A Theoretical Model of Scenario Planning

THOMAS J. CHERMACK
Pennsylvania State University

This article attempts to address a lack of theory-based models in scenario-planning practice. By using Dubin's 1978 quantitative theory-building methodology, this article provides a theoretical model of scenario planning. To clarify, several critical elements of scenario planning are proposed as well as how they are related, in what environments they operate, and under what circumstances. In addition, some logical consequences are offered based on the constructed model. Finally, the implications of the model for human resource development research, practice, and theory are discussed.

Keywords: *scenario planning; scenarios/theory; theoretical model*

Bain and Company's 2003 Management Tools Survey (Rigby, 2003) found strategic planning to be the tool of choice in 2002. Executives indicated that in the midst of an "economy in turmoil, investors in retreat, and managers under attack" (Rigby, 2003, p. 4) they needed some way to cope with devastating circumstances. Although strategic planning has yielded insight about how organizations can anticipate and cope with change, it has not proven its ability to inform organization leaders about massive emerging political, environmental, economic, and/or societal changes (Mintzberg, 1994).

Another school of thought on strategy has emerged in scenario planning. Rather than claiming an ability to predict the future, scenario planners advocate the construction of multiple stories that encompass a variety of plausible futures (Schwartz, 1991). This method reveals an enlarged future landscape. With a focus on long- and short-term alternatives about the future, scenario planning intends to push organizational planners to consider paradigms that challenge their current thinking and to think the unthinkable (Wack, 1985b). Scenario planning is believed by many to be a useful means of conducting or enhancing strategic organizational planning options (Fahey & Randall, 1998; Swanson, Lynham, Ruona, & Provo, 1998). Although scenario-planning methods have been increasingly applied and reported in the literature in the past 3 decades (Georgantzas & Acar, 1995;

Human Resource Development Review Vol. 3, No. 4 December 2004 301-325
DOI: 10.1177/1534484304270637

Micklethwait & Wooldridge, 1997; Ringland, 1998), scholarly development and rigorous application of scenarios is just beginning.

The Problem

Some scenario-planning professionals have tended to think of method and theory as equivalent. Georgantzas and Acar (1995) included an appendix titled Theoretical Foundations of Scenario-Driven Planning; however, an examination of that appendix revealed a summary of differing approaches to the scenario-planning process—different methods. Torraco (1997) stated: "A theory simply explains what a phenomenon is and how it works" (p. 115). By this simple, yet straightforward definition of theory, the shortcomings of this method as theory approach are obvious. Scenario planning is a system, and there are differing methods for completing the processes within that system. Thus, it is fair to say that we know what scenario planning is, but we must rely on theory to tell us how this process works. A description of how scenario planning works is precisely what is missing. It is argued here that scenario-planning professionals have failed make that theory base explicit and, therefore, to explain how this process works.

> The problem is that there is presently no theory of scenario planning and, thus, scenario planning practices are neither fully understood nor fully validated.

Although there are hints at theoretical domains such as constructivist learning (van der Heijden, 1997), mental models (Senge, 1990), decision making (Wright & Goodwin, 1999), system theory (Georgantzas & Acar, 1995), and strategic management (Porter, 1985), these areas have not been explored in detail, and no attempt has been made to integrate the varying components of scenario-planning practice into a wholistic theory.

A Solution

One logical solution is to further clarify and develop each of the theoretical foundations of scenario planning; that is, there is considerable work to be done in identifying, assessing, and exploring the multiple, potential theoretical foundations of scenario planning through rigorous research and study. If scenario planning is ever to become more than a consultant's tool (e.g., a discipline or processional field of practice), it will require strong theoretical foundations. The articulation of theoretical foundations is critical to the development and maturation of any field, discipline, or process (Warfield, 1995). Reviewing the literature, Chermack and Lynham (2002) suggested five primary espoused outcome domains of scenario planning: (a) changed thinking, (b) improved decision making, (c) improved human learning and imagination, (d) plausible stories about the future, and (e) improved performance. The theoretical support for these outcome domains might include decision theory, system theory, learning theory, and performance improvement theory. Conceptual inquiry into the nature of the connection between some of these theoretical domains and scenario planning has been explored; however, these works do not provide empirical evidence. Therefore, scenario-planning practices rest on conceptual arguments and anecdotes supporting the notion that the process is indeed effective, although there is no offer of empirical evidence. A second solution, and the focus of this article, involves the use of an explicit theory-building method aimed at integrating several elements into a specific, and wholistic, theory of scenario planning itself.

Methodological Overview

Several options might be considered in addressing the theory deficiency that has been outlined. These options are (a) theory building through grounded theory research (Egan, 2002), (b) theory building through meta-analysis research (Yang, 2002), (c) theory building through social construction research (Turnbull, 2002), (d) theory building through case study research (Dooley, 2002), and (e) theory building through quantitative research (Dubin, 1978; Lynham, 2002).

Dubin's (1978) detailed theory-building method is judged the most appropriate research method for building a theory of scenario planning. This position is taken for several reasons: (a) it is the most comprehensive method available, (b) it requires that the researcher-theorist construct a theoretical model based on conceptual and logically connected ideas, (c) it requires the translation of that theoretical model into testable hypothesis about how the theory works in practice, (d) it requires that the theoretical model be tested to claim that a theory exists, and finally (e) through the identification of hypothesis, it provides a demand for empirical research. Dubin's (1978) detailed theory-building method is judged the most appropriate research method for building a theory of scenario planning (see Figure 1).

Dubin's (1978) method can be divided into two components (a) the theoretical model and (b) the empirical research. The completion of Steps 1 through 5 results in a theoretical model. When the theorist begins specifying empirical indicators (Step 6) the model becomes a theory, and thus the remaining steps deal with empirical research (Dubin, 1978). This research will complete Steps 1 through 5, specifying multiple propositions of the theoretical model.

