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A Theory of Scenario Planning

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ABSTRACT

Strategic planning has helped organization leaders cope with their complex external environments, but it reveals a weakness in its core assumption of a predictable environment. Scenario planning has emerged as a tool for considering uncertainty in the planning process, and it appears to be of high utility in rapidly changing environments. However, the theoretical development is lacking and general research about scenario planning has been minimal.

To address the current lack of theory, this research developed a theory of scenario planning following Dubin's (1978) theory building method. Dubin's (1978) eight-step reserach methodology consists of (1) developing the units of the theory, (2) specifying the laws of interaction describing the relationships among the units, (3) determining the boundaries within which the theory is expected to function, (4) identifying the system states in which the theory is expected to function, (5) specifying the propositions, or truth statements about how the theory is expected to operate, (6) identifying the empirical indicators used to make the propositions testable, and (7) constructing hypotheses used to predict values and relationships among the units.

The resulting theory is concluded to be of high value to both scenario planning professionals and business practitioners because it provides a basis for consistency in examining scenario planning. Further confirmation or disconfirmation of this new theory will allow more specific conclusions to be drawn about the ultimate effectiveness of scenario planning itself.

Chapter One

INTRODUCTION

This chapter provides the problem statement for which this research is intended as a potential solution. Specifically, this chapter:

1) Introduces the general topic of scenario planning
2) Provides the problem statement
3) Describes the purpose of this study
4) Provides the rationale and significance of the problem for the field of Human Resource Development (HRD), and finally,
5) Provides definitions of key terms

In constant pursuit of methods for increasing organizational effectiveness and profitability, organizational leaders have sought to understand the environments in which they operate. Because organizations are open systems, they constantly exchange information with their environments (Rummler & Brache, 1995). In doing so, organizations strive to achieve the best possible fit with the external environment (Drucker, 1964; Ansoff, 1965). Several methods, including strategic planning, open systems planning, integrated strategic change and transorganizational development have surfaced to help organizational leaders achieve such alignment (Cummings & Worley, 2001). Scenario planning has gained increased attention during the last 20 years as an effective method for identifying critical future uncertainties and investigating “blind spots” in the organization (Kahane, 1999).

As the world progresses further into the knowledge age, organizations are faced with an increasing need to respond quickly to a variety of changes. Uncertainty is becoming an increasingly important factor for organizational leaders and planners to consider. In such a rapidly changing environment, the ability to adapt quickly to major changes can mean the difference between a thriving organization and bankruptcy. These changes are often external to the organization and coping with them has forced managers and executives to adopt a systems view of their organizations and the environments in which they operate. With global complexities and changes likely to continue on the current path of growth, the future of the global business environment will require an even more thorough ability to examine the forces of change and anticipate possible solutions to potential problems.

A well-known method for directing future changes in organizations has been *strategic planning*. While this approach 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, 1995)

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, 1997). This method reveals an enlarged future landscape. With a focus on long and short-term alternatives about the future, scenario planning is meant to force organizational planners to consider paradigms that challenge their current thinking and to think the unthinkable (Wack, 1985a). Scenario planning is believed by many to be a useful means of conducting or enhancing strategic organizational planning options (Swanson, Lynham, Ruona & Provo, 1998; Fahey & Randall, 1998). While scenario planning methods have been increasingly applied and reported in the literature in the last three decades (Georgantzas & Acar, 1995, Micklethwait & Wooldridge, 1997, Ringland, 1998), scholarly development and rigorous application of scenarios is just beginning.

The Utility of Scenario Planning

Scenario planning is seen to have utility in planning for the future (Schwartz, 1991; Ringland, 1995; van der Heijden, 1997). In a world that changes far too rapidly for prediction to be fully accurate, scenarios are gaining credibility as effective tools to prepare for an uncertain future, alter mental models, test decisions, and improve performance in a dynamic environment (Chermack, Lynham, & Ruona, 2001). The popular application of scenarios has resulted in a variety of approaches and methods for conducting the scenario building process. The system theory concept of equifinality (Ashby, 1953) suggests that the same outcome can be achieved via different paths. To this point scenario planning pioneers such as Pierre Wack, Jay Forrester, Art Kliener, Peter Schwartz, Michel Godet, and Kees van der Heijden, have reported on a variety of practical methods for engaging in scenario planning without a deep understanding of the phenomena. Thus, a critical piece is missing -- the theory base on which scenario planning methods stand.

