

Technology and Change Processes in Knowledge Systems

LESLEY FARMER

Department of Advanced Studies in Education and Counseling

California State University, Long Beach

1250 Bellflower Blvd., Long Beach CA 90840

USA

Lesley.Farmer@csulb.edu

Abstract: - Change occurs at several levels within any system: the individual, a group, and the system as a whole. At each level, internal or external factors can drive change (although internal factors are usually responses to outside factors). Change can be viewed in terms of the changer and the entity being changed. The theories of change can be approached in several ways: change theory (defining change), the change in terms of the process itself (what occurs), change agency (catalyst for change), and change management. This paper provides representative studies on the change process as it relates to leadership in knowledge systems.

Key Words: - change, technology, change agent, knowledge system, management, leadership

1 Introduction

Change is a constant variable in today's lives. It is inevitable, so it makes sense to face changing issues and deal with them explicitly and effectively rather than respond to them in an unplanned manner. While it can be said that some change is cyclical, the focus of most educational change theory is on evolutionary change. In knowledge systems, change is a central concept and necessity for personal and professional development, and under girds organizational improvement. This paper provides representative studies on the change process as it relates to leadership in knowledge systems.

2 Problem Formulation

Change occurs at several levels within any system: the individual, a group, and the system as a whole. At each level, internal or external factors can drive change (although internal factors are usually responses to outside factors). Change can be viewed in terms of the changer and the entity being changed. The theories of change can be approached in several ways: change theory (defining change), the change in terms of the process itself (what occurs), change agency (catalyst for change), and change management.

2.1 Bases for Change

Schwartz and Ewald defined changed as "a never ending process of readjustment and readaptation, as man responds behaviorally to ever changing circumstances" [1]. They further asserted that change may be internal, within a culture, or external, originating from outside a culture.

Hohn [2] posted four types of changes:

1. Exception: a specific change that is an exception to the rule of one's knowledge or belief system
2. Incremental: change that happens so gradually that the individual is not aware of it
3. Pendulum: change to results in extreme exchanges of view points
4. Paradigm: fundamental rethinking of premises and assumptions.

Change is usually precipitated by the action of a change agent, followed by a reaction by the targeted population. If change occurs, it is integrated. Several factors are instrumental in change. At its most basic level, as one encounters information that conflicts with one's existing knowledge base, the potential for change exists. As the environment changes, one needs to adapt and change either oneself or that environment. On a social level, conflict between different groups often lead to change, be they institutionally-based, community-based, or more broadly construed. On a societal level, certainly economic and technological change drives social change.

Bennis, Benne and Chin [3] asserted that people change based on self interest. When change is communicated rationally, and supported through

incentives, people are more likely to change. People are also social beings who follow cultural expectations, so when change is based on reinterpreting existing cultural norms and values to achieve superordinate goals, people are more likely to commit to the new forms of that culture. Cultural change levers include communication, demonstration, degree of consistency, structural flexibility, people orientation, and empowerment. People are also apt to change under the exercise of authority or coercion, although they may revert to their prior behavior once such power wanes.

Ely focused on the conditions that should exist or be created in the environment in order to facilitate change [4]. Those catalysts include:

1. Dissatisfaction with the status quo
2. Sufficient knowledge and skills in order to accomplish the change
3. Availability of resources
4. Availability of time
5. Rewards or incentives to engage people to change
6. Participation in decision-making
7. Commitment to change
8. Leadership of expectations, commitment, and support.

In counterpoint, resistance to change is also a reality. Leaders need to identify possible negative reactions so they can know how to deal with them. Furthermore, resistance to change may be an indicator that the change effort is off course. When resistance is encountered, that occasion may be considered a learning opportunity to rethink the reasons for change and the strategies being used to affect change, and to root out the reasons for resistance [5]. Zaltman and Duncan [6] provided the most thorough examination of resistance factors. In terms of social barriers to change, noting how individuals act as members of a social system, they identified five related barriers: group solidarity, rejection of outsiders, conformity to norms, conflict, and group introspection. Organizational barriers were also delineated: threat to power and influence, organizational structure, behavior of top-level administrators, climate for change in the organization, and technological barriers. The researchers separated out cultural barriers to change, those traditions and values conflicting with the change; specific barriers include cultural values and beliefs, cultural ethnocentrism, saving face, and incompatibility of a cultural trait with change. A fourth set of barriers exist: individual's psychological ones: perception, homeostasis, conformity and commitment, and personality factors.

