DOCUMENT RESUME

ED 453 429 CE 081 852

TITLE	Theory Building. Symposium 21. [AHRD Conference, 2001].
PUB DATE	2001-00-00
NOTE	27p.; In: Academy of Human Resource Development (AHRD) Conference Proceedings (Tulsa, Oklahoma, February 28-March 4, 2001). Volumes 1 and 2; see CE 081 829.
PUB TYPE	Collected Works - General (020) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Adult Education; Concept Mapping; Epistemology; *Human Capital; Human Resources; Job Skills; Labor Force Development; *Organizational Effectiveness; *Performance; *Theories; Theory Practice Relationship
IDENTIFIERS	Intellectual Capital; *Knowledge Management; Learning Organizations

ABSTRACT

This symposium on theory building consists of three presentations. "A Multilevel Theory of Organizational Performance: Seeing the Forest and the Trees" (Susan Reynolds Fisher) presents the process used to develop this theory and analyzes emergent insights. It discusses how the theory succeeds in mapping relationships across aspects and levels of performance that have previously been isolated by level and also enhances current levels models by using a social collective perspective to operationalize performance capacities arising from the uniquely human aspects of organizations. "Is Knowledge in the Head or in the World?" (Richard J. Torraco) begins to lay a theoretical foundation for research on how workers attain competence in dealing with rapidly changing work situations using Dubin's theory building methodology. "A Performance Perspective Synthesizing Intellectual Capital, Knowledge Management, and Organizational Learning" (Carson R. Arnett) advances the discussion of theory building aimed at improving "knowledge worker productivity." It presents the topic in two parts: first, revised definitions of the constructs intellectual capital, knowledge management, and organizational learning that are used to expand the definition of human capital and, second, a systems view of the components of human capital. All three papers include substantial bibliographies. (YLB)

2001 AHRD Conference

Theory Building

Symposium 21

Tulsa, Oklahoma

February 28 - March 4, 2001

A Multilevel Theory of Organizational Performance: Seeing the Forest *and* the Trees

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The process used to develop "A Multilevel Theory of Organizational Performance" is presented and emergent insights analyzed. Expert reviewers found the theory to be provocative and useful in examining holistic performance systems. The theory succeeds in mapping relationships across aspects and levels of performance that have previously been isolated by level. It also enhances current levels models by using a social collective perspective to operationalize performance capacities arising from the uniquely human aspects of organizations.

Keywords: Performance, Theory, Multilevel

Human resource development (HRD) scholars have been on the cutting edge in their use of systems theory as a tool for understanding organizational phenomena (Sleezer, Gradous, & Maile, 1999). HRD professionals have effectively used this perspective to contribute to the body of knowledge related to individual, team, and organizational learning and performance. However, our knowledge of the complex relationships that link these processes across organizational levels remains limited. Although we know a great deal about the "trees" and even the isolated groves of trees in the organizational "forest," we have yet to capture the complex whole of the forest itself. To capture the whole, we must consider the myriad relationships that link organizational levels.

This gap in knowledge related to levels issues in organizations is not unique to HRD. The study of organizations by scholars in numerous fields has long been fragmented along lines roughly equivalent to levels of analysis (Behling, 1978; Klein, Tosi, & Canella, 1999; Rousseau, 1985). This situation has encouraged narrowly defined studies that focus on one level at a time and are dominated by a focus on the individual and organizational levels of analysis (Klein, et al., 1999). The "meso" area in between, where components and subsystems interact in complex ways, has been relatively unexplored (Glick, 1985; Holton, 1999; Roberts, Hulin, & Rousseau, 1978). Many are now calling for organizational scholars to confront the complexities of multilevel theory-building and research (e.g., Chan, 1998; House, Rousseau, & Thomas-Hunt, 1995; Morgeson & Hofmann, 1999).

Currently, there is also a convergence of ideas from diverse fields indicating that scholars may now be ready to address this meso gap. Those in micro-oriented fields, such as HRD and organizational behavior, are encouraging their peers to broaden their perspectives by considering organization level effects (e.g., Holton, 1999; Mowday & Sutton, 1993; Passmore, 1997; Swanson, 1999). At the same time, researchers in the macro-oriented field of business policy and strategy have begun to see value in the resources embedded in individuals and groups in organizations. Proponents of the *resource-based view* of the firm (e.g., Barney, 1991; Wernerfelt, 1984) now acknowledge that the idiosyncratic human capital of a firm may represent valuable resources that contribute to a firm's sustainable competitive advantage. The convergence of these ideas creates an incentive to integrate previously competing approaches to the study of performance.

Because multilevel theory provides the means to integrate and explore the dynamic complexities of the meso region, a true multilevel theory of organizational performance should also help us to reconcile previously fragmented views of performance. This paper offers a brief description of one such a theory.

Foundational Concepts from the Literature

A Multilevel Theory of Organizational Performance (Fisher, 2000) was developed using foundational concepts established by early multilevel thinkers who viewed the organization from a social collective perspective (e.g., Behling, 1978; Coleman, (1986). The social collective view of organizational levels focuses on the interaction and affiliation characteristics of the organizational members rather than the task and technical configurations that have characterized the levels models familiar to HRD scholars (e.g., Rummler & Brache, 1995; Swanson, 1996). In addition, the theory draws on ideas advanced by scholars of complexity and systems theory (e.g., Bertalanffy, 1962;

Senge, 1990; Stacey, 1995); organizational learning (e.g., Argyris & Schon, 1996; Daft & Huber, 1987; Walsh & Ungson, 1991; Watkins & Marsick, 1993), and the resource-based view of the firm (e.g., Barney, 1991). The resource-based view holds that firms that develop valuable, rare, inimitable rent-producing resources may outperform their competitors (Reed & DeFillipi, 1990). Many of these types of resources are embedded in the human capital of the firm and are the direct result of organizational learning (Conner, 1991).

Dubin's (1978) seminal work on theory-building was used as a guide to the theory-building process and was supplemented by the work of more contemporary multilevel theorists. The methodology of the theory-building process is traced in the following section.

Methodology

First, to provide the structural foundation for the theory, a multilevel theory building model (MLTB) was developed. The first five steps of Dubin's (1978) theory-building template were used as a framework and augmented with insights of contemporary multilevel theorists who share the social collective view of organizational levels.

Rousseau's (1985) taxonomy of mixed-level models was used to describe functional relationships among levels; the work of Klein, et al. (1994) was used to consider the sources of variability among constructs at multiple levels;and the ideas of Morgeson and Hofmann (1999) and Chan (1998) were used to consider structural, functional, and process characteristics of collective constructs. The resulting MLTB model is summarized in Table 1.

Table 1. An Integrated Methodological Model of Multilevel Theory-building

	Substance	Source
I	Definition of theoretical units and collective constructs	Dubin (1978) and Morgeson & Hofmann (1999)
II	Specification of levels including boundaries	Rousseau (1989)
III	Determination of theoretical boundaries	Dubin (1978)
IV	Identification of laws of interaction among units or constructs	Dubin (1978)
V	Specification of functional relationships among levels	Rousseau (1989), Morgeson & Hofmann (1999), and Chan (1998)
VI	Specification of assumptions of variability among levels	Klein, Dansereau, & Hall (1994)
VII	Definition of system states	Dubin (1978)
VIII	Statement of propositions	Dubin (1978)

Second, to survey the current body of performance research, a sample of 34 performance studies from micro and macro fields published from 1984 to 1998 was examined for areas of convergence. The studies were found to converge in their use of systems theory and their inclusion of concepts related to organizational learning. The resource-based view emerged as a conceptual frame linking systems theory and learning. Third, to test the relevance of the MLTB, the model was used to examine the nine studies from the sample that were determined to be multilevel. The MLTB proved to be useful for examining the multilevel aspects of these nine performance studies. In the fourth step of the methodology, a multilevel theory of organizational performance was developed by systematically addressing the eight elements in the MLTB model. Because this is the heart of the study, this phase is described in more detail in the following section.

Building the Theory

In keeping with the social collective view of organizational levels, three theoretical units representing levels were identified: *individual*, *group*, and *organization*. The *individual* level is the most subordinate and has an unambiguous boundary. In the space between the individual and the organization levels, there are numerous interacting collectives—both formal and informal—including dyads, work teams, informal groups, departments, and business units. Because interaction is a fundamental component of collective action (Weick, 1995a), any collective of individuals that does not include all organizational members and in which social interaction takes place is considered part of the *group* level. This level is complex and characterized by multiple, overlapping memberships, ambiguous boundaries, and partial inclusion. The *organization* is viewed as the formally structured social entity with identifiable boundaries (Katz & Kahn, 1966) that includes all elements of the individual and group levels.

The theory also incorporates a fourth level—*industry*—borrowed from the strategy literature (Porter, 1980). This level includes all organizations competing in the same marketplace. The focal level of the theory is the organization, and "sustained competitive advantage" at the industry level is used as the performance criterion.

Theoretical units representing aspects of performance also were developed. These performance aspects—*capacity, process*, and *accomplishment*—were based on the generic systems view (Katz & Kahn, 1966) and terminology developed by Sleezer, et al. (1999). When relationships were teased out of this traditional model at the organizational level, it became evident that *process* not only serves the traditional, feed-forward production role, but also takes on a separate role in learning. *Learning process* operates in the feedback direction from market experience and production process to organizational memory—a subset of *capacity*. This conception is supported by the organizational learning literature (Argyris & Schon, 1996; Walsh & Ungson, 1991; Watkins & Marsick, 1993). Based on the generic systems model, both *production* and *learning processes* operate as mediators between *capacity* and *accomplishment*. Theoretical units for external *resource* and *product markets* were also established based on the strategy literature. Figure 1 illustrates the performance aspects and the relationships that link them at the *organization* level. The complete model contains 15 theoretical units: four performance aspects at three levels, two markets at the industry level, and one unit representing organizational memory.

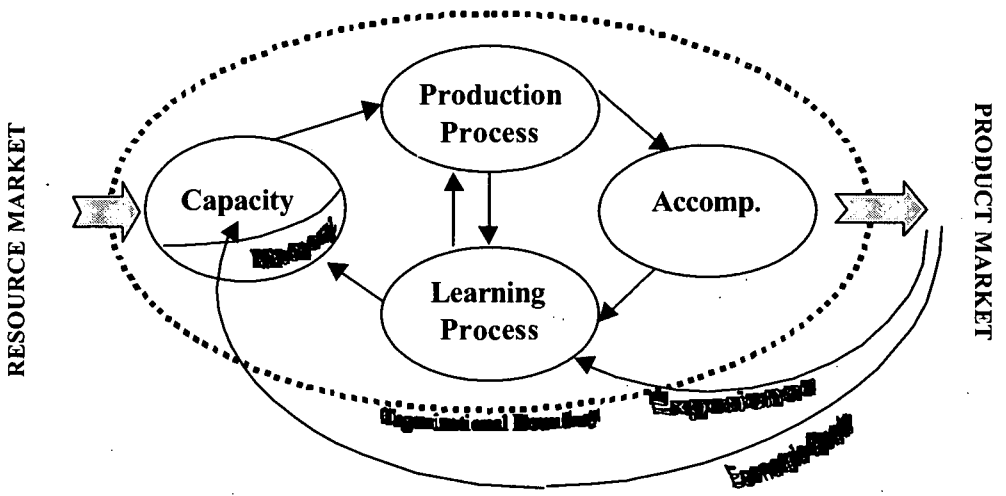

Figure 1. Systems Model of Performance Aspects and Markets at the Organization Level

Following the specification of theoretical units and boundaries, the theorist focused on two types of relationships among the theoretical units: (1) the *intra*-level relationships linking performance aspects within the individual, group, and organization levels and (2) the *inter*-level relationships that cross levels. The *inter*-level relationships may either link levels within performance aspects (such as the link between the individual and group levels of learning process) or cross both aspects and levels (such as the link between group production process and organizational accomplishment). In Figure 1, those relationships shown within the dotted line are all *intra*-level relationships at the organizational level, while those relationships indicated by arrows crossing the dotted line are *inter*-level relationships linking performance aspects at the organization and industry levels. Note that the direction of *intra*-level relationships is constrained by the generic systems model and the mediating role of process, both learning and production. Thus, there are no direct relationships joining capacity and accomplishment

Twenty-one *intra*-level relationships were defined. Upward relationships within performance aspects took the form of Rousseau's (1985) compositional type. Compositional relationships allow collective action to emerge from the individual and group levels to the organization level by focusing on the functional similarities between variables at progressively more complex levels. For example, learning at the group and organizational levels is structurally different from learning at the individual level but fulfills a similar function. Compositional relationships are critical aspects of the meso space in organizations. Twelve compositional relationships were defined for the four performance aspects. Figure 2 depicts compositional relationships among levels using the capacity aspect as an example.