The Problem

The status of theory and theory development in the area of scenario planning and, for that matter, future oriented practices in general is almost non-existent (Chermack, 2002). Literature searches on futures theory yield few resources. It is apparent that scenario planning is increasingly applied in organizations without guiding theory for implementation or means for sound evaluation.

Some scenario planning professionals have tended to think of method and theory as equivalent. Georgantzas and Acar (1995) include an appendix entitled “Theoretical Foundations of Scenario-Driven Planning”, however, an examination of that appendix reveals 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 building can be labeled as a process within the scenario planning system, and there are differing methods around completing the process. Scenario planning theory would tell us how the process of building scenarios works itself, and as a sub-process within the planning system. Such a description of how scenario planning works is precisely what is missing. While it is logical that the same outcome can be achieved using different methods, guiding or underlying theory would point the professional toward that outcome.

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

Authors such as van der Heijden (1997), Schwartz (1991), Ringland (1998), Godet (2001), and Wack (1985a; 1985b) have made considerable written contributions to scenario planning practice and yet, do not mention the word “theory” in their indexes, keywords or tables of contents. This focus on practical application and development has appeared to refine these methods and in some cases, produced agile organizations that seem to be able to anticipate change – as in the highly reported Royal Dutch/Shell success with scenarios (Floyd, 1995a-f; Wack, 1985a; 1985b). In contrast, some scenario projects have resulted in remarkable failure and there has been little effort in searching for the cause (Godet, 2000; Schriefer, 1995). The application of atheoretical scenario planning methods by novices is a threat to organizations seeking long-term solutions and to the potential contribution of theoretically sound scenario planning practices.

Purpose of the Study

Many of the scenario planning authors hint toward implicit theory domains that inform the scenario planning process. For scenario planning to become more than a process advocated by high-profile practitioners, an articulation of its theoretical foundation and scholarly validation will be required. The articulation of theoretical foundations is critical to the development and maturation of any field, discipline, or process (Warfield, 1995). Chermack & Lynham (2001) revealed some core espoused outcomes of scenario planning. These were plausible futures, changed thinking, improved decision-making, enhanced human learning, and improved performance. To be sure, these are promising areas in which to search for theory that underlies, informs, or shapes scenario planning as well as helping to validate outcomes. In an effort to begin filling the present theory void:

The purpose of this study is to develop a theory of scenario planning.

Significance of the Problem and the Link to Human Resource Development

The link between Human Resource Development (HRD) and scenario planning may seem unclear to some HRD professionals. HRD professionals can provide much in the development and facilitation of scenario planning because of their expertise in learning, performance, research, theory building and evaluative techniques (Provo, Ruona, Lynham & Miller, 1998). Considering these potential contributions, HRD is poised to lead the scenario planning process, the construction of its theory, the implementation around its research, and the development of its evaluation. The opportunity presented here is a tool that has the potential to allow individuals and organizations to construct their own futures. If HRD is to continue to be strategic in its attempts to develop individuals and organizations, its scholars and practitioners will realize the value of scenario planning as a tool that addresses the same issues. An exceptional opportunity will be lost if this strategic tool is not claimed and developed, and HRD professionals are in a prime position to do so.

Provo, et al., (1998) outlined 5 key connections between HRD and scenario planning, (1) increased knowledge about scenario planning can leverage HRD to become a shaper of business strategy, (2) implementation of actions resulting from scenario planning often requires HRD expertise, (3) the connection between scenario planning and organization development or change efforts implies a domain of HRD, (4) the theory of scenario planning can benefit from learning expertise in HRD, and finally (5) scenarios were advocated to consider the future of HRD itself.

HRD professionals are concerned with the thoughtful application of tools and interventions that can have a positive impact on the lives of organizational workers, managers, executives, communities and nations. A core assumption underlying the support for HRD to own scenario planning is that HRD professionals are concerned with having a positive impact on the lives of organizational workers, managers, executives, communities and nations in the future.