2.2 Change Process Theories

Change process theories and models may be categorized as inevitable or planned, developmental as reflected in the life cycle, political or strategic, and conceptual. This paper will focus on planned and conceptual approaches.

Most change process theories are based on Lewin's three-stage change model: freezing, movement, unfreezing [7]. The idea is that the status quo or equilibrium is the current stage. Something happens that causes disequilibrium or movement, and then interventions help the system re-achieve equilibrium or new status quo. The driving forces are change agents (positive forces) that overcome resistance (negative forces). Lewin suggested that removing counter forces within individuals was more effective than applying outside pressure, although he also asserted that it is easier to change individuals as part of a group rather than change them separately because group norms provide peer pressure to change and can provide positive reinforcement for change.

Schein [8] added strategies to Lewin's model. For instance, to create motivation and readiness to "unfreeze," he suggested creating guilt or anxiety, causing discomfort of current stasis, and providing psychological safety to support change. At stage two, change occurs through cognitive structuring that helps individuals to evaluate and react differently based on a new point of view obtained through identifying with a new role model and gathering information. In refreezing, where the individual integrated the change, self-concept and positive relations needs to be associated with the change.

Fisher's model of change focuses on individual's reactions to change [9]. At the early stages, people use cognitive, affective, and evaluative processes. As they move to maintenance, they rely more on conditioning and environmental factors. A several points, the person undergoing change may choose not to accept change: at the point of happiness where one may deny the change, at the point of guilt where one may feel disillusionment, and at the point of depression where one may feel hostility.

2.3 Social Aspects of Change

As described by Robbins, social cognitive theory asserts that behavior change is affected by the behavior's attributes, personal factors, and environmental influences [10]. Behavior itself is a result of consequences, which individuals assess in terms of possible benefits. Individuals also have to

decide if they are capable of performing the targeted behavior. Change agents can help individual's sense of self-efficacy by providing clear instructions, modeling the behavior, providing opportunities for practice, and reinforcing changed behavior.

Popper asserted that the change occurred as a result of successful adjustments in response to feedback [11]. He also thought that change was socially contextualized in that an individual could not develop or change independent of the influence of others. Likewise, change as experienced by individuals would impact institutions and organizations as knowledge progressed.

Bandura's early research examined how people model their own behavior on those behaviors observed in other people as a way to facilitate change through adopting new competences and creating emotional proclivities [12]. Bandura then developed the principle of triadic reciprocity, which examines causal relations between personal behavior and events with environmental factors. In his book on social cognitive theory, Bandura stated that self-efficacy beliefs helped individuals plan and optimize personal change; he found humans to be self-organizing and self-regulating; indeed, people are producers as well as products of their environment.

Likewise, Ajzen's theory of planned behavior asserts that a person's intention to perform a changed behavior is largely determined by: that person's attitude about the behavior in terms of the outcomes and value of those outcomes; and the influence of the person's social environment and its norms in terms of social expectations and the person's own motivation to comply [13]. The theory also recognizes the impact of an individual's perceived control about the opportunities, resources, and skills needed to perform the new behavior.

2.4 System Change Theories

An organization may be considered as a large and complex group, and it can also be thought of an open system that deals with its environment, taking in and transforming resources based on assessment and feedback process. An organization includes several goals and several groups, each of which may differ and all of which are interdependent [14]. Within an organization, several levels of behaviors – and opportunities for change – occur: individual, group, and organizational. Change within the smaller groups can be tolerated, and organizational-level changes

can be difficult to perceive. Nevertheless, the influence of the organization as a whole is significant because a number of entities together leverage change.