When the relationships that cross both levels and aspects of performance were considered, some potential links were found to be redundant. (Figure 3 depicts the potential links crossing levels between the capacity and production process aspects that were examined.) As a result, several relationships that initially appeared to be cross-level, multi-aspect links were actually determined to be combinations of compositional and *intra*-level links. An example of such hybrid links is shown in Figure 4.

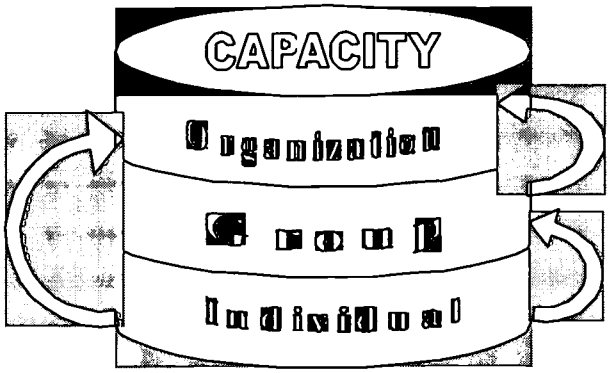

Figure 2. Compositional Links within Performance Aspects

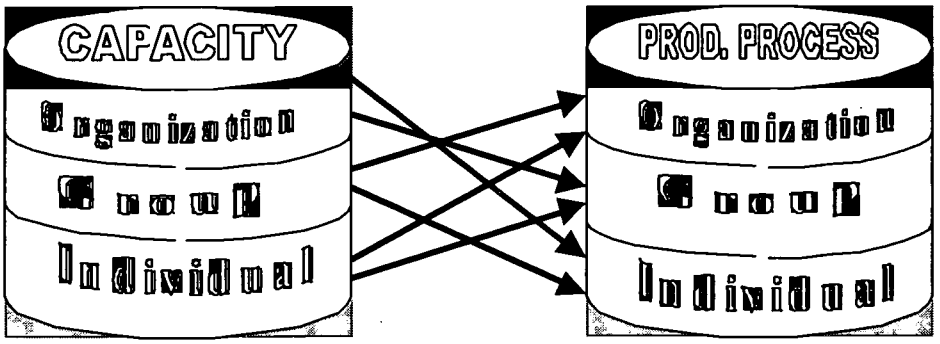

Figure 3. Possible Cross-level, Multi-aspect Links

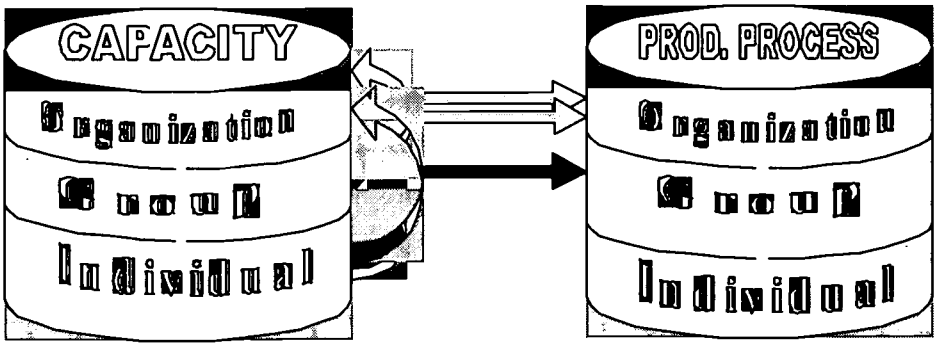

Figure 4. Hybrid Links Involving Composition

Overall, 24 potential relationships crossing both levels and aspects of performance were examined. Nine of these were discovered to be hybrids composed of combinations of compositional, *intra*-level, and cross-level links

previously identified; and two were described by previous relationships. Thus, 13 discrete cross-level, multi-aspect links were defined. Figure 5 depicts the 15 theoretical units and 32 of the 47 relationships defined by the theory. (Because of the complexity of the figure, the relationships that cross both levels and aspects and two relationships defined as managerial links are not shown.)

The 47 relationships among units defined by the theory were all determined to be categoric and directional. This precluded any consideration of *system states* as defined by Dubin (1978). The complexity of the theoretical system also impacted the *proposition* step of theory-building. Because the number of potential propositions emanating from 47 relationships is huge, the theorist elected to develop but a sample to demonstrate how falsifiable and useful truth statements may be drawn from the theory. The following are examples of two.

> *Proposition A*: The cycle time of subsystems at lower levels (individuals, dyads, and small groups) within the organization will be shorter than that of higher level subsystems (large groups) and that of the organization as a whole due to increasing complexity.
>
> *Proposition B*: Groups and organizations that acquire and use knowledge obtained from production process, learning process, and the evaluation of accomplishment make continuing adaptations to production process that result in accomplishments of higher quality and/or greater quantity than those groups and organizational that acquire and use knowledge learned from fewer sources.

Finally, the theory was submitted to outside experts in relevant fields of study to evaluate its usefulness and the magnitude of its contribution to the study of organizational performance. The results of this assessment are described in the following section.

Expert Opinions

Among the group of experts asked to provide feedback were multilevel theorists, researchers who have conducted multilevel studies, HRD scholars and practitioners, and strategy scholars. Four of five experts who participated were satisfied that the model developed in the study is a theory. The fifth reviewer believed that a theory should be a more simplified view of reality. This expert felt that the model presented is not parsimonious enough to qualify as theory. Four reviewers acknowledged that the theory offers a holistic frame for examining performance that reveals synergies among previously fragmented concepts. Thus, the theory may be useful in bridging disciplinary gaps and expanding our vision of organizational performance.

In its present form, the theory was generally considered to be too cumbersome to be easily accessible. Although it is highly unlikely that a theory of this scope could be tested as a whole, one reviewer observed that the propositions presented demonstrate that the theory is testable and thus falsifiable. Further development of propositions should point the way toward combinations of relationships that may be empirically tested.

Strengths and Limitations

Several insights emerged as this theory was developed that constitute contributions to the field of HRD. The first relates to organizational learning. The theory provides a new conceptual space for organizational learning in an organizational performance model by depicting learning process as parallel to production process at three levels but operating in the opposite direction—feedback rather than feed-forward. The views of several prominent multilevel scholars were applied to this conceptual frame to capture many of the social interaction effects that take place in the meso space between the individual and organizational levels. The explication of these meso level activities suggests ways in which previously ambiguous concepts related to organizational learning actually take shape.

Another contribution is the use of a comparative measure of performance—sustained competitive advantage—at the industry level. Using a measure at this level represents a paradigm shift for the micro-oriented disciplines. The field of HRD, in particular, has been focused primarily on *intra*-level performance measures over time. This practice can be misleading when measuring performance at the organizational level. Although organizations may experience performance improvements at individual and group levels, if these improvements fail to bring the organization to a competitive position at the industry level, the organization will ultimately fail despite these improvements.

A third contribution relates to the essence of HRD as a scholarly discipline. To date, the levels models most widely used in our field (e.g. Rummler & Brache, 1995; Swanson, 1996) have been focused on process. In these

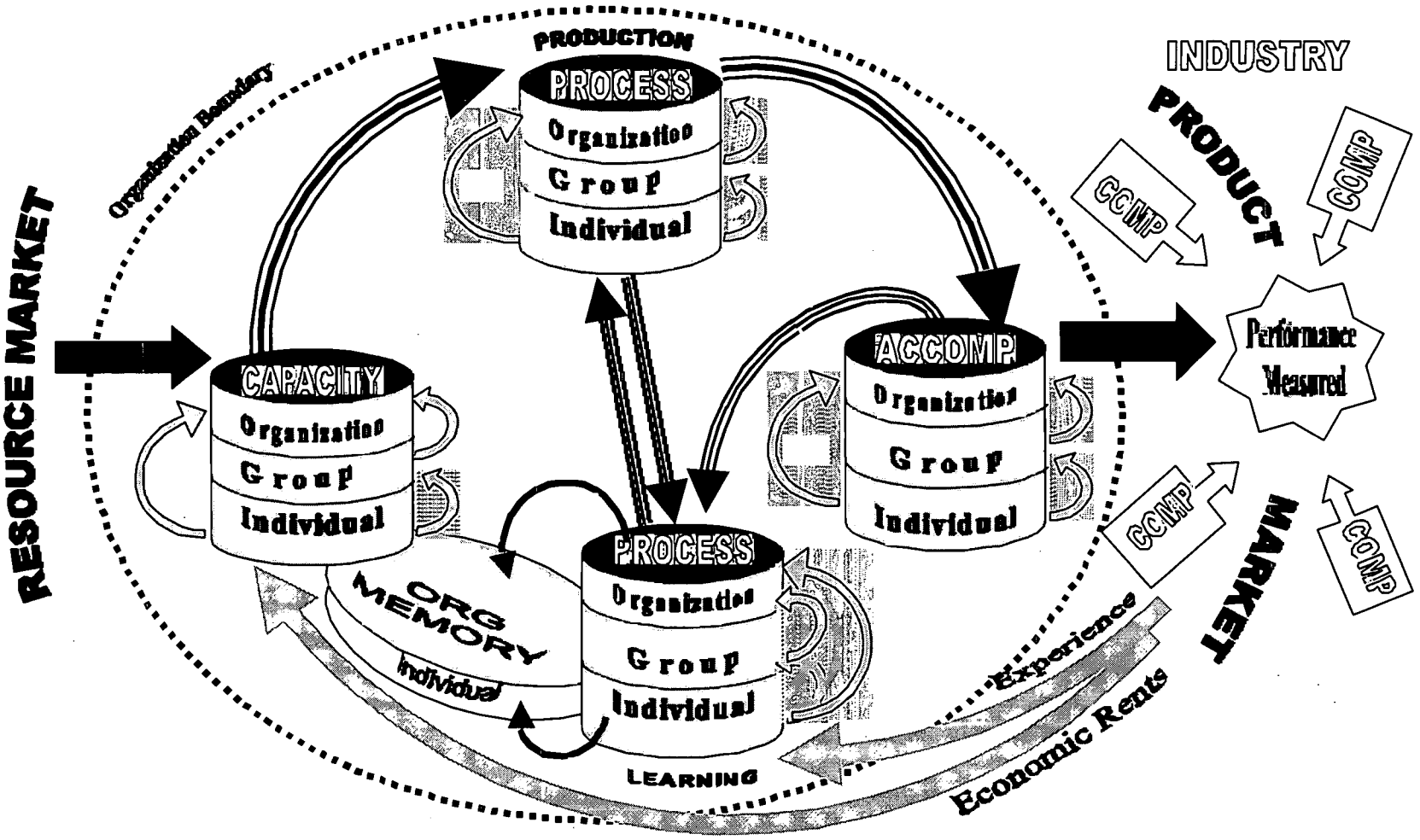

Figure 5. A Partial Model of Organizational Performance

models, organizations are viewed as collections of functions; individuals are addressed primarily by the organizational roles they play or the jobs they occupy; and the space in between is defined as process. These models guide the performance analyst to identify which job is responsible for what is done and when and how these tasks are interlinked in production process. To facilitate this approach, the "doing" is considered a generic function that can be accomplished in much the same way by anyone. Although these models have been effective in helping scholars and practitioners frame performance issues in a manner that renders them highly accessible, they may also have obscured our recognition of some of the most unique, human aspects of performance.