The development of the units of the theory refers to the building blocks of the theory. Specifying the laws of interaction among the units of the theory requires that relationships among the units be made clear. The identification

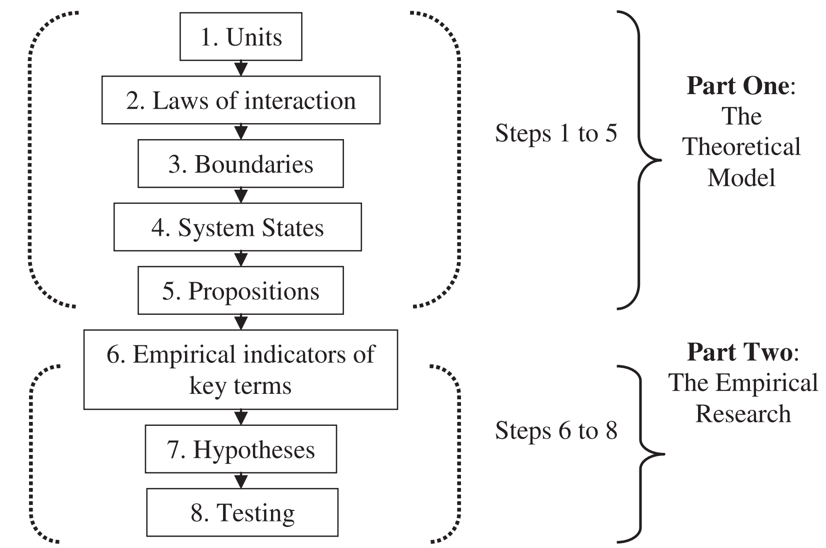


FIGURE 1: Dubin's (1978) Eight-Step Theory-Building Research Methodology

of the boundaries of the theory is important in clarifying the aspects of the real world that the theory is attempting to model. System states represent the conditions under which the theory is expected to operate, and each system state is distinctive. Propositions introduce the idea of prediction into the theory-building equation (Dubin, 1978). An important consideration in this context is that the proposition must conform to the logic of the theory builder and the previous steps in constructing the model.

Step 1—The Units of a Theoretical Model of Scenario Planning

Dubin (1978) stated:

> In principle there are no limitations on the selection of units to be employed in a theoretical model. The theorist has unlimited opportunities to employ units of his [or her] choice. Once he [or she] has made a selection, the constructed models must conform to the limitations set forth in the previous section for employment and combination of units. (p. 78).

This flexibility in determining the units of the theory allows the theorist complete control of this part of the theory-building process.

In this section, the proposed units of a theoretical model of scenario planning are described. Based on extensive literature review (Chermack, Lynham, & Ruona, 2001; Georgantzas & Acar, 1995; Schwartz, 1991; van der Heijden, 1997; Wack 1984b, 1984c), the units of a theoretical model of scenario planning are (a) scenarios, (b) learning, (c) mental models, (d) decisions, and (e) performance.

The use of these units is intended to describe what the phenomenon of scenario planning is and how it works (Torraco, 1997). These are the building blocks of a theory of scenario planning, and each of the units described here corresponds to a specific system state, which is discussed later in the theory development process.

Scenarios

Scenarios are selected as a unit of the theoretical model of scenario planning because they characterize the approach to planning examined in this research. This research suggests that planning is a system with inputs, two core processes (one of option generation, and one of decision formulation), and outputs. Although there are different methods for option generation, this research focuses on the use of scenarios; and therefore, scenarios define the nature of the planning system.

Definition. A scenario has been defined as "an internally consistent view of what the future might turn out to be—not a forecast, but one possible future outcome" (Porter, 1985, p. 63).

Description. Scenarios are narrative stories of the future that outline several possible paths through various challenges to arrive at varying future states. The scenarios are used to challenge the core assumptions of decision makers within the organization. Much of the process of constructing the scenarios involves heavy debate and dialogue among organization members of all levels.

Learning

Learning is selected as a unit of the theoretical model of scenario planning based on supporting evidence in the scenario-planning literature (de Geus, 1988; Schwartz, 1991; van der Heijden, 1997) and the logic that learning is a driver of performance (Swanson & Holton, 2001). The usefulness of learning in a system of scenario planning is embedded in the assumption that a core goal of any planning system is to reperceive (Wack, 1985a) the organization and its environment (Godet, 1987, 2000; Wilson, 1992, 2000).

Definition. Learning has been defined in many ways and there are many specific philosophical orientations toward the learning process. Learning will be generally taken to mean "the process of gaining knowledge or skill" (Trumble, Brown, Stevenson, & Siefring, 2002).

Description. Scholars in human resource development (HRD) have identified five relevant metatheories of learning, namely, behaviorism, cognitivism, humanism, social learning, and constructivism (Swanson & Holton, 2001). Although each of these perspectives is distinctive in its purity, it should be noted that in practice "they are usually adapted and blended to accomplish specific objectives" (Swanson & Holton, 2001, p. 150). Scenario planning seems to most effectively incorporate a blend of social learning, cognitivism, and constructivism (Chermack & van der Merwe, 2003; de Geus, 1988; van der Heijden, 1997). Therefore, principles of social, cognitive, and constructivist learning are found in descriptions of how learning takes place in scenario building and planning systems.

Mental Models

Mental models are selected as a unit of the theoretical model of scenario planning because of their prevalence in the scenario-planning literature and their reported significance (Morecroft, 1990, 1992; Senge, 1990; Wack, 1985a; Weick, 1979, 1990). Mental models encompass people's assumptions. Reperceiving the organization and its environment is thought to occur through learning that forces participants to reexamine their assumptions and alter their mental models (Wack, 1985a, 1985b).

Definition. Doyle and Ford (1999) defined a mental model as "a relatively enduring and accessible, but limited, internal conceptual representation of an external system (historical, existing or projected) whose structure is analogous to the perceived structure of that system" (p. 414).

Description. Originally introduced by Forrester (1961), mental models are the lenses through which we see the world. Mental models incorporate our experiences, learning, biases, values, and beliefs about how the world works. Mental models embody how individuals see the world, how individuals know and think about the world, and how individuals act in the world. Furthermore, as a result of action and learning, mental models are altered, leading to different ways of seeing the world, knowing and thinking about the world, and again, acting in the world. Mental models are constantly being adjusted, refined, and re-created in dynamic and ever-changing environments.

Decisions

Decisions are a unit of the theoretical model of scenario planning because they embody the action component of the planning system. Given the general system of planning presented, decision making marks the second process in the planning system and is based on reperceptions generated in the scenario-building process.

Definition. Plainly, a decision is "an act or process of reaching a conclusion or making up one's mind" (Trumble et al., 2002).

Description. In the business context, decisions must have considerable forethought; however, one of the pitfalls of strategic planning has been in its inflexibility, causing planned decisions that do not account for changes within the environment (Mintzberg, 1994; Morecroft, 1983). Brehmer (1990, 1992) specified that decisions in applied contexts differ from the traditional cognitive decisions studied by psychologists in the following four ways:

1. There is a series of decisions rather than a single decision.
2. The decisions are interdependent—current decisions constrain future decisions.
3. The environment changes autonomously and as a result of decisions made.
4. It is insufficient for the correct decisions to be made in the correct order—they must also be made at a precise moment in real time.

Performance

Performance is one of the most talked about aspects of organizational improvement efforts in recent years. Swanson's (1999) discussion of performance improvement foundations provided a broad yet well-defined perspective of performance along with the means to assess it, describe it, and explain it in more detail. Although the performance perspective has received criticism on the grounds that it neglects the human elements in organizations and improvement efforts, "The best PI theory and practice will in the end validate the need for and contribution of human expertise to PI" (Swanson, 1999, p. 4).