It may be asserted that organizations do not change, but individuals do. While positive change can result in added status and better environment, organizations tend to resist change because it threatens the existing structure of power and influence, and because it tends to redistribute limited resources. The timing may be poor, leadership may be weak, and individuals may feel personal loss. Leaders have to help the organization overcome these fears by personally building pressure for change, lowering resistance, and redirecting human forces. Both task and social aspects of change must be addressed: people must first be aware of their current status and potentiality for change, be interested in changing, evaluate and try to change, and only then adopt the change. Thorough planning, even planning to compensate for a negative change, such as budget reduction, is vital for organizational success.

Havelock's change theory is based on Lewin's, but he focused more on managing change, which acknowledges resistance to change [15]. In his theory, for instance, a person reacts to a disturbance (i.e., change), with the result of being either satisfied or dissatisfied; in some cases the person is resisting change, and in other cases the person self-changes to accommodate the external change. He also delineated three major orientations to innovation adoption: internal problem solving, social interaction, and research-based development and diffusion.

The Burke-Litwin model of organizational change focuses on cause-and-effect relationships within organizations, and links performance to internal and external factors that affect such performance [16]. They posited that organizational change was largely driven by outside factors, which would motivate key individuals within the organization. To this end, Burke and Litwin identified twelve dimensions of organizational change that need to be considered: external environment, mission and strategy, leadership, organizational culture, decision-making and communication structure, policies and procedures, management practices, work unit climate, employees' tasks and skills, individual values and needs, employees' motivation level, individual and overall performance. The key players in organizational change need to prepare for change, manage the change process, and find a way to sustain that change over time.

Kotter posited an eight-step process to lead change processes [17]:

1. Create urgency. This step requires leadership and honest discussion about threats and opportunities.
2. Form a powerful coalition by identifying key players.
3. Create a vision for change and a strategy to achieve it.
4. Communicate the vision, and model the change.
5. Overcome obstacles.
6. Create short-term wins to provide early success that can motivate further change.
7. Build on change, making adjustments as needed. Anchor change in the organization's culture, publicly recognizing models of change.

McWhinney examined leadership and complex situations of organizational change [18]. He perceived planning for change as problem solving, based on the detection of existing conditions that need to be changed in order to achieve a desired outcome. He posited two paths to solutions: revitalization from the top down, and renaissance through open systems planning. McWhinney identified six basic modes of change:

1. Analytic, based on testing ideas against gathered data
2. Participative, by developing a shared value through data analysis
3. Imperative, based on a leader's authority to act on behalf of the organization
4. Emergent, by facilitating social interaction to formulate fresh ideas
5. Inventive, based on a new idea that is not tied down by social values
6. Influential, based on group acceptance of new values that are imposed or group-grown.

Nadler recognized the influence of an organization's subunits, and asserted that optimal change and resultant performance when the entire system was aligned and congruent [19]. Nadler's five stage of discontinuous change follow: 1) diagnose the external environment's impact on the organization; 2) identify needed internal adjustments and communicate the shared vision; 3) implement change through unity and making tasks with staff; 4) monitor change; 5) sustain change through new norms.

Recent discussions about systems and change have led to studies about complex adaptive systems, which are special cases of complex systems. Their complexity arises from their dynamic and interactive networks, and their

adaptability is couched in experience-based changes of individuals and groups within the system. Usually such complex systems consist of loosely coupled entities, such that control is decentralized. Coherence emerges from cooperation among the entities, although the systems' future direction may be unpredictable [20].