By contrast, *A Multilevel Theory of Organizational Performance*, operationalizes a social collective view of organizations by defining the space between the individual and organizational levels in terms of social interaction. When one considers the impact of social interaction, any combination of interacting individuals holds the power to create unique collective capacities and create accomplishments in different ways. These collectives may also learn and affect processes, outcomes, and capacities at supraordinate as well as individual levels. However, because social interaction is based in time, is often unpredictable, and is characterized by ambiguous boundaries, it is difficult to capture in theory and even more difficult to study empirically. This results in a highly complex theory that is more difficult to test and put into practice than those founded in task and process.

The limitations of the current study are those inherent in theory-building in general. The basis for these limitations was aptly described by Sutton and Staw (1995) who observed that organizational scholars engaged in theory-building "are forced to make tradeoffs between generality, simplicity, and accuracy" (p. 372). These tradeoffs leave the theory vulnerable to criticism. For example, establishing boundaries necessarily limits scope and thus generalizability. Overall, theories must be evaluated based on their ability to increase our understanding of a complex reality. But theories can never be more than "approximations" of reality, and "most verbally expressed theory leaves tacit some key portions of the originating insight" (Weick, 1995b, p. 387). Because any multilevel theory is necessarily more complex than theories that focus on one level at a time, the tension between scope and parsimony is a constant challenge. The question remains as to whether this theory achieves the appropriate balance between these essential elements.

Conclusion

The theoretical units representing performance aspects and levels developed for this theory were founded on traditional concepts, and, therefore, are not new. The contribution of this study lies in the inclusion of *all relevant interrelationships*. This is the multilevel dimension of the theory and the source of its complexity. The theory was developed with the intent of transforming traditional concepts of performance using contemporary multilevel thinking based on a social collective perspective. The result is a theory of questionable parsimony. Although some experts viewed the theory as integrating and holistic, others cautioned that its complexity may create an insurmountable barrier to research and application. The first view was more prevalent in the small group of experts participating in this study. However, if the latter view becomes dominant, the utility of the approach as conceived by contemporary multilevel scholars must be seriously questioned. This outcome is significant in itself and may indicate that this highly anticipated path to understanding is not a feasible one.

The development of *A Multilevel Theory of Organizational Performance* was guided by a desire to serve an integrative purpose that grows out of the holistic philosophy of systems thinking. The essence of this philosophy was most eloquently captured by an ancient Sufi teaching: "You think because you understand *one* you must understand *two,* because one and one makes two. But you must also understand *and"* (Meadows as cited by Wheatley, 1996, p. 241). The hope remains that multilevel theories such as this one will help illuminate both the forest *and* the trees of organizational performance.

References

Argyris, C., & Schon, D. A. (1996). Organizational learning II, Reading, MA: Addison-Wesley.

Bacharach, S. B. (1989). Organizational theories: Some criteria for evaluation. Academy of Management Review, 14, 496-515.

Barney, J.B. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17, 99-120.

Behling, O. (1978). Some problems in the philosophy of science in organizations. Academy of Management Review, 3, 193-201.

Bertalanffy, L. (1962). General system theory: A critical review. General Systems, 7, 1-20.

Chan, D. (1998). Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. Journal of Applied Psychology, 83, 234-246.

Coleman, J. S. (1986). Social theory, social research, and a theory of action. American Journal of Sociology, 91, 1309-1335.

Conner, K. R. (1991). A historical comparison of resource-based theory and five schools of thought within industrial organization economics: Do we have a new theory of the firm? Journal of Management, 17, 121-154.

Daft, R. L., & Huber, G. P. (1987). How organizations learn: A communication framework. In S. B. Bacharach & N. DeTomaso (Eds.), Research in the sociology of organization (Vol. 5, pp. 1-36). Greenwich, CT: JAI Press.

Dubin, R. (1978). Theory building. (Revised ed.). New York: The Free Press.

Fisher, S. R. (2000). A multilevel theory of organizational performance. Unpublished doctoral dissertation, Oklahoma State University, Stillwater, OK.

Glick, W. H. (1985). Conceptualizing and measuring organizational and psychological climate: Pitfalls in multilevel research. Academy of Management Review, 10, 601-616.

Holton, E. F. (1999). An integrated model of performance domains: Bounding the theory and practice. Performance Improvement Quarterly, 12(3), 95-118.

House, R., Rousseau, D. M., & Thomas-Hunt, M. (1995). The meso paradigm: A framework for the integration of micro and macro organizational behavior. In L. L. Cummings & B. M. Staw (Eds.), Research in organizational behavior (Vol. 17, pp: 71-114). Greenwich, CT: JAI Press.

Klein, K. J., Dansereau, F., & Hall, R. J. (1994). Levels issues in theory development, data, collection, and analysis. Academy of Management Review, 19, 195-229.

Klein, K. J., Tosi, H., & Albert A. Cannella, J. (1999). Multilevel theory building: Benefits, barriers, and new developments. Academy of Management Review, 24(2), 243-248.

Morgeson, F. P., & Hofmann, D. A. (1999). The structure and function of collective constructs: Implications for multilevel research and theory development. Academy of Management Review, 24, 249-265.

Mowday, R. T., & Sutton, R. I. (1993). Organizational behavior: Linking individuals and groups to organizational contexts. Annual Review of Psychology, 44, 195-229.

Passmore, D. L. (1997). Ways of seeing: Disciplinary bases of research in HRD. In R. Swanson & E. Holton (Eds.), Human resource development research handbook (pp. 114-137). San Francisco: Berrett-Koehler.

Reed, R., & DeFillipi, R. J. (1990). Causal ambiguity, barriers to imitation, and sustainable competitive advantage. Academy of Management Review, 15, 88-102.

Roberts, K. H., Hulin, C. L., & Rousseau, D. M. (1978). Developing an interdisciplinary science of organizations. San Francisco: Jossey-Bass.

Rousseau, D. M. (1985). Issues of level in organizational research: Multi-level and cross-level perspectives. In L. L. Cummings & B. M. Staw (Eds.), Research in organizational behavior (Vol. 7, pp. 1-37). Greenwich, CT: JAI Press.

Rummler, G. A., & Brache, A. P. (1995). Improving performance: How to manage the white space on the organization chart. San Francisco: Jossey-Bass.

Senge, P. M. (1990). The fifth discipline. New York: Doubleday.

Stacey, R. D. (1995). The science of complexity: An alternative perspective for strategic change processes. Strategic Management Journal, 16, 477-495.

Sutton, R. I., & Staw, B. M. (1995). What theory is not. Administrative Science Quarterly, 40, 371-384.

Swanson, R. A. (1996). Analysis for improving performance. San Francisco: Berrett-Kohler.

Swanson, R. A. (1999). The foundations of performance improvement and implications for practice. In R. J. Torraco (Ed.), Performance improvement theory and practice (pp. 1-25). San Francisco: Berrett-Koehler.

Walsh, J. P., & Ungson, G. R. (1991). Organizational memory. Academy of Management Review, 16, 57-91.

Watkins, K. E., & Marsick, V. J. (1993). Sculpting the learning organization. San Francisco: Jossey Bass.

Weick, K. E. (1995a). Sensemaking in organizations. Thousand Oaks, CA: Sage.

Weick, K. E. (1995b). What theory is not, theorizing is. Administrative Science Quarterly, 40, 385-390.

Wernerfelt, B. (1984). A resource-based view of the firm. Strategic Management Journal, 5(2), 171-180.

Wheatley, M. J. (1996). Leadership and the new science: Searching for a simpler way to lead organizations. In J. S. Ott (Ed.), Classic readings in organizational behavior (2nd ed., pp. 238-243). Belmont, CA: Wadsworth Publishing.

Is Knowledge in the Head or in the World?

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Despite the greater challenges to learning posed in demanding work environments, few studies examine the full range of factors needed to broaden our understanding of this important type of learning. This paucity of studies is due, in part, to an inadequate theory base for examining how skilled workers, technicians, professionals, managers and others attain competence in dealing with rapidly changing work situations. This paper begins to lay a theoretical foundation for this research using Dubin's theory building methodology.

Keywords: Theory Building, Work Activities, Work Skills

Working

Working consumes about three-quarters of our waking hours. Next to close social relationships nothing is more influential in our lives. For those who are challenged by their work, it can be a mixed bag of routine and novelty, rewards and disappointments, of fun and monotony. Some define success at work as simply learning to cope. For others acquiring fulfillment and expertise through work is a necessity that sustains career exploration until fulfilling work is found. Consider the following personal vignettes from the world of work:

> Sam is a 39-year-old control room operator on "Usra," a deep-sea petroleum production and drilling platform 65 miles offshore in the Gulf of Mexico. Sam's work schedule requires 14 days on the job followed by 14 days off. As deep-water drillers, Sam and others are involved with work that is enormously complex, with a number of workplace constraints—some technological, some human. The challenge, of course, is for everything and everybody (250 people) on this oil-and–gas platform to function smoothly. One mistake, and Usra could join the Exxon Valdez in the oil-and-environment-disaster history books. (from Lieber, (2000), Platform for Excellence).
>
> Software support technicians who provide direct customer service through hot lines face major challenges related to locating the sources of error underlying customer problems. Sifting through information from customers, technicians must decide what is and is not relevant to problems. Compounding the challenge, computer problems frequently interrupt customers' key business operations. Under the pressure of deadlines, customers are anxious to regain their lost computer capabilities. In addition, customers have diverse software and hardware configurations. The customer problems that technicians encounter are poorly defined and often conflict with the belief that software programs do exactly the same thing every time you run them. If a customer has encountered a problem since the last time a program was successfully run, something must have changed. Lacking a definitive diagnosis of the problem, the preferred solution is to tell customers to remove all unfamiliar system features until the software works again. The overriding principle is that anything that resolves the problem is justified and acceptable, as long as it works. Thus, the precision and logic suggested in theory are replaced by behaviors that are far more contingent and difficult to anticipate in practice. (from Brian T. Pentland (1997), Bleeding Edge Epistemology: Practical Problem Solving in Software Support Lines).
>
> "So you want to understand our work on an aircraft carrier? Well, just imagine that it's a busy day and you shrink San Francisco Airport to only one short runway and one ramp and gate. Make planes take off and land at the same time, at half the present time interval, rock the runway from side-to-side, and require that everyone who leaves in the morning returns the same day. Make sure that equipment is so close to the edge of the envelope that it's fragile. Then turn off the radar to avoid detection, impose strict controls on radios, fuel the aircraft in place with their engines running, put an enemy in the air, and scatter live bombs and rockets around. Now wet the whole thing down with salt water and oil, and man it with 20-year-old's, half of whom have never seen an aircraft close up. Oh, and by the way, try not to kill anyone." Senior Air Operations Officer, USS Carl Vinson. (from Rochlin, LaPorte, and Roberts (1987), The Self-designing High-reliability Organization: Aircraft Carrier Flight Operations at Sea).