Definition. Performance has been defined as "the valued productive output of a system in the form of goods or services" (Swanson, 1999, p. 5).

Description. Performance occurs in four core domains, namely, organization, process, group, and individual. Performance has also been placed at the center of a lengthy debate about the intended outcome of organizational interventions. The perspective advocated here is that performance is necessary, although not necessarily sufficient. Clearly, responsible scholars and practitioners must address both of these perspectives and concerns, and the position argued in this model is that the scenario-planning system inherently requires that learning and performance are necessary outcomes.

Assessing the Units of the Theoretical Model of Scenario Planning

To avoid some contradictory issues in theory construction, Dubin (1978) provided several guidelines and restrictions for combining unit types:

Guideline 1—"Relational units cannot be combined in the same theory with enumerative or associative units that are themselves properties of that relational unit" (p. 73).

Guideline 2—"Where a statistical unit is employed, it is by definition a property of a collective. In the same theory, do not combine such a statistical unit with any kind of unit (enumerative, associative, or relational) describing a property of members of the same collective" (p. 74).

Guideline 3—"Summative units have utility in education of and communication with those who are naïve in a field. Summative units are not employed in scientific models" (p. 78).

Guideline 4—A unit type must be chosen, and a unit can be of only one type. Further specification is at the discretion of the theorist. The initial distinctions are intended to help the theorist in considering the variables to include in the theory and to assess the maturity or development stage of the domains to be included.

The proposed theoretical model of scenario planning combines only enumerative units. Therefore, there is no risk of violating any of the four guidelines proposed by Dubin (1978).

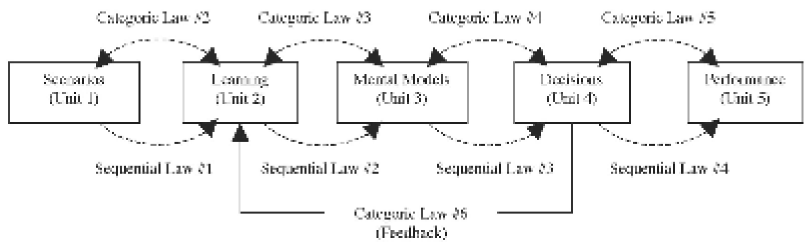
Step 2—Laws of Interaction in the Theoretical Model of Scenario Planning

The laws of interaction among the units of a theoretical model of scenario planning include six laws and four sequential laws. All units are linked with categoric laws, as a change in any unit will provoke a change in at least one other unit. All units are also linked with sequential laws to denote the im - portance of the time element in scenario planning. Catalyst units are independent units whose presence is required for other interaction in the theoretical model. A graphic depiction of the laws of interaction is displayed in Figure 2.

Categoric Laws Employed by the Theoretical Model of Scenario Planning

"A categoric law of interaction is one that states that values of a unit are associated with values of another unit" (Dubin, 1978, p. 98). The common phrasing of a categoric law in interaction follows this format: There is a greater-than-chance (or less-than-chance) probability that *X* is associated with *Y.* It is important to note that if there can be nonzero values for *X* or *Y*, it is necessary to specify the associatedness further, requiring four total statements about the law of interaction (Dubin, 1978). If this is not the case, then the law requires only one statement. The categoric laws of the theoretical model are stated as follows:

1. All units are required for the theory to function.
2. There is a greater-than-chance probability that scenarios are associated with learning.



Categoric Laws
Law #1 -- All units are required for the theory to function
There is a greater than chance probability that:
Law #2 -- Scenarios are associated with learning.
Law #3 -- Learning is associated with mental models
Law #4 -- Mental models are associated with decisions.
Law #5 -- Decisions are associated with performance.
Law #6 -- Decisions are associated with learning.

Sequential Laws
There is a greater-than-chance probability that:
Law #1 -- Scenarios precede learning
Law #2 -- Learning precedes the alteration of mental models.
Law #3 -- The alteration of mental models precedes improved decision making.
Law #4 -- Improved decision-making precedes improved performance.

FIGURE 2: The Laws of Interaction in the Theoretical Model of Scenario Planning

3. There is a greater-than-chance probability that learning is associated with mental models.
4. There is a greater-than-chance probability that mental models are associated with decisions.
5. There is a greater-than-chance probability that decisions are associated with performance.
6. There is a greater-than-chance probability that decisions are associated with learning through feedback.

Sequential Laws Employed by the Theoretical Model of Scenario Planning

Sequential laws of interaction are defined as laws that are “always employing a time dimension. The time dimension is used to order the relationship among two or more units” (Dubin, 1978, p. 101). Again, it is tempting to extract causality from this relationship; however, the only real meaning that can be gleaned from the relationship is the time sequence—that one variable precedes another.

The sequential laws incorporated by the theoretical model of scenario planning can be stated simply as follows:

1. Scenario stories parallel, or precede learning.
2. Learning precedes the shaping and altering of mental models.
3. Mental models precede improved decision making.
4. Improved decision making precedes improved performance.

At first glance, it may appear that these laws of interaction provide little new or unique contributions to knowledge of scenario planning. However, overall, these laws of interaction provide the only explicit attempt at linking the core units of scenario planning in a clear and logical manner. Furthermore, although each individual law might not provide groundbreaking insight, (e.g., we already suspect that learning is associated with mental models) the laws taken as a whole provide a logical view of the key elements of scenario planning and describe how they are linked in a way that produces a novel and cohesive view of scenario planning.

It could be argued that the model might also operate in reverse, for example, that performance improvement results in better decisions, better decisions lead to more adequate mental models, and so on. The intent of using the directional approach reflected in the current laws of interaction is to denote that based on current scenario-planning literature (van der Heijden, 1997, Wack, 1985b) scenario planning unfolds generally in a directional manner; that is, scenarios are used to provoke learning, which is thought to provide a mental model shift and so on through the other units of the theory. At this point, it is thought that alternative views of the sequence or feedback throughout the model might best be addressed in the development of competing or alternative logics that would, in turn, result in an alternative theoretical model.

Determinant Interactions in the Theoretical Model of Scenario Planning

"A determinant law of interaction is one that associates determinate values of one unit with determinate values of another unit" (Dubin, 1978, p. 106). In simpler terms, this means that the values of the units are related such that if we know the value of one of the units, we can know the value of another, for example, because they are inversely related.

The proposed theoretical model of scenario planning does not incorporate any determinant interactions. There is not enough research to specify the relationships of the units at a level such that the value of one unit allows the value of another to be known.