3 Problem Solution

Technology has been a major driving force in change, so not surprisingly, several change process models focus on adoption of innovation by stages. While adults exhibit varying degrees of comfort with learning, they tend to display overarching attitudes about new knowledge integration as a guiding principle. Typically, each person progresses through each stage but may take different amounts of time to transition from one stage to another, depending on the nature of information or situation. As change agents, leaders should conduct ongoing needs assessment to determine the stage of learners and design activities accordingly. This process can result in differentiated instruction to fit the needs of each group of potential participants. In this manner, those individuals further along the process can engage in activities when they need it. If an organizational major initiative is being started, leaders should develop learning experiences that progress along those same stages in order to maximize participation and integration.

Building on Lewin's theory, Rogers created a five-stage theory that focused on the diffusion of innovation [21]. The theory's stages for change consisted of: awareness, interest, evaluation, implementation, and adoption. Rogers posited that within any organization, individuals would differ in the timing and pacing of their adoption of change. He asserted that within any social system change would begin slowly, then would experience rapid change, and then end in slow change as the source of change matured or new innovations would emerge. This pattern results in an S-curve; it should be noted that disruptive technologies may radically change the diffusion patterns for established technologies by starting a different competing S-curve.

Davis contributed the idea that individuals' perception about technology impacts its use: specifically, its ease of use (which is tied to self-efficacy) and its usefulness largely predicted its adoption [22].

Rogers and Shoemaker also focused on diffusion of innovation, and identified five questions about innovation characteristics that potential adopters consider when making decisions about accepting the change [23].

1. What are the *relative advantages* to accepting the innovation?
2. How *compatible* is the innovation to one's lifestyle?
3. How *complex* is the innovation; is one competent to use it?
4. Can the innovation be *tested* on a limited basis?
5. How *observable* is the innovation and its effects?

In terms of the decision-making process itself, Rogers and Shoemaker stated that four steps are involved: 1) acquiring conceptual and procedural knowledge; 2) forming attitudes; 3) making a decision; 4) confirming the decision.

Lamble and Seaman [24] researched types of innovation decisions. They asserted that decisions reflect a continuum of responsibility, from largely individual to little individual authority, with optional decisions made independently, collective decisions and decision by authority in between. Contingent decisions consist of a sequence of two or more decisions, which may depend on one another.

Toledo developed a five-stage adoption model that explicitly targets higher education: 1) pre-integration, 2) transition through external pressure, 3) development through resources and training, 4) expansion, 5) systemwide integration [25].

Venkatech and his colleagues reviewed several innovation models to develop a united theory of technology acceptance and use. They contended that change is a complex social and developmental process; adoption must consider cognitive, affective and contextual dimensions. The model includes four determinants of use and four moderators of individual use behaviors [26]. The determinants consist of:

1. Performance expectancy: how technology will help carry out a function
2. Effort expectancy: how easy the technology is to use
3. Social influence: the degree of social pressure to use the technology
4. Facilitating conditions: the degree to which the organization supports the technology

The individual moderators include gender, age, experience, willingness to use.

4 Conclusion

In order to lead effectively, leaders need to understand change and its processes. They need to define their own roles within the change process, particularly as change agents and managers of change.

Many theories and models exist to capture the essence of change and its processes. It is perhaps most useful to think about change processes in terms of interactions between internal and external factors, which result in negotiated modifications. This dynamic interplay exists at all levels: psychological interaction with an external idea introduced in a book, individual accommodation as part of a job function, organizational reform, culture clashes, international trade regulations. In each case, change can be viewed from the perspective of the change agent, the adopter, and the system in which change occurs.

In facilitating change, several conditions need to be considered: readiness for change, knowledge of the current situation, vision and perception of the change, resources and support capacity to support change. leadership and commitment to change, cognitive and affective factors impacting the change process, reinforcement and incentives for change, factors to insure sustainability and integration.

In any case, change involves ongoing interaction, assessment, and decision-making. It is a dynamic and complex set of processes that are interdependent, even if at the unconscious level, and can never be completely controlled. Even the decision NOT to change is likely to evoke change as some other point within the system. Furthermore, as change becomes the new normal, it sets up the conditions for other changes. The more that the nature of change is understood, however, the more effectively educators and counselors can manage and leverage change in order to facilitate adult development.

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