"My job as a reservationist is like being on a production line, only I work at a computer on the Astrojet Desk. This is our airline service is for commercial and business customers. They're all frequent flyers who know they're supposed to be getting premium service. So they request things no one's ever heard of before, and they get them! And they want them now! One crazy request after another—like a production line. They monitor our calls and listen to some of our conversations, to improve customer satisfaction, they say. I'm never bored, but this sure is hectic—like a production line. I can hardly learn new things fast enough to keep up." Carol Gleason, 27, works for a major airline.

On any given day work involves activities that may range from dealing with routines to reacting to emergencies. The passages from the work vignettes above demonstrate expertise in action. While these accounts are, first and foremost, about work, they illustrate situations in which learning is closely enmeshed with the conduct of work itself.

Problem Statement

In many cases, learning and working are indistinguishable. Each of the passages above was elicited by a simple inquiry about the type of work these people do all day. When asked about their work, most people including those in complex work environments, relate what they do in terms of the activities and tasks they perform without mentioning the learning that is inevitably needed to acquire their skills. Unfortunately, however, many skilled workers, technicians, and professionals appear to be on their own in dealing with these situations. In many cases they must devise their own learning experiences, which frequently include trial and error. Today's work environments increasingly demand "thinking on one's feet"—learning that is tightly interwoven with the temporal and technical constraints of the work itself. What are the implications of this reality for education and training? Does this type of learning require more attention to the technical and environmental aspects of learning? At present little is known about the successful integration of learning and working.

Recent research in activity theory and cognitive science suggests that physical and environmental factors in the workplace influence how expertise is acquired and demonstrated on-the-job (Hutchins, 1995; Scribner, 1984; Suchman, 1987). This research emphasizes the need for a clearer understanding of how discrimination occurs between internal and external sources of knowledge, that is, *knowledge in the head* and *knowledge in the world.* Knowledge in the world represents knowledge that does not require encoding in long-term memory because it is readily available "in the world." That is, this knowledge resides within work activities as environmental artifacts such as operating instructions, job aids, and software programs designed to reduce the representational and computational load placed on the human agent (Norman, 1988; 1997). This perspective suggests that both knowledge in the head and in the world are essential for the development of the sophisticated expertise demanded in many of today's work environments.

Given the influence of physical and environmental factors in the workplace, how complete an understanding of work activities themselves must we have to fully harvest these potential advancements in our understanding of work-related learning? Frameworks and taxonomies have been developed to examine different types of work and their components. Taxonomies of work activities (Gagne, 1962; McCall, 1988; Swanson, 1994; Winter, 1987) and taxonomies of learned capabilities (Gagne, Briggs and Wager, 1988; McLagan, 1989) are considered individually later in this paper.

Several learning theories are also reviewed (experiential learning, situated cognition, and activity theory). Although these theories specifically address developmental processes, they were not designed to explicitly relate to various kinds of work activities. They do not address the influence the work itself has on this type of learning. Thus, our present theory base remains inadequate for providing a full understanding of how people interact with work activities, especially in today's rapidly changing work environments. New and better theoretical understandings in this area are needed.

Research Design

This paper has two purposes. First, it is intended to expand our present theoretical knowledge basc to support future studies of this type of learning. Second, this paper is intended to contribute to advancing our knowledge of how to develop conceptual systems and, ultimately, how to build formal theory itself. Scholarly work in this area is necessarily guided by conventions that are appropriate for theory development in applied domains. The research design of this paper follows the theory building methodology of Dubin (1978). Dubin's philosophy and methodology for theorizing was developed for theory building in the behavioral sciences. The theoretical products of Dubin and others who have used this methodology demonstrate the value of this methodology for building theory

in applied fields such as human resource development. Specifically, this paper will select, justify, and develop the conceptual elements and relationships that provide the basis for a theoretical system to support research on the type of work-related learning of interest here. The theoretical product will then be compared with taxonomies of work and present theories of learning to demonstrate the product's contribution to our knowledge of this type of learning.

Theoretical Formulations

Dubin's methodology for theory building requires attention to a pivotal task at the outset—specifying the major concepts and relationships that provide the basis for the theoretical system (Dubin, 1978). These components of theory building require the specification of the *units of the theory*—stating the key concepts or building blocks around which the theory will be developed, and developing the *laws of interaction*—the relationships among the units (concepts) of the theory that show the associations and the sequential or determinate relationships between and among the concepts. Brief descriptions of these elements follow as the basis of the proposed theoretical system.

Units of the Theory

The units of the theory are the concepts or building blocks around which the theory is developed. The central elements of concern for examining work and leaning in today's work environments are the worker and the work to be done. The essence of a system for understanding this phenomenon is the subject and object of the phenomenon—the worker and his or her work. The human agent and the work activities performed are two basic elements that form the basis for a carefully developed system of concepts and relationships to advance our understanding of this type of learning. These two units of the theory are briefly described next.

The Human Agent (Worker). The human agent possesses the knowledge and skills to perform various types of work. More important for work activity, the agent possesses the cognitive capabilities to process information and to assimilate new knowledge. These capabilities allow the agent to integrate existing knowledge with new knowledge as it is generated and needed to undertake new work activities. Cognitive processing allows existing knowledge and new knowledge to be reconciled and incorporated into a growing repertoire of expertise (Anderson, 1988). The human agent also demonstrates affective capacities at work—motives, aspirations, feelings, and anticipation of consequences of actions at work. A classification of affective behaviors was developed by Krathwohl, Bloom and Masia (1964). The psychomotor dimension of work behavior has been represented by Harrow (1972) as a taxonomy of psychomotor learning. Human cognitive, affective, and psychomotor capabilities constitute the potential of human agents for learning about and performing work activities.

Work Activity (Task). The work activity itself is central to the understanding of work-related learning. According to activity theorists, whose interests include but are not limited to work activities, the starting point and primary object of analysis is the actual process of interaction in which humans engage the world and each other. Sequences of work organized around motives constitute work activities. These activities are always part of a social system that has been culturally developed and that continues to change. The concrete contents of work activities include the tools, symbols, material resources, and procedural information that distinguish work activities from one another. The also includes the dynamics of the work activity (the process and modes of action through which it unfolds and its interaction with related work activities). Finally, all work activities occur in the larger context (that is, environment, organization, system) in which they are carried out. All work activities, in the abstract, are constituted by these elements. A specific component of a work activity is identified as a task. Thus, the *nature of a work activity* is conceptualized as having the following elements:

- *Contents* of work activity—the tools, symbols, materials, and procedural information of the work or task.
- *Dynamics* of work activity—the processes and modes of action through which it unfolds and its interaction with related work activities.
- *Context* of work activity—the environment, system, or other relevant context in which they are carried out.

The two main conceptual elements *(units of the theory)* whose interaction constitutes work performance are represented in Figure 1. (See Figure 1, *Agent-Work Activity Interaction).*

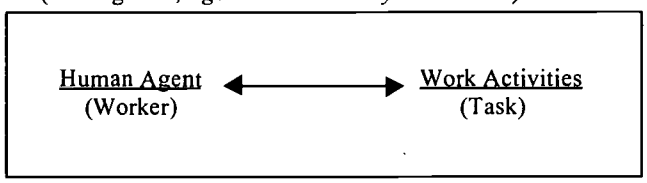


Figure 1. Agent—Work Activity Interaction

Conceptual Relationships Among the Concepts

The relationships among the concepts (units) of a theory are described in the theory's *laws of interaction* (Dubin, 1978). There are three general types of laws of interaction. These types of laws—categoric, sequential, and determinant—encompass all forms for expressing relationships among the concepts of a theory. Categoric laws state that values of a unit of the theory are associated with values of another unit. Sequential laws use a time dimension to describe the temporal relationships among two or more units. A determinant law of interaction is one that relates determinate values of one unit of the theory with determinate values of another unit. Since determinant laws of interaction describe specific relationships among units with determinate values, they are used in the physical sciences where such precise relationships are more common than in the behavioral sciences. The relationships among agents work activities are categoric laws since each specifies a relationship in which one or more conceptual elements *are associated with* (versus *determined by*) other elements of the theory. These conceptual relationships are described next.

Interaction of Agent and Work Activity. The interaction of agents with work activities may involve the movement of agents from one job (or work role) to another. Work is frequently a stimulus for novelty and innovation. Many are drawn to certain types of work because the nature of the work invites human creativity and innovation. Work that ceases to provide this type of stimulation (e.g., a once-innovative product or service that reaches maturity) can no longer engage those who are attracted by creativity, innovation, and entrepreneurship. Workers who remain with this type of work experience stagnation. Stasis in agent-work activity interactions necessitates movement among jobs if worker growth is to continue. Conversely, agent-work activity interactions involving learning are those in which the work activity and agent are both dynamic. There are multiple manifestations of dynamic agent-work activity interactions. These are classified in two categories: (a) the *rates of change* between and among agents and work activities, and (b) the *types and combinations of change* involving agents and work activity. Each of these agent-work activity dynamics is briefly described next.

First, the *rates of change* may vary between one or both of the constructs (the agent and/or the work activity). With the ever-increasing influence of technical innovations, the rate of change in work processes is increasing due to the integration of technology. Change is manifested in many human agents as their motives, aspirations, expertise and other work-related characteristics continuously grow and change over time. With respect to the possible effects of these changes, it is often the *relative* rates of change between and among agents and work activities that are of particular interest. That is,

Second, various *types and combinations of change* are possible among the two concepts. The constituent elements of the agent (human capabilities) and of work activity (its content, dynamics, and context) interact in different combinations as various types of change occur. A simple combination of change types might involve both the agent and the work activity as would occur with an ergonomic modification of the workplace after a worker illness or injury. A complex combination of change types might involve fundamental work process redesign that includes new materials and process dynamics. This would require more sophisticated change in the effected agents, who would need retraining and new skills.

Learning as change

The *rates of change* and the *types and combinations of change* among agents and work activity provide the basis for examining changes involving the phenomenon of primary interest—learning at work. Among the various types of change, we would expect some to involve greater opportunities for learning than others. For example, a simple change in work content may require little or no learning (e.g., a change in product packaging). On the other hand, change involving the type of work process redesign mentioned above affords a greater opportunity for learning, as it requires the acquisition of new skills.