Efficiency of the Laws Employed by the Theoretical Model of Scenario Planning

In the theoretical model of scenario planning, it is assumed that an increase in exposure to scenarios via engagement in the scenario-planning process produces an increase in learning, which produces an increase or change in mental model capacity, which produces an increase in decision-making efficiency, which, finally, produces an increase in performance. It is also plausible that the laws incorporated in the proposed theoretical model covary, although there is currently no research to support this suspicion. Thus, the testing of the theoretical model will determine if the laws operate at the covariate level of efficiency.

Assessing the Laws of Interaction in the Theoretical Model of Scenario Planning

Dubin (1978) designated parsimony as the single criteria for evaluating the laws of interaction in a theoretical model. Parsimony is established by utilizing the minimum complexity and number of laws necessary to relate all of the units in the model and has solely to do with the number of laws that link the units.

The minimum number of laws was used to connect each unit, categorically, and sequentially, including a law stating the requirement for all stated units, and a law covering the influence of feedback from decision-making outcomes while capturing the essence of the interaction of the units as the model was conceptualized.

Step 3—The Boundaries of the Theoretical Model of Scenario Planning

The determination of the boundaries of a theoretical model of scenario planning requires that the theorist identify the domain or multiple domains in which the theory is expected to operate (Dubin, 1978). The boundaries locate the theoretical model in the environment that it concerns. In identifying the boundaries, the theorist must also make the logic used to determine those boundaries explicit. The boundaries of a theoretical model of scenario planning are identified and depicted graphically in Figure 3.

Four important domains that bound the theory of scenario planning: (a) the domain of processes, (b) the domain of planning systems, (c) the domain of performance systems, and (e) the organizational and contextual environments.

All boundaries in the theoretical model are open boundaries (as denoted by the dashed lines in Figure 3) indicating that the system constantly exchanges information and resources with each exterior domain. Planning in the organizational context will generally be thought of as a system (Mintzberg, 1994; Porter, 1985). This means that organizations consist of the general components that constitute a system, namely, inputs, processes, and outputs.

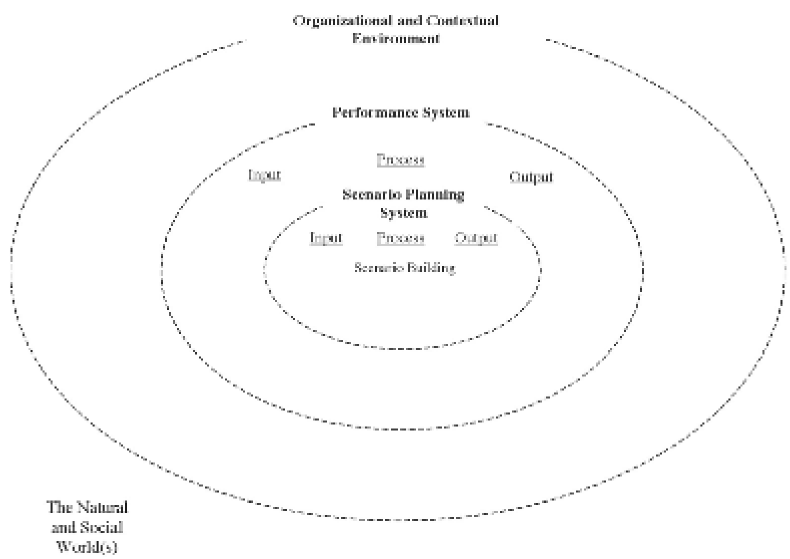


FIGURE 3: The Boundaries of a Theoretical Model of Scenario Planning

The Boundary of Processes

Scenario building is one of many processes used for a variety of purposes in organizations and human systems. A process can be defined as "how inputs are converted to outputs" (Rummler & Brache, 1995, p. 19). In the context of organizations, processes can be thought of as how work gets done (Swanson & Holton, 2001).

Scenario building is therefore a defined process, and this notion is heavily supported in the scenario-planning literature (de Geus, 1988; Ringland, 1998, 2002; van der Heijden, 1997; van der Heijden, Bradfield, Burt, Cairns, & Wright, 2002). Although there is little agreement on the specific steps of the process, it is a process nonetheless (Georgantzas & Acar, 1995; Ringland, 1998; Wilson, 1992). Louis van der Merwe of The Centre for Innovative Leadership (Centre for Innovative Leadership, 1995) synthesized a general process for building scenarios in the following steps:

1. Identify a strategic organizational agenda, including assumptions and concerns about strategic thinking and vision.
2. Challenge existing assumptions of organizational decision makers by questioning current mental models about the external environment.
3. Systematically examine the organizations external environment to improve understanding of the structure of key forces driving change.
4. Synthesize information about possible future events into three or four alternative plots or story lines about possible futures.

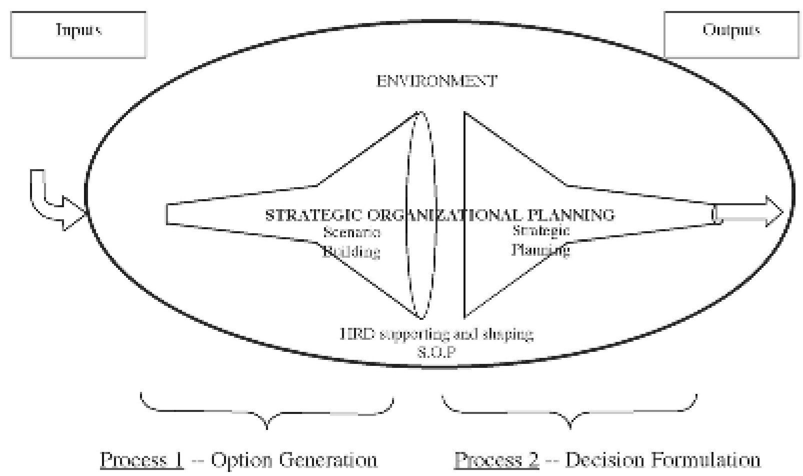


FIGURE 4: The Scenario-Planning System
NOTE: HRD = human resource development.

5. Develop narratives to make the scenarios relevant and compelling to decision makers.
6. Use scenarios to help decision makers review their strategic thinking.

The Boundary of Planning Systems

Scenario planning is a system (Mintzberg, 1994; Porter, 1985; Ringland, 1998; Wack, 1985b). This system has as one of its processes, scenario building (see Figure 4 for a visual depiction of this system).

This is an important technicality as the scenario-planning system goes much further than simply constructing scenarios about the future. In addition, scenario planning uses the alternative future environments to learn, alter mental models, test decisions, and improve performance. Scenario planning is also a performance system, meaning that there are requirements for the system outputs. To clarify, Figure 4 provides the conceptual picture of the scenario-planning system, whereas Figure 3 works to identify clearly the external boundaries and contexts within which the scenario-planning process is expected to operate.

