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Systems Design for Change in Education and Training

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ABSTRACT

The purpose of this chapter is to introduce current research and theory on systems design for change, or systemic change, in the fields of education and training. Systems design is the process for determining what characteristics a new system should have, resulting in a model of the new system and a plan for creating it. Systemic change is the process of changing a system from one paradigm to another by applying systems thinking and systems theory. Repeated calls for massive reform of current educational and training practices have consistently been published over the last several decades. This has resulted in an increasing recognition of the need for systemic change in education as numerous structured, piecemeal approaches to education reform have been implemented and failed to significantly improve the state of education. This chapter first presents a description of design theory and systems theory as the foundations for systems design. Design theory is the concepts and principles that help to develop strategies and methods for designing. The term *system* has been defined in various ways by different researchers, but the core concept is one of relationships among components comprising the whole.

KEYWORDS

Design theory: The concepts and principles that help to develop strategies and methods for designing.
Systemic change: The process of changing a system from one paradigm to another by applying systems thinking and systems theory.
Systems design: The process for determining what characteristics a new system should have.
Systems theory: An interdisciplinary field with applications in both the hard and soft sciences; it focuses on understanding relationships among components comprising the whole.

INTRODUCTION

The purpose of this chapter is to introduce current research and theory on systems design for change, or systemic change, in the fields of education and training. Systems design is the process for determining what characteristics a new system should have, resulting in a model of the new system and a plan for creating it (Banathy, 1996). Systemic change is the process of changing a system from one paradigm to another by applying systems thinking and systems theory; however systemic change has different meanings for different people in education. Squire and Reigeluth (2000) identified four different meanings: statewide changes, districtwide changes, schoolwide changes, and ecological changes. Ecological systemic change is based on an understanding of interrelationships and interdependencies with the system and between the system and its systemic environment. This meaning more fully implements the concepts of systems theory and systems thinking by embracing the organic, interconnected nature of social systems, and it encompasses the other three meanings, so it will be the focus of this chapter.

A systems-thinking or systemic approach to design views problems and their solutions from the perspective of the whole system. A system is composed of many parts, all of which relate to each other. Systems design takes into account the interrelationships among these parts, rather than isolating individual problems and simplifying solutions by decomposing and fragmenting reality into an easier-to-understand but incomplete view.

The next section of this chapter presents the foundations of systems design by illustrating the need for systems design in education and training and summarizing the major literature in design theory and systems theory. The third section provides a synthesis of systems design principles. The fourth and final section presents a number of current systems design models in the literature.

FOUNDATIONS OF SYSTEMS DESIGN

Need for Systems Design and Systemic Change

Systemic change is concerned with the creation of a completely new system rather than a mere retooling of a current system. It entails a paradigm shift as opposed to piecemeal change. Repeated calls for massive reform of current educational and training practices have consistently been published over the last several decades. This has resulted in an increasing recognition of the need for systemic change in education as numerous piecemeal approaches to education reform have been implemented and failed to significantly improve the state of education. But, is a true paradigm shift needed to better meet the needs of today's learners?

Numerous publications have discussed the shift of society from the industrial age into what many call the information age (Reigeluth, 1994; Senge et al., 2000; Toffler, 1980). The current educational and training systems were built to fit the needs of an industrial-age society, where the focus was on sorting learners rather than on learning (Reigeluth, 1994). Learners in the industrial age were expected to learn the same amount of material in the same time, thereby forcing the slower students to accumulate learning deficits and eventually fail. In the industrial age, it was important to sort learners into management or worker roles, and the teacher-centered, standardized paradigm of education was well suited for this purpose (Joseph and Reigeluth, 2002).

In the current information age, however, the majority of jobs entail knowledge work that requires learners to master such skills as communication, problem-solving, critical thinking, and teamwork. Furthermore, employees are more and more expected to show initiative, manage themselves, and cooperate with others; therefore, training and education now must have a customized and learner-centered focus that the old paradigm does not offer. Systemic change seeks to shift from a paradigm in which time is held constant, thereby forcing achievement to vary, to one designed specifically to meet the needs of information-age learners and their communities by allowing students as much time as each needs to reach proficiency. Systems design focuses on creating a new system to meet the new educational and training needs of the information age.