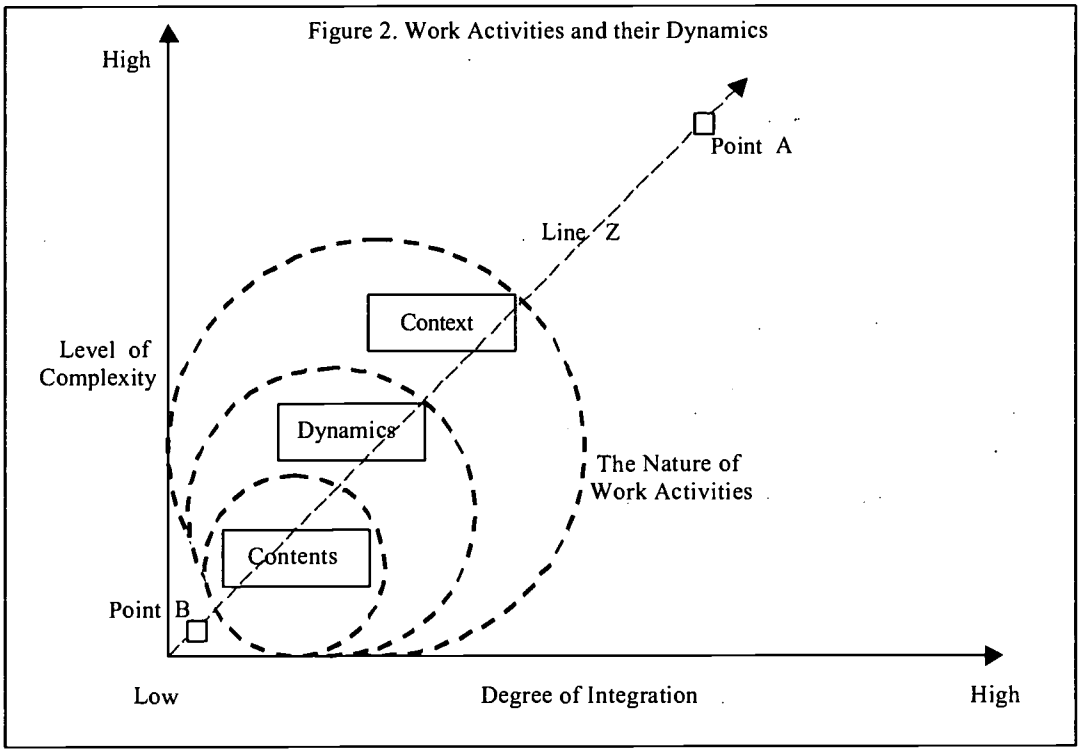
Variability in learning opportunities is also associated with different rates of change among agents and work activities. Rapid change in work processes is fast becoming the norm in many work settings. A high degree of change in work is associated with a greater demand for agent expertise. As stated above, the relative rates of change between agents and work activities are of concern when change in one outstrips the capacity for change in the other. For example, internet-based innovations in commercial and business transactions are multiple examples of the changing context and dynamics of work activities. Many workers have anticipated these developments and have upgraded their work skills accordingly. For others, these developments reveal their inability to keep pace with the accelerated rate of technological change in how work is accomplished. The agent-work activity interactions that have potential for learning are those in which the *rates* and *combinations of change* between agent and work activity can be determined and related. These are the work situations of primary interest in this paper.

Work Activities and Learning

It is possible that the degree of change, and of learning, required by agents is related to whether change involves the contents, dynamics, and/or context of work activities. For example, it is likely that simple changes in work contents require less learning than more complex changes involving the context and dynamics of work activities. The latter changes in work activities involve the processes through which work activity unfolds and change in how the work and the agent(s) who perform(s) it interact(s) with other related work activities. Clearly, these are sophisticated changes that involve other agents and work processes. They would seem to place greater demands on the agent's capacity for learning than a simple change involving new materials only.

This relationship is expressed in Figure 2. (See Figure 2, *Work Activities and their Dynamics).* The circular figures in the model represent the nature of work activities. The vertical and horizontal axes that bound the model represent the major dynamics in the work activities discussed in this paper—the *change* in work activities accounted for by their levels of complexity and degrees of integration.

Figure 2. Work Activities and their Dynamics



The *level of complexity* of work activities varies from high to low and is represented in Figure 2 by the vertical axis. Work activity *contents, dynamics,* and *context* are each characterized by their own levels of complexity. For example, the contents of an airline baggage handler's work activities may be quite straightforward, yet the context of this work, a busy international airline terminal, may be complex. Conversely, the contents of a college professor's work activities may be complex, yet the context of this work, especially if it is devoted primarily to classroom teaching, is fairly straightforward. While the levels of complexity of work activity *contents, dynamics,* and *context* are clearly interrelated in most work environments, the concept of complexity is conceptualized here as having independent as well as interdependent effects on the three components of work activity.

The *degree of integration* can also vary within and among the components of work activities. This is represented in Figure 2 by the horizontal axis. Low integration among the *contents, dynamics,* and *context* of work activity means that there is little relationship between these components of work activity. The comparison of two different kinds of work activity helps distinguish low from high degrees of integration in these components. The work of an interagency courier demands competence in the contents and, to a lesser degree, dynamics of this work. However, it requires little or no expertise in the context of this work (i.e., interagency systems). The courier simply delivers materials to the right place at the right time. Conversely, the work of an information systems director

requires a great deal of integration among the *contents, dynamics,* and *context* of work. The competence of the information systems professional not only includes the technical aspects of information technology, that is, the *contents* (the tools, symbols, materials, procedures) and *dynamics* (the processes and modes of action) of this work, but also knowledge of the larger contextual issues required for successfully integrating information systems among diverse departments and functions of the organization's sub-systems. Since the degree of integration in work activities applies across the components of *contents, dynamics,* and *context,* this construct is conceptualized as having interdependent effects on the components of work activity.

The Dynamics of Work Activities

The dynamics of work activities represented in Figure 2 suggest that important contrasts exist between different types of work. These contrasts illustrate the potential importance of the nature of work activities to our understanding of agent-work activity interactions and, ultimately, to the phenomenon of work-related learning. Consider a hypothetical continuum represented in Figure 2 by the dotted diagonal line *Z*. The point at the upper right end of line *Z* designated as point A represents a work situation characterized by both a high level of work complexity and a high degree of work integration. In contrast, the point at the lower left end of line *Z* represented by point B is a work situation characterized by both a low level of complexity and a low degree of integration in the work activities. These points in Figure 2 represent two types of work activities with distinctive features that relate both to the nature of work and to work-related learning. An example of the contrast between these types of work will illustrate the potential importance work activity has to our understanding of agent-work activity interactions and, ultimately, to the phenomenon of work-related learning.

An example of contrasting work activities. The worldwide shipping business has grown into a huge industry that has undergone a fundamental transformation since its inception as a critical business function after World War II. Shipping packages to locations in distance countries used to be a gamble involving questionable arrival at the right location and even greater concerns about the timeliness of deliveries. Actual confirmation of delivery by the sender could only occur through written or verbal contact with the receiving party. Personnel working for shipping companies were concerned primarily with the physical movement of packages. The tracking of packages moving throughout the company's shipping system was not yet an important concern. Contact by a customer with a shipping company representative to determine the location of a shipped package might yield information only that a given package had not yet arrived and was likely still in transit.

Today, uncertainty regarding the tracking of packages is no longer tolerated by either customers or shipping companies themselves. Comparing the work activities of the former company representative with today's practices that yield precise shipping locations and timetables serves as a useful contrast in work activities that illustrates the different levels of complexity and integration among their components. The shipping worker in the earlier example was focused on a narrow portion of a linear shipping process in which the functions of materials handling, pricing and labeling, and providing the transportation (i.e., delivery driver) accounted for a vast majority of shipping services. The work activities followed basic procedures composed of relatively simple tasks. Representing point B in Figure 2, the work of service representatives, materials handlers, or delivery drivers required little awareness of the larger work context, as long as they performed their particular tasks, however narrow in focus, reliably and efficiently. Tracking package locations, if done at all, was someone else's job.

In contrast, working knowledge of shipping timeframes and locations is now required of a majority of shipping company job categories. Representing point A in Figure 2, today's work activities are likely to require the use of computers, the handling of both packages *and* information from shipping databases, and broad contextual knowledge of the shipping business that includes the nuances of shipping practices in foreign locations and diverse cultures. This work is both more complex and fully integrated than the work activities of traditional employees.

Discussion—The Nature of Work Activities and their Implications for Learning

Any given work task, including those represented by points A and B in Figure 2, exists apart from the person(s) who might perform the task. Work activities (tasks) are conceptually distinct from human agents (workers). Each of these key concepts brings distinctive features to agent-work activity interactions. Agent-work activity interactions provide the context for the phenomenon of interest—work-related learning. The nature of work activity itself contributes a substantial measure to the dynamics of this interaction. The contrast between the two types of work shown in Figure 2 was intentionally drawn as a simple and straightforward example. Yet in today's rapidly changing world of work, countless situations exist that illustrate starker contrasts in *the nature of work activities themselves.* The contrasting work of the grocery bagger and the research scientist is one of an infinite number of such examples. The nature of work activities provides the content of work performance, the substrate within which the agent and work activity react. Examining the nature of the work to be performed and how the agent experiences and, ultimately, learns to conduct such work activities holds great promise for advancing our understanding of work-related learning.

Accounts of the influence of the work itself on this type of learning, however, are missing altogether in most theories of learning. Experiential learning theory, the theory of situated cognition, and activity theory are briefly reviewed next. After the review of theories, several taxonomies of work activities are then explored to examine how well these theories and taxonomies account for the character and dynamics of work activity.

Experiential and Situated Theories of Learning

The *experiential learning model* offered by Kolb (1984) frames learning as a process based in experience in which a person encounters a new idea, reflects upon it, compares it to what else he or she knows, tests it in a real situation, reflects on the

meaning of the consequences of the action, and then formulates a new theory of action or revises an existing one. Schon (1983) described the pragmatic use of knowledge and problem solving used by professionals on the job in the *reflection-in-action* model. *Reflection-in-action* model is an iterative process that moves through (a) assessment of the situation, (b) testing of one's preliminary sense of the problem through experiments, (c) examination of results, and (d) reassessment leading to another cycle of problem reformulation (Schon, 1983, 1987). One's preliminary assessment of a unique and uncertain situation is tested to see if a plan based on the assessment will lead to progress in resolving the problem. One conducts an experiment to examine the validity of one's preliminary assessment. The consequences may include unintended changes which give the situation new meanings. According to Schon (1983), "the situation talks back, the practitioner listens, and as he appreciates what he hears, he reframes the situation once again" (p. 131). Learning occurs through an iterative process of purposeful actions, discovered consequences, implications, reassessments, and further actions.

Situated Cognition

Unlike conventional theories of how learning occurs in formal structured settings, situated cognition starts with activity the activity itself—a position fully consistent with *activity theory*. Situated cognition views learning through an "activity—perception—representation" model, in which the cognitive dynamics of learning appear less open to the preconceived knowledge schemas that are dominant in formal instruction (Brown, Collins and Duguid, 1989). When people lack experience with a situation or are introduced to a new concept, providing them with a model or description of the new situation or concept is a useful catalyst for forming mental representations of what is learned. While inexperienced people may accept such a model, they will try to integrate it with new activities and perceptions, and any past experiences that they may consider relevant. The model will become part of the present context for learning, in which the learner's activities and perceptions precede mental representation.

Activity Theory

Activity theory attempts to explain purposeful behavior by focusing on the structure of the activity itself. Leont'ev (1981), a development psychologist and colleague of Vygotsky, developed the activity theory as reviewed here. For Leont'ev, the appropriate unit of analysis for studying purposeful behavior in the workplace is the activity itself—the *task*. If we are interested in accomplishing real world tasks, the *task* should the unit of analysis, not isolated, abstracted components of the task. According to Leont'ev, an activity can be analyzed at three levels. First, the motivation of the activity, at the highest level of organization, provides coherence to the other levels. At the next level are goal-directed actions, carried out in the service of the activity. At the third level are operations, or the specific conditions under which actions are carried out. For example, if our action is travelling from point A to point B in the service of some activity, whether we walk or drive is an operation that depends on the distance and availability of a car. Operations, which depend on the circumstances, refer to how an action is done.

Schemes for Classifying Work Activities

Roughly forty years ago, Gagne first noted that the issue of highest priority for users, designers, and scholars of training and education for work is the specification of *what is to be learned.* As a scholar of instructional systems himself, Gagne's (1962) seminal treatise in *American Psychologist* alerted us to the importance of first examining the tasks to be learned in order to *specifically* address the issue of what the training program is intended to accomplish. Later, he developed a taxonomy of capabilities to be learned that still serves as a starting point for the design of work-related instruction (Gagne, Briggs and Wager, 1988).