The Boundary of Performance Systems

Performance has been defined as "the valued productive output of a system in the form of goods or services" (Swanson, 1999, p. 5). Systems have been defined as a series of inputs, processes, and outputs, connected by a feedback loop (von Bertalanffy, 1969). Performance systems need not focus solely on financial performance; rather, they focus on the goods or services deemed the valued output of the system. The boundary of performance system might include individuals, education systems, nonprofit, for-profit, government agencies, communities, and nations or any other type of performance system.

The Boundary of Organizational and Contextual Environment

With regard to planning, forces in the contextual environment are commonly social, technological, economic, environmental, and political (Ringland, 1998). These uncertain forces in the contextual environment are the source of much uncertainty for organizations and thus, the motivation for planning efforts (Schwartz, 1991; van der Heijden, 1997).

Assessing the Boundaries of a Theoretical Model of Scenario Planning

The theoretical model of scenario planning is expected to operate (a) from a process of scenario building, (b) in a planning system, (c) in a performance system, and (d) within a varied organizational-contextual environment, in the natural and social worlds. These boundaries were "derived from the nature of the units and the laws that relate them" (Dubin, 1978, p. 133), and the boundaries logically include the laws of interaction.

This discussion of the boundaries of the theoretical model is not intended to indicate that the model applies in all domains of the natural and social world. To clarify, the model is expected to operate as a process, within a planning system, as part of a performance system, within an organizational and contextual environment. The use of the terms *natural and social worlds* in Figure 3 are simply intended to recognize that all human activity takes place, ultimately, in the natural and social worlds.

Step 4—System States of a Theoretical Model of Scenario Planning

Dubin (1978) stated "a state of a system may be defined by three features: 1) all units of the system have characteristic values, 2) the characteristic values of all units are determinant, and 3) this constellation of unit values persists through time" (p. 144). To determine the system state, it is necessary for the values of all units to be known. If this is not the case, it can be assumed that the system is transitioning between states. The period of time over which all of the unit values are known and a system state is designated

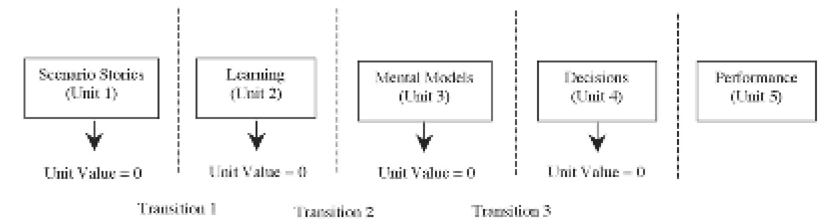


FIGURE 5: System State 1 in a Theoretical Model of Scenario Planning—Nonoperation

is called a state life (Dubin, 1978). State lives in biological systems can be small fractions of seconds while state lives in the social sciences tend to be considerably longer—some social phenomena may only have one state.

According to Dubin (1978) system states are often designated by examining the laws of interaction. "A system state characterized by a categoric law of interaction typically has the following format: 'If . . . , then . . . under the conditions of . . .' (p. 152). Using this logic, the theory of scenario planning can be characterized by six system states.

- System State 1—Nonoperation
- System State 2—Scenario generation
- System State 3—Reflection and learning
- System State 4—Revealing and altering mental models
- System State 5—Improving decision making
- System State 6—Assessing implications and performance

To illustrate the differing states of the system, the theory proposed will adopt (0, 1) coding. By this, it is intended that 0 indicates none of the thing or characteristic under examination (e.g., if the unit scenarios were coded 0, this would be taken to indicate that the scenarios have not been developed). As the theoretical model of scenario planning moves through its sequence of states, the unit values shift from 0 to 1.

System State 1—Nonoperation

Figure 5 shows the theoretical model of scenario planning in a state of nonoperation, or prior to the development of scenarios. This is System State 1. In it, the values of each unit are known to be zero. System State 1 is also defined by the fact that its values persist over some course of time. This state life (Dubin, 1978) is undefined as the time allotted to generate scenarios varies, as does the approach and preparation for scenario planning.

System State 1 can be defined using Dubin's (1978) logic by the following statement:

> If all unit values in a theoretical model of scenario planning are equal to zero, then the model is in a state of nonoperation under the conditions that no scenarios have been developed.

Scenarios constitute the catalyst unit (Dubin, 1978) that sets the theory of scenario planning into operation. When the scenarios are developed, the theory proposed is operating; that is, the theory proposed attempts to explain what the phenomenon of scenario planning is, and how it works from the point of engagement in scenario planning (Torraco, 1997).

The theoretical model of scenario planning is set in motion through the generation of scenarios with relevance to a particular situation or issue (Schwartz, 1991). As each unit is incorporated and affected, the theoretical model transitions through six system states based on Figure 5. However, as the theory transitions through each state, the corresponding value transitions from 0 to 1 (refer to the bottom of Figure 5 for these values).

System State 2—Scenario Generation

In this state, scenarios have been created and incorporated into the next state of the planning system. This is System State 2. In this state, the unit value for scenarios is 1, and all remaining units are zero. This state is characterized by the use of scenarios to provoke learning in the organization context.

System State 2 can be defined using Dubin's (1978) logic by the following statement:

> If scenarios are used in the planning system then, the value of the unit (scenarios) transitions from 0 to 1 under the conditions that a process of scenario building has been completed by the planning team.

System State 3—Learning and Reflection

System State 3 indicates that the scenarios have been used to trigger learning among the participants in the planning system.

System State 3 can be defined using Dubin's (1978) logic by the following statement:

> If learning occurs in the scenario-planning system, then, the value of the unit (learning) transitions from 0 to 1 under the conditions that the scenarios are used to provoke dialogue, interaction, and thoughtful reflection by the planning team.

System State 4—Revealing and Altering Mental Models

The unit value shift in mental models indicates that scenarios have triggered learning among the planning participants, and that learning has altered the experiences, learning, assumptions, biases, and beliefs of the participants.

System State 4 can be defined using Dubin's (1978) logic by the following statement:

> If mental models are altered in the scenario-planning system, then the value of the unit (mental models) transitions from 0 to 1 under the conditions that learning has provoked new insight, revealed assumptions, and allowed participants to re-view their thinking about the organization and its positioning.

System State 5—Improving Decision Making

In System State 5, the theoretical model of scenario planning in a state is characterized by decision making. In this state, scenarios have been used to provoke learning, mental models have been altered, and the decisions have been pushed against multiple hypothetical situations.

System State 5 can be defined using Dubin's (1978) logic by the following statement:

> If decision making is improved in the scenario-planning system, then the value of the unit (decisions) transitions from 0 to 1 under the conditions that changed mental models have provided increased, more diverse, more robust and more challenging decision options.