The foundations of systems design are systems theory and design theory. The following two sections summarize these theories and their relation to systems design.

Design Theory

One foundation of systemic change and systems design is design theory. Design theory is the concepts and principles that help to develop strategies and methods for designing. A number of different design theories in the literature provide insight on the complex and challenging task of designing organizations or educational systems. These include Nelson and Stolterman's (2003) *design way*, which is applicable to all kinds of organizations; Ackoff's (1999) *idealized design* for corporations; Banathy's (1996) *social systems* design for all kinds of organizations; and Reigeluth's (2006a) *leveraged emergent approach* for educational systems.

The Design Way

Nelson and Stolterman (2003) noted that, fundamentally, design is a creative act, resulting in the creation of something that has not previously existed. It focuses on making choices to create the best design for a very specific system. As such, it examines a real, natural, complex world that requires systems thinking to take into account the interdependent relationships at work. Design is service oriented, a creative expression of what is desired, and it relies on relationships between formalized roles among the participants in a collaborative social system.

Idealized Design

The key concept behind Ackoff's (1999) idealized design is the selection of ideals to create an ideal vision of what the new system should be. An idealized design should be technologically feasible, operationally viable, and capable of rapid learning and development. It is the most effective system of which the designers can conceive, and its vision should be shared by all participants.

Social Systems Design

Banathy (1996) viewed design as a creative, iterative, holistic, decision-oriented process resulting in a model of a new system. It is key to understand that designers must transcend current approaches and solutions to design a completely new model of a system appropriate for the specific, unique context.

Leveraged Emergent Approach

Reigeluth's (2006a) leveraged emergent approach posits that it is difficult to make the drastic changes to a new paradigm all at once, but piecemeal change is

likely to be unsuccessful; therefore, high-leverage structural changes should be implemented that can resist the pull of the current system to return to the *status quo* and can exert leverage to change the rest of the system. These high-leverage changes will be guided by a few principles, and the remaining changes will emerge over time as the need for them becomes apparent and resources become available. This approach yields frequent visible progress to sustain momentum and win over skeptics.

Systems Theory

Systems theory was established in the mid-20th century by a multidisciplinary group of researchers who shared the view that science had become increasingly reductionist and the various disciplines isolated. Bertalanffy (1968) was among the first to establish a general systems theory, which noted the existence of principles and laws that could be generalized across systems and their components regardless of the type of system or its relationship to other systems.

The term *system* has been defined in various ways by different researchers, but the core concept is one of relationships among components comprising the whole. Ultimately, systems theory is an interdisciplinary field with applications in both the hard and soft sciences. Hard systems thinking is appropriate for closed, engineered systems, while soft systems thinking is appropriate for the complexities of social systems (Checkland and Scholes, 1990). Nelson and Stolterman (2003) argued that there are no set types or categories of systems; instead, the view of a system is a matter of perspective and choice.

Flood (1990) took this viewpoint even further in his *liberating systems theory* (LST) by firmly focusing systems theory with a critical viewpoint. LST is related to critical systems theory, which draws from Habermas (1973) and seeks emancipation of humans in systems that promote subjugation and dominance (Flood, 1990). LST uses a post-positivist approach to analyze social conditions to liberate the oppressed while also seeking to liberate systems theory from tendencies such as self-imposed insularity, cases of internal localized subjugations in discourse, and liberation of system concepts from the inadequacies of objectivist and subjectivist approaches (Flood, 1990).

Banathy (1991) applies systems theory to social systems design by examining the design of educational systems. He suggested examining systems through three lenses: a "still picture lens," used to understand the components comprising the system and their relationships; a "motion picture lens," used to understand the processes and dynamics of the system; and a

"bird's-eye view lens," to understand the relationships between the system and its peer and suprasystems (Banathy, 1992).

Senge (1990) applied systems theory to organizational learning. Systems thinking is the fifth and most important of five disciplines of a learning organization, according to Senge. He suggested that learning organizations help their members to view the organization as a complex system of interrelated parts, rather than as isolated departments.