Winter (1987) described the taxonomic dimensions of work expertise as a way of assessing its strategic value to organizations. Winter used several dimensions of knowledge and work tasks to develop several continua along which various types of work expertise could be described and classified. These dimensions of work expertise include their observability, complexity, articulability, a procedural-conceptual continuum, and an independent-systems element continuum. McCall's (1988), who studied experiential learning, produced a taxonomy of events from the work experiences of subjects that consistently provided opportunities for their learning. These events were classified as (a) work assignments (for example, initiating or fixing a project, line to staff assignment), (b) hardships (for example, business failures, personnel performance problems), (c) key interactions with people, (for example, role models), and (d) other events (for example, first supervisory experience). These events (17 in total) were integrated with 34 areas of learning content to produce an experiential learning matrix.

Swanson's (1994) taxonomy of performance specifies five levels of work performance in the context of two broader systems goals: *maintaining a system* or *changing a system.* Within the systems maintenance category are the levels—understand, operate, and troubleshoot. Within the systems change category are the levels—improve and invent. Each of these five performance levels is associated with a distinct set of work objectives and outcomes. This taxonomy of performance effectively addresses the perennial confusion associated with acquiring the expertise to maintain systems versus the expertise needed to change or improve them.

McLagan, who directed the seminal ASTD project that produced the *Models for HRD Practice,* developed a classification of specific competencies derived from four general categories of work—technical, business, intellectual, and interpersonal (McLagan, 1989). These categories provide the framework for a roles-competencies matrix that includes more than two dozen skills derived from work activities such as electronic systems skill, performance observation skill, computer skill, and cost-benefit analysis skill.

These taxonomies of work activities (Gagne, 1962; McCall, 1988; Swanson, 1994; Winter, 1987) and taxonomies of learned capabilities (Davenport and Prusak, 1998; Gagne, Briggs and Wager, 1988; McLagan, 1989) examine different types of

work and their components. While they provide useful schemes for classifying the various types of work activities that frequently constitute the *content* work-related learning programs, they do not address directly the *processes for learning* about these work activities and acquiring the skills to perform them.

Conclusions and Implications for Further Research

A central question, and perhaps the most important question for educators at this point, is how complete an understanding of work activities themselves, beyond the theories and taxonomies discussed above, must we have to fully harvest these potential advancements in our understanding of this type of learning? In a word the answer is, a much fuller understanding of work activities is needed than currently exists. Present studies of workplace learning focus primarily on the learner and context variables related to the learner. New insights into individual learning variables have come without a corresponding increase in our understanding of the work activities themselves. Few studies contain the rich description of work activities needed for a greater understanding of work-related learning. Only the studies of Scribner (1984), Suchman (1987), and Hutchins (1995) seem to adequately address *both* the characteristics of the agent *and* of the work activity that is needed for a balanced understanding of this phenomenon.

Further research is needed to examine the source of expertise on work activities. If greater understanding of work activities is needed, then where does this expertise come from? The traditional source of work expertise is the subject matter expert (SME). The SME has been used by educators seeking to design learning experiences in specific areas of work content. However, SMEs are conspicuously absent from much of recent literature on work-related learning. Their absence reflects the changing nature of the work itself. Work activities now evolve more quickly than in the past. Fewer SMEs exist since less time is available for gaining the experience needed to achieve this status. Instead, employees who are confronted with changing work activities become *in situ learners,* and by default, acquire the responsibilities formerly held by SMEs. Thus, increasingly the learner is the work activities "expert." This is clearly inconsistent with present theories and models of education for work.

Today's work environments demand greater flexibility for learning and working that enables workers to meet changing conditions. Our present theory base is inadequate for addressing this situation. Scholars who value this type of learning cannot afford to remain disengaged from the theoretical and research challenges posed by today's work environments. New and better theory in this area is needed. This will require further research on both the content and process of theorizing.

References

Anderson, R. J. (1988). Human cognition and problem solving. American Psychologist, 32, 17-23.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Researcher, 18(1), 32-42.

Brown, J. S., & Duguid, P. (2000). The social life of information. Boston: Harvard Business School Press.

Campbell, J. P. (1990). Training design for performance improvement. In J. P. Campbell & R. J. Campbell (Eds.), Productivity in organizations. San Francisco: Jossey-Bass.

Dubin, R. (1978). Theory building (revised edition). New York: Free Press.

Gagne, R. M. (1962). Military training and principles of learning. American Psychologist, 17, 83-91.

Gagne, R. M., Briggs, L. J., & Wager W. W. (1988). Principles of instructional design (3rd edition.). Fort Worth, TX: Holt, Rinehart and Winston.

Howard, A. (Ed.). (1995). The changing nature of work. San Francisco: Jossey-Bass.

Hutchins, E. (1995). Cognition in the wild. Cambridge, MA: MIT Press.

Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Englewood Cliffs, N.J.: Prentice-Hall.

Leont'ev, A. N. (1981). Problems of the development of mind. Moscow: Progress Publishers.

Lieber, R. (2000). Platform for excellence. Fast Company, 18, 206-220.

McCall, M. W. (1988). Developing executives through work experiences. Human Resource Planning, 11(1), 1-11.

McLagan, P. A. (1989). The Models: Models for HRD practice. Alexandria, VA: American Society for Training and Development.

Norman, D. A. (1988). Knowledge in the head and in the world. The psychology of everyday things. New York: Basic Books.

Norman, D. A. (1997). Melding mind and machine. Technology Review, 100, 29-31.

Rochlin, G. I., LaPorte, T. R., & Roberts, K. H. (1987). The self-designing, high-reliability organization: Aircraft carrier flight operations at sea. Naval War College Review, 40(4),76-90.

Schon, D. A. (1983). The reflective practitioner: How professionals think in action. N.Y.: Basic Books.

Schon, D. A. (1987). Educating the reflective practitioner. San Francisco: Jossey-Bass.

Scribner, S. (1984). Studying working intelligence. In B. Rogoff & J. Lave (Eds.). Everyday Cognition: Its Development in Social Context. Cambridge, MA: Harvard University Press.

Suchman, L A. (1987). Plans and situated actions: The problem of human-machine communication. Cambridge: Cambridge University Press.

Swanson, R. A. (1994). Analysis for improving performance: Tools for diagnosing organizations and documenting work expertise. San Francisco: Berrett-Kohler.

Winter, S. G. (1987). Knowledge and competence as strategic assets. In D. J. Teece (Ed.), The competitive challenge (pp. 159-184). Cambridge, MA: Ballinger.

A Performance Perspective Synthesizing Intellectual Capital, Knowledge Management and Organizational Learning

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The purpose of this paper is to advance the discussion of theory building aimed at improving "knowledge worker productivity". The article presents the topic in two parts: 1) revised definitions of the constructs intellectual capital, knowledge management and organizational learning; which are used to expand the definition of human capital; 2) a systems view of the components of human capital.

Keywords: Intellectual Capital, Knowledge Management, Organizational Learning

Importance of Knowledge

Ever since pioneering work on human capital in the 1960's, the organizational value of employees' knowledge and skills has received increased attention. As the economic emphasis has shifted from production/manufacturing to service and information, "knowledge and human expertise are increasingly recognized for what they are: the source of value creation" (Lank, 1997, p. 306). A number of socio-economic theorists have echoed this attention to the increasing importance of human mental capabilities and their relationship to organizational survival and advancement. Drucker (1993) describes the "knowledge society" as a shift from emphasis on capital and production resources to emphasis on "knowledge" resources. He differentiates a "knowledge society" from an industrial society, by stating, "knowledge has become the resource, not just another resource alongside the traditional factors of production – labor, capital and land)." Quinn, Anderson, and Finkelstein (1996) reinforce Drucker (1993) when they recommend, "leveraging the organization's intellectual capital" and cite US government reports showing software, medicine, communications, and education (knowledge work) provide 79 percent of all jobs and 76 percent of all U.S. GNP. Romer (1993) points out the primary difference between industrial capital and human capital, calling "knowledge", the only unlimited resource and the one asset that grows with use. Stewart (1994) warns companies to focus less on what they own and more on what they know: their IC. (Drucker, 1999) summarizes the importance of humans in organizations with the following statement (p. 79)

> "the most important contribution of management in the 21st century is increasing the productivity of knowledge work and knowledge workers" (highly qualified and educated professionals converting information into knowledge largely through their own competencies. (Svieby, 1997).

Accepting Drucker's (1999) statement creates urgency for organizational researchers (themselves knowledge workers) to develop theory for describing, predicting and explaining "knowledge worker productivity." Consequently, an increasing number of scholars in the fields of economics, information technology, human resource development, management, psychology, organizational behavior, organizational theory, sociology, and strategy have begun theorizing about "knowledge worker productivity" and its importance to organizations.

Edvinsson and Malone (1997) proposed a theory of "value capital" as the interaction of human capital, organizational capital and customer capital. Harris (2000) proposed a more dynamic theory of IC using human capital and systems theory. In (1995), Nonaka and Takeuchi advanced a theory of knowledge creation in Japanese firms. At about the same time, Leonard-Barton (1995) published a study of knowledge management in manufacturing firms and most recently, Torraco (2000) introduced a theory of knowledge management using Dubin's (1978) theory building methodology. Management and organizational scholars recognize the importance of "knowledge worker productivity" by focusing on organizational learning Cangelosi and Dill, 1965). Crossan, Lane, and White (1999) offer an organizational learning framework identifying strategic renewal as the underlying phenomenon of interest as a precursor or a component of a more complete theory of OL.

Most organizational researchers agree on the importance of humans to organizations and that the knowledge bases mentioned earlier share common themes. Crossan et. l. (1999) reinforces this assertion by noting that the fields of *intellectual capital* (Edvinsson and Malone, 1997; Quinn, Anderson and Finkelstein, 1996; Stewart, 1997), *knowledge*

creation (Nonaka and Takeuchi, 1995) and *management* (Conner and Prahalad, 1996; Davenport and Prusak, 1997; Grant, 1996; Kogut and Zander, 1992, Svieby, 1997; Torraco, 2000), and organizational learning (Cangelosi and Dill, 1965; Daft and Weick, 1984; Dixon, 1993; Fiol and Lyles, 1985; Huber, 1991; Crossan, Lane and White, 1999), share common ground, namely, "recognizing the importance of knowledge to the success of the enterprise (p. 524)." Despite this acknowledged importance and research attention from such diverse perspectives, there is a scarcity of useful language for discussing the subject "knowledge worker productivity". Winter (1987, p. 184) summarizes this dilemma,

> "Within each microcosm of expertise or skill, there is of course, a specialized language in which that particular subject can be discussed. At the opposite extreme there is terminology that is very broad in scope, such as information, innovation, skill, technology transfer, diffusion, learning and of course, knowledge and competence."

Research Question

How can these related but diverse knowledge bases inform each other to produce theory about the role of *knowledge* in organizations and organizational performance?

Two major tasks seem necessary to answering this question. First, is to define the phenomena of interest with sufficient clarity and a high enough level of abstraction to reduce some of the confusion generated by the many different perspectives and terminology. Since, concepts are the building blocks of science (Dubin, 1978; Klimoski, 1991), Osigweh (1989) notes that the need for developing precise concepts cannot be overstated. Furthermore, ill-defined concepts produce imprecise research results making it difficult to produce *cumulative* knowledge that is (Achinstein, 1968). Second, is postulate a theoretical relationship among these concepts, which points researchers towards the questions requiring research into improving "knowledge worker productivity".

Accordingly, the purpose of this paper is to advance the discussion of theory building aimed at improving "knowledge worker productivity". The article addresses the topic in two parts: 1) revised definitions of the constructs IC, KM and OL; which are used to expand the definition of human capital; and 2) a systems view of the components of human capital.

