cognizant of the social, psychological, and organizational influences on employee learning and performance and are well positioned to use this expertise to develop theory that supports effective work design. Since they study the development of managers and employees at all levels of the organization, HRD scholars recognize the need for work systems that enable seamless performance across levels of the organization so that employee development has beneficial results.

Implications for HRD also arise from changes in work reflected in virtual and alternative work environments. The preparation of those who work in these environments should now include consideration of the opportunities and challenges of employment both in and outside organizations (Hall, 2002). Work environments that are not time and place specific require different skills from those needed in traditional work settings (Apgar, 1998; Kanter, 2001). Although communities of practice can develop in virtual environments, they face unique barriers and prerequisites for success (Ardichvili, Page, & Wentling, 2002). Physical and temporal separation from the major locus of work activity also requires the capability for visualizing situations that are developing elsewhere without sentient cues and information on the events themselves (Torraco, 2002). Today's information-rich work environments require work designs that draw attention to the most important information and place more emphasis on the development of higher-level evaluation and problem-solving skills (Norman, 1993). Finally, the HRD implications of new work environments again underscore the importance of developing a workforce with the capabilities for continuous learning. Learning and sense making are more important than ever before for adapting resourcefully to new environments and unforeseen circumstances.

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