PRINCIPLES OF SYSTEMS DESIGN

Of the many principles of systems design, the ones described in this section include systems thinking, design theory, idealized design, broad stakeholder involvement, mindset and culture, participatory leadership, shared vision, learning organization, and strange attractors and leverage.

Systems Thinking

An important principle of systems design is a systems thinking approach to design. Systems thinking is a framework for seeing patterns and interrelationships in a complex organization or system. Banathy's (1992) three-lens view described earlier is a useful framework for examining the system through its components, its processes and relationships, and its peer systems and suprasystems. The complexity of systems can be overwhelming, but systems thinking makes these complex realities more manageable while still retaining a true view of reality, rather than the fragmented and inaccurate view of a systematic analysis.

Design Theory

Also important is the recognition that systems design is about design, meaning the creation of a new system that has not previously existed (Banathy, 1996; Nelson and Stolterman, 2003). This is a shift to an entirely new paradigm, a transcendence of the current system rather than a piecemeal approach of modifying the existing system. Furthermore, the design process should be holistic and iterative, rather than sequential and systematic (Banathy, 1996; Nelson and Stolterman, 2003) by beginning with a "rough sketch" (Ackoff, 1999) or "fuzzy image" of the new system and proceeding to gradually work out more detail for the whole new system, one level at a time (Banathy, 1991). It is important to be able to generate feedback on the emerging vision or model of the new system through the development of artifacts and the

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implementation of accountability (Banathy, 1996; Nelson and Stolterman, 2003; Reigeluth, 2006a).

Idealized Design

Related is the principle of idealized design. The result of the design process should be a model of the ideal system (Ackoff, 1981; Banathy, 1996). This ideal design should be the designer's best expression of what is desired by the clients or stakeholders, labeled "desiderata" by Nelson and Stolterman (2003). Design is driven by hope and vision, which motivates the participants to make the leap to a new paradigm, and the newly created system should meet the desired results as best as possible (Banathy, 1996; Nelson and Stolterman, 2003).

Broad Stakeholder Involvement

An important principle to consider in systems design is the involvement of those who will be affected by any changes in the system. This is an ethical issue, but it is also a quality-of-design issue. The different stakeholders bring diverse perspectives to the process of systemic change. Different professions, cultures, understandings, and skills should come together to create a rich environment for design decisions in schools and other organizations. Hutchins (1996) pointed out that, because systems are complex, they usually serve multiple purposes—often changing over time and in conflict with each other. Because of the complex nature of any system, each stakeholder's perspective needs to be heard and addressed for more positive change in schools to occur.

The role of the community is extremely important in organizational change as well (Jenlink et al., 1998). A system does not exist in isolation, and the community impacts the schools and organizations within it. The roles of higher education institutions and community organizations and businesses are often overlooked but should be included when designing a new paradigm of education. Furthermore, rather than just involving stakeholders, it is important to create a collaborative social system (Nelson and Stolterman, 2003). This entails developing a design culture where participants become knowledgeable about design, develop design competence, and empower themselves (Banathy, 1996).

Mindset and Culture

Mindsets or mental models are one of the most important things to consider in systemic change. One aspect of mindset is the nature of the change process. Edu-

cators are used to thinking in terms of piecemeal reforms imposed from the top down. A successful systemic change process requires a different mindset, one of empowerment, collaboration, consensus building, and trust. It is important to help stakeholders evolve their mindsets to participate effectively in the change process (Banathy, 1996; Nelson and Stolterman, 2003).

The other aspect of mindset entails helping participants to shift their mindsets from the standardized, time-based, industrial-age paradigm of training or education to the customized, attainment-based, information-age paradigm, and from piecemeal change to systemic change. Senge (1994) noted that good, new ideas rarely get put into practice, often because these new ideas conflict with participants' subconscious, internal images of the world. If stakeholders are operating on different mental models of what the designed system should be or how the process for creating that system should be enacted, then they will resist or oppose the changes and perpetuate the existing paradigm.

Culture for change can be viewed as the collective mindsets of participants in the change process. A culture of collaboration, consensus-building, empowerment, and trust among the stakeholders is crucial for true paradigm change to succeed in an organization. The roles of leaders (such as principals, school district administrators, or CEOs) are particularly important. To move forward in the beginning of a systemic change process, leaders must establish the culture of the system and set examples by taking the courageous first steps.