Knowledge Bases Related to Human Capital

Intellectual Capital

Table 1 details the variety of definitions of the concept. An analysis of these definitions reveals areas of both agreement and disagreement among the selected authors. Klein and Prusack, Stewart and Quinn fail to capture the importance of organizations as "collectors " and "amplifiers" of knowledge and lack the depth of definitions proposed by Brooking, Edvinsson and Malone and Sveiby. Furthermore, while Brooking, Edvinsson and Malone and Sveiby's definitions present a number of common elements and even use common terms, they disagree about categories or classification of the various products derived from IC. For example, Brooking's Market Assets (repeat business percentage, branding, market dominance) and Sveiby's External Structure (brand names, trademarks, reputation and image) contain many of the same elements, but mix different levels of tangibility. It also seems necessary to recognize the differences between those IC assets represented by individuals (knowledge, expertise) and the synthesis of those qualities represented in the collective (processes, methods). The three areas of agreement among the more authoritative definitions are the importance of individual knowledge; the collective results of human expertise enable the organization to perform and the combination of these two elements results in output that both increases in value and is transferable.

Blending these definitions produces three elements of IC:

Human asset represents the capacity, inseparably embedded in the nervous system of a specific individual, to act in a wide variety of situations in fulfilling the organization's mission. This asset forms the foundation for the accomplishment of work in an organization. Examples include intellect, know what, know how, know why, care why, knowledge, skills, competence, expertise and experience.

Structural assets embody both intangible (often tacit) and tangible, collective outputs of human cognitive work essential to accomplishing work in an organization. This definition emphasizes the group/process, and organization levels, as well as the combination and synthesis of many human assets represents the capacity to perform tasks too complicated or too large for individuals (Dixon, 1993). This concept does not include physical assets such as computer systems or databases, because they are tangible assets and thus quantifiable and transferable. Examples include organizational culture, concepts, models, processes and operating technologies.

Intellectual property assets created as output of human cognition are a discrete bundle of legally defined and enforceable property rights (Winter, 1987, p. 165), which can be given a relatively precise economic value and can be

conveyed from one owner to another. Examples include patents, copyrights, trademarks, brand names and "goodwill (customer capital)".

Based on these elements, this article defines *intellectual capital* as the unique combination of human, structural, and intellectual property assets, which constitute an organization's capability to perform in the current environment and position the organization for future performance.

Knowledge Management

Before defining knowledge management, it seems necessary to recognize the complexity of the concept and the resulting controversy about "managing knowledge". This complexity arises from the fact that knowledge is uniquely human and therefore subject to the complexities of individuals and the context in which it is embedded. Another level of complexity concerns the two knowledge types generally accepted by many theorists from applied fields and described by Polyani (1962) as tacit and explicit. According to Polyani, tacit knowledge comprises intuition, unarticulated mental models and embodied technical skills that are personal and context specific and therefore hard to formalize and communicate. Whereas, explicit knowledge is codified and transmittable in formal systematic language or symbols. Both types of knowledge are context specific and relational in that they depend on the situation and are created dynamically in social interaction (Tonaka and Takeuchi, 1995). There is general agreement among epistemologists that the majority of individual human knowledge is tacit. This characteristic makes knowledge difficult or some would say impossible to "manage" as a supervisor would to ensure completion of a manual task or as information technology professionals conceive of managing information.

Without minimizing the cogency of either side of this disagreement, this article accepts this controversy and chooses to move past it to advance theory discussion concerning "knowledge worker productivity". Like IC, definitions of KM from a variety of sources (Table 2) were examined for similarities and differences to craft a more comprehensive and coherent definition.

Torraco's proposed theory of knowledge management uses Dubin's (1978) theory building methodology and combines many of the common elements found in the definitions in Table 2, such as capturing and using knowledge and expertise and improving organizational performance and creating value. But, his specification of a complete theory extends and surpasses these definitions and forms the basis for this author's definition of knowledge management.

Based on Toracco's (2000) theory, *knowledge management* is a dynamic transformation process supported by an appropriate organizational culture through which individual, group and organizational knowledge is accessed and codified to produce organizational learning. The next section addresses the definition of organizational learning.

Organizational Learning

Organizational learning has been a research subject more often and for a longer period of time than the other two constructs. It has been defined in a number of ways. An analysis of these definitions reveals a broad range of perspectives and little apparent consensus. Only Argyris and Schon and Miller directly address the role of individuals in their definitions of OL. Despite this lack of specific mention, the implication remains in every definition of organizational learning that organizational learning begins with individuals. With the exception of Huber, who describes more the state of OL, most of these authors stress action as the crucible that signifies OL has occurred. All of these authors stress that OL is an organization level phenomena and represents a change in the "system state". Daft and Weick (1984) express this succinctly, "organizations represent patterns of interactions among individuals, especially through communication, and therefore learning in organizations to a large extent depends largely on the ability to exploit shared common understandings. Clearly, there is agreement that organizational learning is a multi-level phenomenon (individual, group, enterprise). Finally, although only Dixon, Fiol and Lyles, and Nevis, et. al. directly address performance and effectiveness, a close examination of the majority of the definitions reveals the implication that OL produces survival and enhanced success. Torraco's KM theory indirectly summarizes these areas of agreement concerning OL.

Torraco (2000) describes three processes, which form the KM system output– learning (individual and collective), knowledge creation and knowledge use. This author asserts that these are the components of OL and agree, that they are the output from the KM process. Earlier, the definition intellectual capital incorporated both individual and collective learning, therefore in this description; IC replaces learning. Knowledge creation is a process through which new ideas and information are created and synthesized into knowledge "from the inside out, in order to redefine both problems and solutions and in the process, recreate the environment (Tonaka and Takeuchi, 1995). Knowledge use refers to the speed and methods by which organizations bring knowledge to product and process development (Fiol, 1996).

Consequently, *organizational learning* is the multilevel output from a knowledge management transformation process consisting of three elements; knowledge creation, knowledge use and enhanced IC, which combined, improve the enterprise's capacity to act in pursuing survival and success. Using these three components, "human capital" can be redefined.

Human Capital

Human capital theory (HCT) (Becker, 1993) indicates that individuals, organizations and society benefit from investments in training, educating and developing people. While HCT is a well specified, but limited economics theory, Sweetland (1996) suggests researchers use HCT to evaluate and synthesize studies from "diverse disciplines and specializations such as economics, sociology, psychology, human development and business [management and organizational behavior]." This view coincides with the steady rise in interest from both organizational researchers and practitioners regarding the use of "human capital" to improve organizational performance.

Originally formulated to facilitate organizational comparison decisions between investing in "human capital" and investing in other forms of capital, the analogy between human and real capital breaks down in one important respect. Whereas, human capital is inseparable from a specific individual and thus cannot be owned except by that individual., property rights over tangible capital are readily transferable from one owner to another.

The need for theory to "improve knowledge worker productivity", Sweetland's suggestion and the redefined constructs of IC, knowledge management and organizational learning suggest an expanded view of organizational human capital:

Intellectual capital is the unique combination of human, structural, and intellectual property assets, which constitute an organization's capability to perform in the current environment and position the organization for future performance.

Knowledge management is a dynamic transformation process supported by an appropriate organizational culture through which individual, group and organizational knowledge is accessed and codified to produce organizational learning.

Organizational learning is the multilevel output from a knowledge management transformation process consisting of three elements; knowledge creation, knowledge use and enhanced IC, which combined, improve the enterprise's capacity to act in pursuing survival and success.

Using these three components, the redefined *Human Capital* represents the capability embodied in IC transformed through a knowledge management process to produce organizational learning for the purpose of ensuring enterprise survival and success. Based on these definitions, one potential view of the relationships can be examined.

Human Capital Through Systems Theory

Using systems theory at the firm level, many disciplines previously viewed organizations as "black boxes", focusing on the resources going into the box, the products and services being output and the effects of the external environment. The rise in the importance of knowledge and knowledge work forces the theorist to focus on the organization's internal components. Figure 1 conceptualizes the three components of human capital defined earlier as a system. IC serves as the input to the KM transformation process, which produces OL. OL balances the tension between creating new knowledge and using existing knowledge to ensure organizational performance and survival. As Figure 1 shows, OL enhances IC, informs the KM process and by so doing, assumes continuous development of the firm's core competencies leading to improved performance.

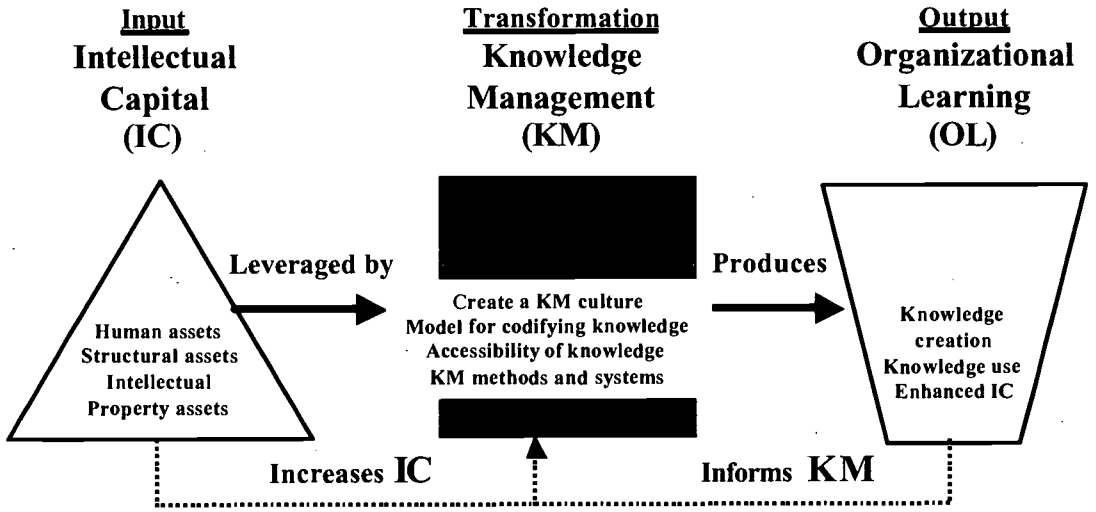
Implications for Human Resource Development

As the value of a firm's human capital has achieved recognition as the cornerstone of competitive advantage or increased organizational survival and success, there has been a corresponding rise in the recognition that human resource development has a significant role in both the theory and practice of identifying, developing, leveraging and managing those resources to realize that advantage. The more precise definitions of the constructs related to human capital will facilitate discussion among researchers in the variety of disciplines that will be needed to gain a true picture of the impact of human capital as an organization's primary resource. Furthermore, by overlaying the systems view of human capital onto an organization, researchers can assess both individual components such as IC and/or any of its subordinate constructs without losing sight of the relationship of those components to the higher level construct or the organization as a whole.

Having well-constructed definitions of both human capital and its subordinate constructs will also aid HRD practitioners as they strive to overcome a senior management mindset which views all elements of capital as equal. The ability to swiftly and succinctly describe how the human capital elements relate to the organization's core

competencies, how those competencies can be used to achieve value and increased competitive advantage and how continued development of each element of human capital leads to sustained advantage will be invaluable.

Figure 1: A Systems View of Human Capital Synthesizing Intellectual Capital, Knowledge Management and Organizational Learning (©2000)



References

Achinstein, P. (1968). Concepts of science. Baltimore, MD: John Hopkins University Press.

Argyris, C., & Schon, D. (1996). Organizational learning: Theory, method and practice. Reading, MA: Addison.

Barnett, C. (1994). Organizational learning theories: A review and synthesis of the literature. Academy of Management Review 19.

Bassi, L. J. (1997). Harnessing the power of intellectual capital. Training and Development Journal, 51 12), 25-30.

Becker, G. S. (1993). Human capital: A theoretical and empirical analysis with special reference to education (3rd Edition). University of Chicago Press, Chicago, IL.

Beckman, T. (1997). A methodology for knowledge management. International Association of Science and Technology for Development (IASTED), AI and Soft Computing Conference. Banff, Canada.