System State 6—Examining Implications and Performance

At the state in which the value of the decision unit transitions from 0 to 1, there are two possible paths of feedback that may result from the next transition. In the first, the decisions directly affect organization performance. This state occurs when the focal issue that prompted engagement in scenario planning is one of explicitly improving organization performance. In this case, engagement in scenario planning has been focused on a focal issue of uncertainty, and assessments of increased performance and preparation around that focal issue can be made. This state is characterized using Dubin's (1978) logic in the following way:

> If firm performance is improved in the scenario-planning system, then the value of the unit (performance) transitions from 0 to 1, under the conditions that improved decision-making has resulted in better organizational fit with the environment, and has exposed organizational decision makers to hypothetical but plausible future states that have fostered the development of signposts and anticipatory memory.

The second state is characterized by outcomes from the decisions unit being fed back into the learning unit and also into the scenario stories unit. In this sense, the original reasoning for engaging in scenario planning may simply be one of ongoing monitoring or assessment of possibilities. In this case, scenario planning is not targeted specifically at improving performance; rather, it is targeted at continuous learning about strategic options. However, it is inherent that firm performance is affected by such learning. When the theoretical model has reached a state in which all units have moved from 0 to 1, feedback from decisions becomes an input to the learning or scenario units and begins the process again from either point.

Assessing the System States of a Theoretical Model of Scenario Planning

Dubin (1978) provided three criterions of system states, namely, (a) inclusiveness, (b) that individual units have determinant values in a given state, and (c) that the state of the system persists through some period of time. Inclusiveness refers to the fact that the values of the units in a given state may be measured; although the determinant values measured in Criterion B imply that the values measured are distinctive for that state of the system. Criterion C simply bounds states of the system to time frames in which they occur.

The system states proposed for a theoretical model of scenario planning accompany the development of the system from the generation of scenarios through their use to learn, alteration of mental models, and improvement of decision making and ultimately make an impact on firm performance. The six system states described follow the system through three transitions as the system fulfills itself.

It is at this point that the benefits of continuous-engagement scenario planning become obvious. For example, firms such as Royal Dutch/Shell are not experiencing performance crises; and by continuously engaging in scenario planning, such firms are able to keep attuned to their environments and develop remarkable agility in the ways that they perceive and respond to change.

Step 5—Propositions of a Theory of Scenario Planning

Propositions introduce the idea of prediction into the theory-building equation (Dubin, 1978). Dubin (1978) stated “A proposition may be defined as a truth statement about a model when the model is fully specified in its units, laws of interaction, boundary, and system states” (p. 160). Given this definition, an important consideration in this context is that the truth statement or proposition must conform only to the logic designated by the theory builder for distinguishing truth and false statements. The requirement for truth statements or propositions to correspond between the predictions of the model, and the empirical domain it purports to represent is left for the empirical testing of the model (Dubin, 1978). Dubin suggested the use of the term *logical consequence* (p. 160) as a replacement for the term *truth statement* if the connotations of the latter term cause problems. Propositions regarding one theoretical model are not comparable to propositions regarding any other theoretical model, even if they are attempting to model the same phenomenon as each model builder has likely based his or her model on different paths of logic. As a result, Dubin (1978) argued that many researchers have incorrectly posited propositions as the starting point of research investigations.

Dubin (1978) offered: "The number of propositions is the sum of different ways the values of all the units in the model may be combined with the values of all other units with which they are lawfully related" (p. 166). Dubin suggested that this number of propositions is also potentially excessive. To simplify the process of specifying propositions, a theory of scenario planning will focus on strategic propositions. Strategic propositions are those that identify specific critical or limiting values of units (Dubin, 1978). Therefore, the propositions of a theory of scenario planning in accordance with Dubin's preliminary suggestion of an appropriate number of such propositions are as follows:

Strategic Proposition 1: If scenarios are positively associated with learning, then learning will increase as a result of participation in scenario planning.

Strategic Proposition 2: If learning is positively associated with the alteration of mental models, then mental models change as a result of learning.

Strategic Proposition 3: If a change in mental models alters decision structure, then a change in mental model implies a change in the approach to decision making.

Strategic Proposition 4: If changes in decision making are positively associated with firm performance, then firm performance will increase as a result of altered decision making strategies.

Strategic Proposition 5: If scenarios are positively associated with learning, learning is positively associated with altered mental models, altered mental models are positively associated with change in decision making, and change in decision making is positively associated with firm performance, then scenarios can be positively associated with firm performance.

The proposition locations are depicted in Figure 6. Figure 6 locates the strategic propositions as the theoretical model transitions through its varying states.

Assessing the Propositions of a Theoretical Model of Scenario Planning

The propositions of a theoretical model of scenario planning are consistent, accurate, and parsimonious; that is, each proposition is derived logically from the same system of logic, each proposition follows logically from the units, laws, boundaries, and system states specified thus far, and all propositions are strategic propositions, ensuring a minimum number, but still covering the important transitions of the model.

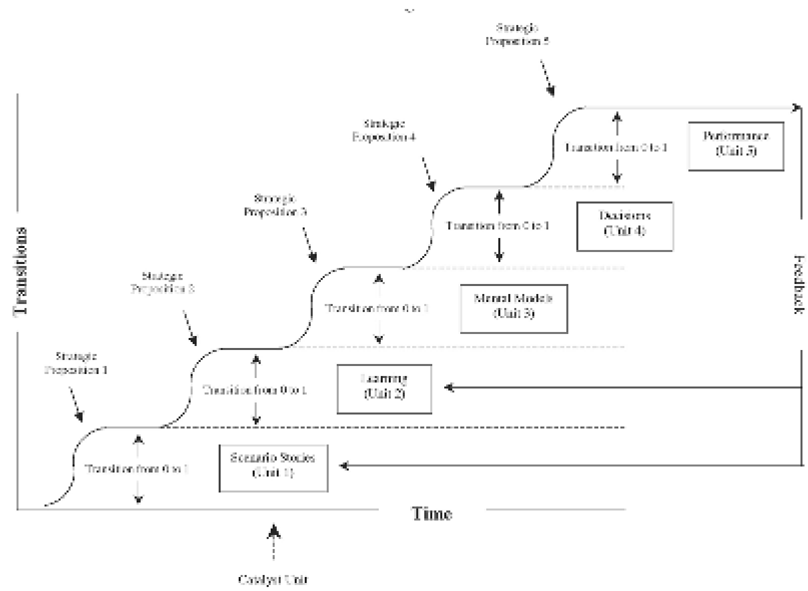


FIGURE 6: Locating the Strategic Propositions Within an Operating Theoretical Model of Scenario Planning

Summary of Scenario Planning Theory Development

The completion of Dubin's Steps 1 through 5 results in a theoretical model (Dubin, 1978). The essence of the theoretical model specifies the core concepts in the theory, how they interrelate, the context in which they relate, the conditions under which the theoretical model is expected to operate, and the propositions about the model.