Participatory Leadership

Leaders of the change process have big responsibilities in systemic change. They must not only evolve their own mindsets and guide the change process but also involve other stakeholders in the decision-making process and share responsibilities. Most leaders have experienced the authority-centered approach of leadership in systems; however, leaders in systemic change processes need a different paradigm of leadership. Leaders must be open to new ideas, be self aware, and pay individual attention to followers to empower them, help them grow, and stimulate their intellectual abilities (Duffy et al., 2000; Senge, 1994). Furthermore, it is important for leaders to be actively involved in the change process. A design team must have the full authority it needs to design and implement changes. Without the support of the top leaders in a system, design decisions will always run the risk of being overturned; it is therefore important to have the top leaders

as members of the design team (Nelson and Stolterman, 2003). Moving beyond the traditional top-down approach of most organizations and the "principal-do-right" (Senge, 2000) leadership model in schools is important to achieve paradigm change in a system.

Shared Vision

Shared vision is another vital notion in systemic change. There must be values and beliefs that individual stakeholders in the school system come to share to change the paradigm. Senge (1994) pointed out that no organization becomes great without goals, values, and a mission that become shared throughout the organization. A vision statement or the leader's charisma cannot be enough. Shared vision is fundamental for learning organizations that want to help their employees to fundamentally change their work. The overarching vision establishes not just commitment but also new ways of thinking and acting and consequently fosters risk taking and experimenting in the organization (Senge, 1994). This shared vision is related to the earlier discussion of a shared idealized design.

Learning Organizations

Educational systems also must transform into learning organizations to succeed in systemic change. According to Senge (1994), a learning organization requires its members to acquire competency in five disciplines: systems thinking, personal mastery, mental models, shared vision, and team learning. These disciplines are provided to help the members and teams of the organization in shifting their mental models to understand their system as a whole rather than as parts and consequently to move toward a shared vision. Furthermore, they must become design knowledgeable and competent to fully participate in the design process (Banathy, 1996). These disciplines also consider all members as contributors to their own personal growth as well as the growth of their organization and team as a whole (Senge, 1994).

Strange Attractors and Leverage Points

Fractals and strange attractors are another important notion in the systemic change process. Fractals are patterns that recur at all levels of a system (Wheatley, 1999), which in education are core ideas, values, and beliefs (Banathy, 1991; Reigeluth, 2006b, 2007). Strange attractors are a kind of fractal that has a powerful influence over the processes and structures that emerge during transformation (Wheatley, 1999). These are similar to *memes*, which are the social counterpoints to genes in the physical organism and have the power to organize a system in a specific way (Caine and Caine, 1997). These strange attractors become essential in the mindsets or mental models held by a critical mass of participants; hence, they are an essential part of the culture of the organization (Reigeluth, 2007).

Leverage points are important in terms of the efficiency and effectiveness of the change process. They are related to Senge's (1994) notion of small changes being capable of producing big results. They are certain elements of the system that have a large impact in the entire organization (Reigeluth, 2006a). For the systemic change process to happen more quickly yet still effectively, it is important to identify the leverage points in the school system; however, Senge (1994) also talked about how the areas of highest leverage are often the least obvious. Investigating school systems and organizations to identify leverage points is a crucial step in systemic change.

SYSTEMS DESIGN MODELS

This chapter has described systems theory and design theory as the foundations of systems design and presented systems design principles to guide the process of designing educational and training systems. This final section presents an overview of major systems design models in the literature. These models present specific, elaborate processes for designing education and training systems. These models include Jenlink et al.'s Guidance System for Transforming Education (GSTE), Duffy's Step-Up-to-Excellence, Schlechty's guidelines for leadership in school reform, Hammer and Champy's business process redesign/reengineering, and Ackoff's idealized systems design.