Brooking, A. (1996). Intellectual capital. London: International Thomson Business Press.

Cangelosi, V. and Dill, W. (1965). Organizational learning observations: Towards a theory. Administrative Science Quarterly, 10: 175-203.

Conner, K., & Pralahad, C. (1996). A resource-based theory of the firm: Knowledge versus opportunism. Organization Science, 7(69).

Crossan, M., Lane, H., & White, R. (1999). An organizational learning framework: From intuition to institution. Academy of Management Review 24(3): 522-537.

Daft, R., & Weick, K. (1984). Toward a model of organizations as interpretation systems. Academy of Management Review, 9, 284-295.

Davenport, T. H., & Prusak, L. (1998). Working knowledge: How organizations manage what they know. Boston: Harvard Business School Press.

Dixon, N. (1993). Organizational learning: A review of the literature with implications for HRD professionals. Human Resource Development Quarterly 3(1), 29-49.

Drucker, P. (1993). Post-capitalist society. New York: Harper Business.

Drucker, P. (1999). Knowledge worker productivity: The biggest challenge. California Management Review, 41(2), 79-94.

Dubin, R. (1978). Theory building (2nd Ed). New York: Free Press.

Edvinsson, L., & Malone, M. S. (1997): Intellectual capital: Realizing your company's true value by finding it's hidden brainpower. Harper Business.

Fiol, C., & Lyles, M. (1985). Organizational learning: Implications for organization design. Academy of Management Review 10, 803-813.

Fiol, C. M. (1996). Squeezing harder doesn't always work: Continuing the search for consistency in innovation research. Academy of Management Review, 21(4), 1012-1021.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. Strategic Management Journal, 17, 109-122.

Harris, L. (2000). A theory of intellectual capital. In R. Herling & J. Provo (Eds.), Strategic perspectives on knowledge, competence, and expertise (pp. 22-37.). San Francisco: Berrett-Koehler.

Hibbard, J. (1997) Knowing what we know. Information Week, October 20, 1997.

Huber, G. (1991). Organizational learning: The contributing processes and literatures. Organization Science 2: 88-115.

Klein, D. and Prusack, L. (1994). Characterizing intellectual capital. Boston: Ernst and Young Center for Business Innovation.

Klimoski, R. (1991). Theory presentation in human resource management. Human Resource Management Review 1(4), 253-271.

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities and the replication of technology. Organization Science 3, 383-397.

Lank, E. (1997). Leveraging invisible assets: The human factor. Long Range Planning, 30(3), 406-412.

Leonard-Barton, D. (1995). Wellsprings of knowledge: Building and sustaining the sources of innovation. Boston: Harvard Business School Press.

Macintosh, A. (1996). Position paper on knowledge asset management. Artificial Intelligence Institute, University of Edinburgh, Scotland.

Miller, D. (1996). A preliminary typology of organizational learning: Synthesizing the literature. Journal of Management 22 (3), 485-505.

Nevis, E. C., Dibella, A. J., & Gould, J. M. (1995). Understanding organizations as learning systems. Sloan Management Review, Winter, 73-85.

Nonaka, I., & Takeuchi, H. (1995). Knowledge-creating company: How Japanese company creates the dynamic of innovation. New York: Oxford University Press.

O'Dell, C. (1996). A current review of knowledge management best practice. Conference on Knowledge Management and Transfer of Best Practices. Business Intelligence. London.

Petrash, G. (1996). Managing knowledge assets for value. Knowledge-Based Leadership Conference. Linkage, Inc. Boston, MA.

Polyani, M. (1966). The tacit dimension. London: Routledge and Kegan Paul.

Quinn, J, Anderson, P., and Finkelstein, S. (1996). Leveraging intellect. Academy of Management Executive, 10(3).

Romer, P. (1993). Two strategies for economic development: Using ideas and producing ideas. Proceedings of the World Bank Annual Conference on Development Economics. The World Bank: NY, 64.

Schein, E. H. (1990). Organizational culture. American Psychologist, 45(2), 109-119.

Stewart, T. A .(1997). Intellectual Capital: The new wealth of organization. New York: Doubleday/Currency.

Sveiby, K. E. (1997). The new organizational wealth: Managing and measuring knowledge-based assets. San Francisco: Berrett-Koehler Publisher, Inc.

Swanson, R. A. (1995). Human resource development: Performance is the key. Human Resource Development Quarterly, 6(2), 207-213.

Sweetland, S. (1996). Human capital theory: Foundations of a field of inquiry. Review of Educational Research, 66(3), 341-359.

Torraco, R. (2000). A theory of knowledge management. In R. Herling and J. Provo (Eds.), Advances in Developing Human Resources, 5, 38-62.

Van der Spek, R. and Spijkervet, A. (1997). Knowledge management: Dealing intelligently with knowledge. In Liebowitz & Wilcox, (Eds.), Knowledge management and its integrative elements. CRC Press.

Wiig, K. (1997). Knowledge management: Where did it come from and where will it go. Expert Systems with Applications, Volume 14. Pergamon Press/Elsevier.

Winter, S. (1987). Knowledge and competence as strategic assets. In D. Teece (Ed.), The Competitive Challenge: Strategies for Industrial Innovation and Renewal. Cambridge, MA: Ballinger. 159-184.

Table 1: Definitions of Intellectual Capital

Author	Definition
Klein and Prusack (1994)	intellectual material formalized, captured and leveraged to produce a higher value asset
Quinn, Anderson and Finkelstein (1996)	begin their discussion with Webster's definition of intellect as "knowing or understanding; the capacity for knowledge, for rational or highly developed use of intelligence." They describe four types of organizational IC in increasing order of importance: 1) Cognitive knowledge (or know what); 2) Advanced skills (know how); 3) System understanding and trained intuition (know why); 4) Self-motivated creativity (care why).
Brooking (1996)	defines IC as comprised of four dynamic assets, which must be considered together when judging organizational potential: Human centered assets - comprise the collective expertise, creative capability, leadership, entrepreneurial and managerial skills embodied by the employees of the organization; Intellectual property assets - include know how, copyrights, patent, semiconductor topography rights, various design rights as well as trade and service marks, Infrastructure assets - are technologies, methodologies and processes, which enable the organization to function. Examples include risk assessment methods, sales force management techniques, market or customer databases, and communication systems such as e-mail and teleconferencing systems; and Market assets - represent intangible organizational potential [for performance]. Examples include repeat business percentage; value associated with goodwill such as branding, and market dominance.

Table 1: Definitions of Intellectual Capital

Author	Definition
Edvinsson and Malone (1997)	possession of the knowledge, applied experience, organizational technology, customer relationships and professional skills that provide a competitive advantage in the marketplace: Human capital – people who work in a system themselves with all of their knowledge, experience and capacity to grow and innovate Structural capital – what remains behind when people leave the premises, that is systems, policies, processes, tools or intellectual property that people create, but which then becomes the collective property of the system Customer capital – the system of relationships that an organization has with its clients irrespective of the people who work there or the structural capital that is in place.
Sveiby (1997)	defines IC as an intangible asset created as the result of human action and composed of three elements: Employee competence - forms the basis for the dynamic process of organizational performance – capacity to act in a variety of situations to create both tangible and intangible assets.; Internal structure - and external structure. His definition of Sveiby's (1997) concept of internal structure seems to combine elements of Brooking (1996) intellectual property and infrastructure assets. He includes patents, concepts, models, computer systems and administrative processes. External structure - mixes other elements of Brooking' intellectual property assets with her concept of market assets to include brand names, trademarks, reputation and image.
Stewart (1997)	the sum of everything the people of the company know, which gives a competitive advantage in the market.

Table 2: Definitions of Knowledge Management (KM)

Author	Definition
Wiig, (1997)	KM is the systematic, explicit, and deliberate building, renewal, and application of knowledge to maximize an enterprise's knowledge-related effectiveness and returns from its knowledge assets.
Hibbard (1997)	KM is the process of capturing a company's collective expertise wherever it resides - in databases, on paper, or in people's heads - and distributing it to wherever it can help produce the biggest payoff.
Petrash (1996)	KM is getting the right knowledge to the right people at the right time so they can make the best decision.
Macintosh (1996)	KM involves the identification and analysis of available and required knowledge, and the subsequent planning and control of actions to develop knowledge assets so as to fulfill organization objectives.
O'Dell (1996)	KM applies systematic approaches to find, understand, and use knowledge to create value.
Van der Spek and Spijkervet (1997)	KM is the explicit control and management of knowledge within an organization aimed at achieving the company's objectives.
Beckman (1997)	KM is the formalization of and access to experience, knowledge, and expertise that create new capabilities, enable superior performance, encourage innovation, and enhance customer value.
Bassi, (1997)	KM refers to the purposive and systematic identification, capture, organization and dissemination of tacit and explicit knowledge within an organization to improve organizational performance.

Torraco (2000)	Torraco (2000) specifies four units in his theory of knowledge management: creating a culture of KM uses Schein's (1990) definition of culture as a systematic phenomenon rooted in the organization's basic assumptions, beliefs and values that influences the essential processes used for organizational adaptation, growth and renewal and refers to the trust necessary for knowledge creation, sharing and use; accessibility of knowledge represents the degree to which knowledge is available to be shared throughout the system and has three dimensions, (a) the source of knowledge, (b) the half-life of knowledge, and (c) the exposure of knowledge; codifying knowledge means classifying knowledge along four dimensions (a) scope of knowledge, (b) type of knowledge, (c) level of knowledge, and (d) specificity of knowledge to determine its usefulness to the organization; and methods and systems of knowledge management are the strategies and techniques based on the following three dimensions: (a) the depth of analysis, (b) the time constraints on managing knowledge, and (c) the degree of structure in the methods and systems used to identify the knowledge and make it explicit and available to others.

Table 3: Definitions of Organizational Learning

Author	Definition
Fiol and Lyles (1985)	Organizational learning refers to the process of developing insights, knowledge and associations between past actions, the effectiveness of those actions and future actions. Hence learning is a change in the state of knowledge within the organization.
Huber (1991)	An entity learns if, through processing information, the range of its potential behaviors is changed, any of its units acquires knowledge that it recognizes as potentially useful to the organization, this knowledge is subject to more and varied interpretations and when more organizational units develop uniform comprehension of the various interpretations.
Dixon (1993)	Organizational learning is the process by which knowledge about action outcome relationships between the organization and the environment is developed. Organizational learning holds considerable promise for improving organizational effectiveness.
Barnett (1994)	Organizational learning is an experience-based process through which knowledge about action outcome relationships develops, is encoded in routines, is embedded in organization memory, and changes collective behavior.
Nevis, Dibella and Gould (1995)	Define organizational learning as the capacity within an organization to maintain or improve performance based on experience. OL is a systems-level phenomenon because it stays within the organization even if people change.
Miller (1996)	Organizational learning means the acquisition of new knowledge by actors who are able and willing to apply that knowledge in making decisions or influencing others in the organization.
Crossan, Lane and White (1999)	Organizational learning can be conceived of as a principal means of achieving strategic renewal, where strategic renewal requires that organizations explore and learn new ways while exploiting what they have already learned.
Argyris and Schon (1996)	Organizational learning occurs when individuals within an organization experience a problematic situation and inquire into it on the organization's behalf. They experience a surprising mismatch between expected and actual results of action and respond to that mismatch through a series of thought and action that leads them to modify their images of the organization or their understandings of organizational phenomena and to restructure their activities so as to bring outcomes and expectations into line, thereby changing organizational theory-in-use. In order to become organizational, the learning that results from organizational inquiry must become embedded in the images of the organization held in its' members minds and or in the epistemological artifacts embedded in the organizational environment.

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