This article specified the units, laws of interaction, boundaries, system states, and propositions of a theory of scenario planning and therefore has produced a theoretical model. The significance of this article is that it provides a logical model on which to build empirical indicators and hypotheses for testing and confirming the theory. The model is also believed to be the first of its kind pertaining to the phenomenon known as scenario planning. The model is summarized visually in Figure 7.

Conclusions and Implications

This article proposed a conceptualization of a theory of scenario planning according to Dubin's (1978) methodology. Although Dubin's (1978) quantitative theory-building method has been used in this case, the phenom-

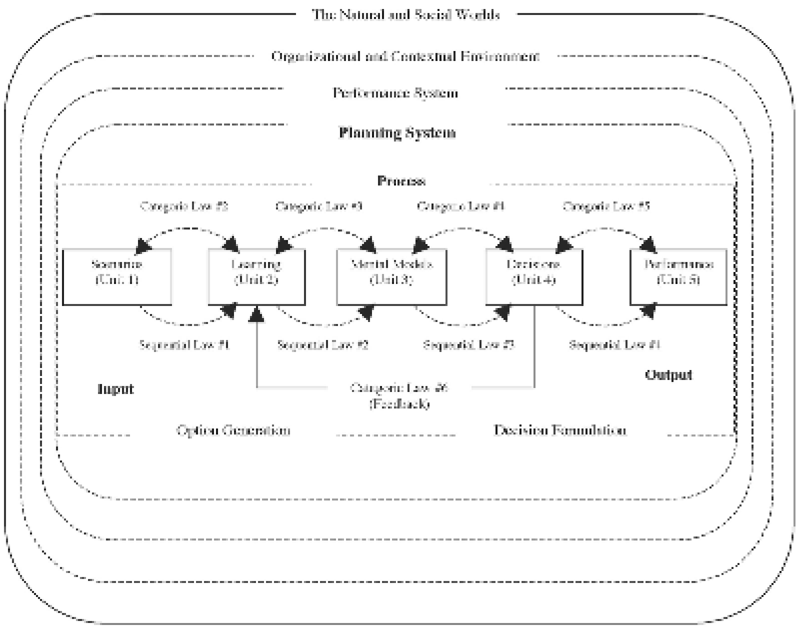


FIGURE 7: The Theoretical Model of Scenario Planning

enon of scenario planning could benefit from alternate approaches to theory development including many of the methods detailed by Lynham (2002). Such other methods might include grounded theory research (Egan, 2002), social construction research (Turnbull, 2002), and case study research (Dooley, 2002). The generation of countertheories and alternative logics are critical to working toward a better understanding of scenario planning.

At first glance, some of the technical language and complicated concepts detailed in this article may evoke questions of relevance for practice. The theoretical model, as it exists, at the conclusion of this piece is not likely to inform practice directly, although some practitioners may find the identification of key components in the scenario-planning process useful. However, a core problem in the general practice of scenario planning is that it is done without theory-based models. Thus, the intent of this article is to take the first step in addressing the lack of theory-based models in scenario planning practice. Some elements that may prove worthwhile to practitioners include simply the identification of some key elements of scenario planning and descriptions of how they are related. Given the absence of reference to theory in the scenario-planning literature, this article may have also suggested theory domains that provide practitioners with further ideas on which to draw as they work to improve their consulting models and steps. At the very least, this article clarifies the fact that claims of scenario planning leading to improved firm financial performance, decision making, or any other aspect of organizational improvement are unsupported by research and should not be blindly accepted.

Logically, the next steps would be to complete the application of Dubin's (1978) theory-building methodology, namely, identifying empirical indicators, specifying hypotheses, and then testing the hypotheses. The kind of empirical research called for in this article might include interviews with experienced scenario-planning professionals, and the use of varying learning, mental model, decision-making, and performance improvement measures for pre- and post-scenario-planning intervention comparison. However, the first task will clearly be to formulate empirical indicators and hypotheses about the theoretical model given its development thus far. These steps would result in the confirmation or disconfirmation of the theoretical model. In the likely event that some aspect of the model proposed is found to be an inadequate or inaccurate representation of the scenario planning phenomenon, the model would require revision. To clarify, based on research results, units may be added or subtracted, laws of interaction may change, boundaries and system states may be redefined, and new propositions might be developed.

In the hopeful and eventual event that aspects of the model proposed might be confirmed, it is likely that such confirmation may send a signal to practitioners that a better understanding of scenario planning and how it works is developing. Such confirmation would suggest that the necessary elements of scenario planning have been captured in the model and that the description of how they are related, and the circumstances under which they are related, are relatively accurate. This knowledge would directly inform the practice of scenario planning by providing a picture of effective scenario planning that is supported by sound research and study. It may be optimistic to assume that a model will be chosen by practitioners simply because it is supported by research and study; however, if research can indeed show that engaging in scenario planning in a specific fashion yields results, it is more likely to be an attractive method for business professionals.

If the research described above were completed by HRD professionals, there are numerous potential implications for the HRD discipline. HRD has long sought a louder voice in the organizational planning system. Knowledge and expertise with regard to a tool such as scenario planning, if found valid and effective, has the potential to bring HRD professionals the voice they have been seeking. With current expertise about organizational learning, dialogue, and the impact of these elements on firm performance, HRD professionals can offer much that is currently missing from strictly strategy-based approaches to understanding scenario planning itself, as well as organizational planning in general.

Ultimately, the confirmation of scenario-planning practices through research is sought. Although Dubin's methodology is highly quantitative in its approach to theory building, it also provides the specification of multiple research hypotheses at its conclusion—something currently missing in the scenario-planning literature. This article aims to take a first step in developing theory that underpins scenario planning—and in some ways, of equal importance—to provoke discussions about scenario-planning theory in general.

References

Brehmer, B. (1990). Strategies in real-time, dynamic decision making. In R. Hogarth (Ed.), *Insights in decision making* (pp. 262-291). Chicago: University of Chicago Press.

Brehmer, B. (1992). Dynamic decision making: Human control of complex systems. *Acta Psychological*, *81*, 211-241.

The Centre for Innovative Leadership (1995). *Strategic management: Introduction to scenario thinking public workshop*. Rivonia, South Africa: Author.

Chermack, T. J., & Lynham, S. A. (2002). Definitions and outcome variables of scenario planning. *Human Resource Development Review*, *1*(3), 366-383.