Guidance System for Transforming Education

The Guidance System for Transforming Education (GSTE) (Jenlink et al., 1996, 1998) is a process model for facilitating systemic change. The GSTE was designed to provide process guidelines to a facilitator engaging in a K–12, districtwide systemic change effort. The GSTE does not provide any suggestion of what changes should be made in the school district; rather, it provides the facilitators with process guidelines to help the school district and its community make decisions about what changes should be made. The GSTE is comprised of:

- Core values about the change process
- Discrete events (a chronological series of activities for engaging throughout much or all of the change process)
- Continuous events (activities that must be addressed continuously throughout much or all of the change process)

The GSTE, originally developed by Jenlink et al. (1996, 1998), has undergone additional development based on Reigeluth's experience using it in the Metropolitan School District of Decatur Township in Indianapolis, Indiana. The discrete events listed in Table 52.1 reflect these tentative revisions of the GSTE. These events are guided by underlying principles and suggested activi-

TABLE 52.1
Revised Discrete Events in the GSTE

Phase I. Initiate a systemic change effort	Facilitators assess and enhance their own readiness for the process and form a support team.
	Facilitators establish or redefine a relationship with a school district and discuss *per diem* payment for Event 3.
	Facilitators assess and enhance district readiness for change.
	Negotiate and sign a contract/agreement with the superintendent and board for Phase II.
Phase II. Develop starter team	Facilitators and superintendent form the starter team.
	Hold a retreat to develop the starter team dynamic.
	Develop starter team understanding of systems, design, mental models, systemic change process, dialog, and small-group facilitation.
	Assess and enhance district and community capacity for change (identify assets and barriers, and use community forums if needed).
	Develop an agreement/contract with the starter team and school board for Phase III, scope out resource needs, and plan a budget for internal funding and a proposal for external funding.
Phase III. Develop the districtwide framework and capacity for change	Starter team expands into the leadership team; starter team becomes facilitators; facilitator becomes an advisor and "critical friend."
	Hold a one-day retreat to develop the leadership team dynamic.
	Facilitators develop leadership team understanding of systems, design, mental models, systemic change process, dialog, and small-group facilitation (address throughout Events 13 to 17).
	Leadership team develops a district-wide framework with broad stakeholder participation (community forums). This includes identifying changes in the community's educational needs and using them to develop a mission, vision, and core values for an ideal school system. It takes this opportunity to assess and enhance district and community interest in, and culture for, systemic change. It develops pyramid groups for broad stakeholder involvement.
	Leadership team identifies current and recent change efforts and decides what relation those should have with this effort.
	Leadership team develops a change process strategy, including capacity building and funding; advisor's role is defined and funded for Phase IV.
Phase IV. Create ideal designs for a new educational system	Leadership team forms and capacitates building-level design teams and conducts a workshop on the framework.
	Design teams create building-level designs and systems for evaluating those designs with broad stakeholder involvement; leadership team supports and monitors the design teams.
	Leadership team forms and capacitates a district-level design team.
	Design team creates a design for ideal district administrative and governance systems and systems for evaluating that design, with broad stakeholder involvement; leadership team supports and monitors this design team.
Phase IV. Create ideal designs for a new educational system	Design teams create building-level processes for evolving as close as possible to their ideal designs; leadership team supports and monitors the design teams.
	Carry out implementation plans, formative evaluations, and revisions of the evolving designs and the implementation processes.

Source: Reigeluth, C.M. and Duffy, F.M., in *Trends and Issues in Instructional Design and Technology*, 2nd ed., Reiser, R.A. and Dempsey, J.V., Eds., Prentice Hall, Upper Saddle River, NJ, 2007. With permission.

ties that help one to understand and engage in them. The core values underlying the GSTE are:

- Caring for children
- Co-evolution
- Collaboration
- Common language
- Community
- Context
- Conversation
- Culture
- Democracy
- Evolution of mindsets
- Facilitator
- Ideal vision
- Inclusiveness
- Participant commitment
- Process orientation
- Readiness
- Respect
- Responsibility
- Space
- Stakeholder empowerment
- Systemic thinking
- Time
- Wholeness

Step-Up-to-Excellence

Step-Up-to-Excellence (SUTE) (Duffy, 2002, 2003, 2004, 2006) is a process methodology designed to help change leaders in school districts create and sustain whole-district improvement. This methodology combines effective tools for school system transformation. SUTE, a three-step process that is preceded by a *pre-launch preparation phase*, proceeds as follows.

Pre-launch preparation phase
Step 1: Redesign the entire school system
Step 2: Create strategic alignment
Step 3: Evaluate whole-system performance
Recycle to the next pre-launch preparation phase

Pre-Launch Preparation Phase

The pre-launch preparation activities are carried out by the superintendent of schools and a couple of hand-picked subordinates. This small team is temporary, and it will not lead the transformation; its purpose is to prepare the system to engage in systemic change. If the decision is made that the transformation effort is to be launched, then the activities are transferred to a *strategic leadership team*, which is composed of the superintendent, teachers, and building administrators.

The team also appoints a *transformation coordinator*. The process then proceeds to Step 1.

Step 1. Redesign the Entire School System

During Step 1, the district's core purpose, mission, values, and goals are defined. Educators then work in small teams within each cluster of schools (all those schools that feed into a single high school, plus that high school) to redesign their entire school district by improving three areas: their district's core and supporting work processes, its internal social architecture, and its relationship with its environment.

Step 2. Create Strategic Alignment

After the redesign process of a district, change leaders invite educators to align their individual work with the goals of their teams, the work of teams with the goals of their schools, the work of schools with the goals of their clusters, and the work of clusters with the goals of the district. Creation of strategic alignment ensures everyone will work systemically toward the same goals and vision of the district. It also determines responsibilities for all stakeholders involved in a child's educational experience and frees the district from unnecessary bureaucratic hassles, dysfunctional policies, and obstructionist procedures that limit effectiveness.

Step 3. Evaluate Whole-System Performance

During Step 3, change leaders evaluate the performance of the clusters, schools, and teams of the district. The purpose of this evaluation is to measure the success of the district's effort. Evaluation is reported to stakeholders and is used to sustain school district improvement by managing the district's performance.

Recycle to the Next Pre-Launch Preparation Phase

After a predetermined period, the district steps up again by cycling back to the pre-launch preparation phase for further improvement and transformation.

Schlechty Center's Guidelines for Leadership in School Reform

The Schlechty Center for Leadership in School Reform has been engaging in school district transformation processes from a comprehensive and systemic approach to school reform (Solomon, 2006). Theories and frameworks that provide guidelines for the activities of the school reform processes in the districts and schools with which the Schlechty Center works are provided below.

Two Theories Underlying the Activities of the Schlechty Center

The Theory of Change

The theory of change (Christensen, 1997) focuses on transforming schools from organizations based on the hypothesis that the central business of schools has to do with producing conformity and attendance to organizations where the central work focuses on nurturing attention and commitment towards students. The theory of change is the basis for the *Ten District Standards*, an underlying framework of the Schlechty Center which is described in the next section.

The Theory of Engagement

The theory of engagement focuses on student motivation and the strategies that are needed to increase the perspective that schools and teachers will enlarge the presence of engaging tasks and activities in the everyday life of the schools. The theory of engagement is the basis of the *Working on the Work* framework (Schlechty, 2002), described below.

Two Frameworks Underlying the Activities of the Schlechty Center

Ten District Standards

The Ten District Standards framework helps leaders assess and build system capacity so the entire district is aligned and focused on the core purpose of schools by:

- Developing a shared understanding of the need for change
- Developing shared beliefs and vision
- Developing a focus on students and on the quality of work provided to students
- Developing structures for participatory leadership
- Developing structures for results-oriented decision making
- Developing structures for continuity
- Providing ongoing support
- Fostering innovation and flexibility
- Employing technology
- Fostering collaboration

Working on the Work

The Working on the Work framework calls on everyone to provide challenging and engaging work for students that results in students learning what schools, parents, and the community want them to learn:

- Work that is challenging to students
- Work with which students persist when they experience difficulty
- Work from which students gain a sense of satisfaction

Hammer and Champy's Business Process Redesign/Reengineering

Hammer and Champy (1993, 2003) defined the process of reengineering a corporation as the "fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed" (p. 32). They provided a systemic change design model for organizational transformation in corporate sectors with their *business process redesign/reengineering* (BPR) approach. BPR is a management approach that examines aspects of a corporation or business and its interactions and attempts to advance the competence of the underlying processes. It is a systemic and fundamental approach that redesigns the core work processes and either modifies or eliminates activities that are not producing value in the corporation. Hammer and Champy (1993, 2003) argued that far too much time is wasted by businesses that pass on tasks from one department to the other, and they claimed that it is much more important to build a team that can perform all tasks in the process. They identified four main themes that accompany reengineering:

- *Fundamentals*—Focusing on the fundamentals allows a look at tacit principles and assumptions; once these rules and assumptions are identified, they should be redesigned for an entirely new system.
- *Radical*—Organizational change must not engage in piecemeal changes; systemic change is needed.
- *Dramatic*—There should be big leaps in performance; reengineering is not for marginal changes.
- *Processes*—Organizational changes must be process oriented and must not be focused on individual tasks.

Common Themes in Reengineering Efforts

Although reengineering processes take various forms, similarities exist. Hammer and Champy (1993, 2003) identified nine common themes to reengineering efforts:

- Steps in the process are simplified and several jobs are combined into one.
- Workers make decisions, which eliminates the hierarchy in decision making.
- Steps or processes are performed in a natural order.
- Processes are not standardized; they have multiple versions.
- Work occurs where it makes the most sense, sometimes by customers or suppliers.
- Checks and controls are reduced to reduce costs.
- Reconciliation is minimized to encourage consistency.
- A case manager provides a single point of contact with customers.
- Centralization and decentralization are one process.

The Change Process in Reengineering Efforts

Hammer and Champy (1993, 2003) also provided change process guidelines for reengineering efforts:

- Identify and map the processes using process mapping.
- Identify the process requiring reengineering.
- Achieve high-level understanding of the current process from a customer perspective.
- Look outside the process to customer needs by observing performance.
- Look at the process itself by observing performance.
- Understand what is critical in the process.
- Consider feasibility, such as scope, cost, and commitment.
- Designate the process owner and form a process team.

Ackoff's Idealized Systems Design

Based on the theoretical foundation of systems theory and the systems view of the world and organizations, Ackoff's (1999) *idealized systems design* approach identifies design strategies and implementation planning processes for organizational change and the recreation of business corporations. The process of creating the idealized systems design includes the following stages:

- Formulating the mess (sensing and making sense of the situation)
- Ends planning (where to go)
- Means planning (how to get there)

- Resource planning (what is needed to get there)
- Implementation and control (doing it and learning)

The design comes forth with situational analysis, which is a systemic understanding and detailed evaluation of the current state of the organization and its environment. Ackoff (1999) suggested that, upon achieving systemic comprehensive understanding of the current system, the system should progress to the idealized design stage.

The ends of an organization consist of ideals, objectives, and goals. Ends planning should be directed to make explicit exactly what is wanted in the organization. Ackoff (1999) emphasized that the vision of the ideal system of an organization must be a shared image among the stakeholders and that it should be created by all stakeholders in the system. The three characteristics of an idealized design are that it should be technologically feasible, operationally viable, and capable of being improved continuously.

Having a shared ideal vision of the system, system designers then engage in an implementation planning process. The means that the planning stage selects creates the means that will help achieve the ends. First, designers engage in the design of the means planning. Means planning determines the gaps between the current and ideal systems and constitutes a set of instructions that enable the possible realization of the vision. These means include acts, practices, processes, projects, programs, and policies of the system.

The means planning determines what kinds of resources are required for the implementation and further requires determining the allocation of these resources. In addition, appointing human resources is required in this phase: who is doing what, when, how, and where in the system. The next step is to plan the allocation of the resources that the means require. Money, capital goods, people, consumables, data, information, and knowledge are all involved. Finally, the designers formulate the design of a management learning and adaptation system that will aid in the realization of these requirements.

CONCLUSION

This chapter reviewed the current research on systems design for change in education and training. It argued for the need for systemic change to create a completely new paradigm suitable for today's information age. It presented a description of design theory and systems theory as the foundations for systems design. Principles

of systems design were offered, as well as several systems design models. Despite a history of systems design research and an increasing call for systemic change efforts over the last several decades, most change efforts continue to be piecemeal, tinkering with or revising the currently used yet horribly outdated paradigm of education and training. This chapter has summarized a foundation for better understanding systems design and how it can be applied to training and education.

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