Chermack, T. J., Lynham, S. A., & Ruona, W. E. A. (2001). A review of scenario planning literature. *Futures Research Quarterly*, *17*(2), 7-31.

Chermack, T. J., & van der Merwe, L. (2003). The role of constructivist learning in scenario planning. *Futures*, *35*(5), 445-460.

De Geus, A. (1988). Planning as learning. *Harvard Business Review*, *66*(2), 70-74.

Dooley, L. M. (2002). Case study research and theory building. *Advances in Developing Human Resources*, *4*(3), 335-354.

Doyle, J. K., & Ford, D. N. (1999). Mental models concepts revisited: Some clarifications and a reply to Lane. *Systems Dynamics Review*, *15*(4), 411-415.

Dubin, R. (1978). *Theory building* (Rev. ed.). New York: Free Press, Macmillan.

Egan, T. M. (2002). Grounded theory research and theory building. *Advances in Developing Human Resources*, *4*(3), 277-295.

Fahey, L., & Randall, R. M. (1998). Integrating strategy and scenarios. In L. Fahey & R. Randall (Eds.), *Learning from the future: Competitive foresight scenarios* (pp. 22-38). New York: John Wiley.

Forrester, J. W. (1961). *Industrial dynamics*. Cambridge, MA: MIT Press.

Georgantzas, N. C., & Acar, W. (1995). *Scenario-driven planning: Learning to manage strategic uncertainty*. Westport, CT: Quorum.

Godet, M. (1987). *Scenarios and strategic management: Prospective et planification strategique* (D. Green & A. Rodney, Trans.). London: Butterworths.

Godet, M. (2000). The art of scenarios and strategic planning: Tools and pitfalls. *Technological Forecasting and Social Change*, *65*, 3-22.

Lynham, S. A. (2002). The general method of theory-building research in applied disciplines. *Advances in Developing Human Resources*, *4*(3), 221-241.

Micklethwait, J., & Woolridge, A. (1997). *The witch doctors: What the management gurus are saying, why it matters, and how to make sense of it*. New York: Times Books.

Mintzberg, H. (1994). *The rise and fall of strategic planning*. London: Prentice Hall.

Morecroft, J. D. W. (1983). System dynamics: Portraying bounded rationality. *OMEGA: The International Journal of Management Science*, *11*(2), 131-142.
Morecroft, J. D. W. (1990). Strategy support models. In R. G. Dyson (Ed.), *Strategic planning: Models and analytical techniques* (pp. 119-132). Chichester, UK: Wiley.
Morecroft, J. D. W. (1992). Executive knowledge, models, and learning. *European Journal of Operational Research*, *59*(1), 102-122.
Porter, M. E. (1985). *Competitive advantage*. New York: Free Press.
Rigby, D. (2003). Management tools survey 2003: Usage up as companies strive to make headway in tough times. *Strategy and Leadership*, *31*(5), 4-11.
Ringland, G. (1998). *Scenario planning: Managing for the future*. New York: John Wiley.
Ringland, G. (2002). *Scenarios in business*. New York: John Wiley.
Rummler, G. A., & Brache, A. P. (1995). *Improving performance: How to manage the white space on the organization chart*. San Francisco: Jossey-Bass.
Schwartz, P. (1991). *The art of the long view*. New York: Doubleday.
Senge, P. (1990). *The fifth discipline*. New York: Doubleday.
Swanson, R. A. (1999). The foundations of performance improvement and implications for practice. *Advances in Developing Human Resources, 1*(1), 1-25.
Swanson, R. A., & Holton, E. F., III. (2001). *Foundations of human resource development*. San Francisco: Berrett-Koehler.
Swanson, R. A., Lynham, S. A., Ruona, W., & Provo, J. (1998). Human resource development's role in supporting and shaping strategic organizational planning. In P. K. Kuchinke (Ed.), *Proceedings of the Academy of Human Resource Development Conference* (pp. 589-594). Baton Rouge, LA: Academy of Human Resource Development.
Torraco, R. J. (1997). Theory-building research methods. In R. A. Swanson & E. F. Holton III (Eds.), *Human resource development research handbook: Linking research and practice* (pp. 114-137). San Francisco: Berrett-Kohler.
Trumble, W. R., Brown, L., Stevenson, A., & Siefring, J. (Eds.). (2002). *Shorter Oxford English dictionary* (5th ed.). London: Oxford University Press.
Turnbull, S. (2002). Social construction research and theory building. *Advances in Developing Human Resources*, *4*(3), 317-334.
van der Heijden, K. (1997). *Scenarios: The art of strategic conversation*. New York: John Wiley.
van der Heijden, K., Bradfield, R., Burt, G., Cairns, G., & Wright, G. (2002). *The sixth sense: Accelerating organizational learning with scenarios.* New York: John Wiley.
von Bertalanffy, L. (1969). *General system theory: Foundations, development, applications*. New York: George Braziller.
Wack, P. (1985a). *Scenarios: The gentle art of re-perceiving*. Unpublished manuscript, Cambridge, MA: Harvard Business School.
Wack, P. (1985b). Scenarios: Shooting the rapids. *Harvard Business Review*, *63*(6), 139-150.
Wack, P. (1985c). Scenarios: Uncharted waters ahead. *Harvard Business Review*, *63*(5), 73-89.
Warfield, J. N. (1995). Demands imposed on systems science by complexity. In K. Ellis, A. Gregory, B. R. Mears-Young, & G. Ragsdell (Eds.), *Critical issues in systems theory and practice* (pp. 81-88). New York: Plenum.
Weick, K. E. (1979). *The social psychology of organizing*. Reading, MA: Addison-Wesley.
Weick, K. E. (1990). Introduction: Cartographic myths in organizations. In A. S. Huff (Ed.), *Mapping strategic thought* (pp. 1-10). New York: John Wiley.
Wilson, I. (1992). Teaching decision makers to learn from scenarios: A blueprint for implementation. *Planning Review*, *20*(3), 18-22.
Wilson, I. (2000). From scenario thinking to strategic action. *Technological Forecasting and Social Change*, *65*, 23-29.
Wright, G., & Goodwin, P. (1999). Future-focused thinking: Combining scenario planning with decision analysis. *Journal of Multi-Criteria Decision Analysis*, *8*, 311-321.

Yang, B. (2002). Meta-analysis research and theory building. *Advances in Developing Human Resources*, *4*(3), 296-316.

Thomas J. Chermack is an assistant professor in the Department of Learning and Performance Systems at the Pennsylvania State University. He received his doctorate from the University of Minnesota in 2003, and his research focuses on scenario planning and its theoretical base. He is currently conducting interdisciplinary and mixed methodological research to examine how and why scenario planning works and fails. His other research interests generally include the role of human expertise in organizations, decision making, and organization development from a strategic frame.