In a world of increasingly rapid change, scenario planning has emerged as a tool for considering multiple plausible futures, embracing multiple differing views on what "better" futures might and "should" look like (Ogilvy, 1996; 2002; Sunter, 1982; 1987; 1986).

Recent statements include an assertion that there is an increasing value of human expertise as a competitive or strategic advantage (De Geus, 1998; Jacobs & Jones, 1995; Senge, 1994). There are also some differing views on what is required of HRD's contribution to a competitive or strategic advantage for the organization. "HRD will only be perceived as having strategic value if it also demonstrates genuine strategic capability" (Torraco & Swanson, 1995, p. 18). Torraco and Swanson (1995) further stated that there are two ways for HRD to demonstrate its strategic capability. They are (1) through educating organizational leaders about strategic thinking and (2) through direct participation in organizational planning. A mastery and leadership of the scenario planning process might enable HRD to effectively increase its contribution in both of these domains, providing the potential for HRD itself to be recognized as being of more strategic value to other business units.

Scenario planning is a practical alternative to strategic planning as it avoids the pitfalls of attempts at prediction. The intent of scenario planning is to challenge what members of organizations assume to be true by exploring stories that cover a wide range of potential outcomes. Given that the interests of the HRD professional parallel the intended outcomes of the scenario planning process, HRD professionals ought to be very much in favor of a process such as scenario planning, provided it produces results. Therefore, this study intends to develop a theory of scenario planning to help fill the theory void, establish sound means for evaluating the process, and provide the first step for HRD in its leadership of scenario planning in organizations.

Definition of Key Terms

At this point, it is also appropriate to provide a general lexicon of the key terms to be used in the following chapters. Some key terms to be distinguished include scenarios, scenario building, scenario planning, theory and theoretical model. Each of the following terms will be elaborated upon as this research unfolds; however, it is appropriate to provide some general clarification early on. Thus, important terms to distinguish before proceeding are as follows:

Figure 1.1. Definition of Key Terms

Term	*Definition*
Scenario	"A tool for ordering one's perceptions about alternative future environments in which one's decisions might be played out" (Schwartz, 1991, p. 45).
Scenario Building	"The process of constructing alternate futures of a business' external environment" (Simpson, 1992, p. 10).
Scenario Planning	"Scenario planning is inherently a learning process that challenges the comfortable conventional wisdoms of the organization by focusing attention on how the future may be different from the present" (Thomas, 1994, p. 6)
Theory	Theory helps us understand (describe, explain, and sometimes predict) what happens in practice" (Gioia & Pitre, 1990, p. 4).
Theoretical Model	A theoretical model is produced when units are identified and their laws of interaction, boundaries, system states and propositions have been articulated (Dubin, 1978).

Chapter Two

REVIEW OF LITERATURE

This chapter provides a comprehensive view of content being published around the phenomenon of scenario planning. Specifically, this chapter:

1) Considers definitions of scenario planning
2) Provides an historical perspective of scenario planning
3) Provides an overview of basic paradigms in strategy
4) Includes a detailed review of varying methods for conducting scenario planning, and
5) Offers key themes and characteristics of effective scenario planning

Finally, the current status of evaluation in scenario planning is considered as well as options for proceeding in an effort to fill the theory deficit.

An important consideration for this chapter is that it is intended to make the case supporting the problem statement presented in chapter 1: *that there is presently no theory of scenario planning and, thus, scenario planning practices are neither fully understood nor fully validated*. Additional literature review will be presented in chapters three and four to provide the necessary background for the concepts and content as the theory is constructed.

Definitions of Scenario Planning

Scenario planning has been defined in several ways. Michael Porter (1985) defined scenarios as "an internally consistent view of what the future might turn out to be – not a forecast, but one possible future outcome" (p. 63). Schwartz (1991) defined scenarios as "a tool for ordering one's perceptions about alternative future environments in which one's decisions might be played out" (p. 45). Ringland (1998) defined scenario planning as "that part of strategic planning which relates to the tools and technologies for managing the uncertainties of the future" (p. 83). Schoemaker (1995) offered, "a disciplined methodology for imagining possible futures in which organizational decisions may be played out" (p. 71) as a definition for scenario planning.

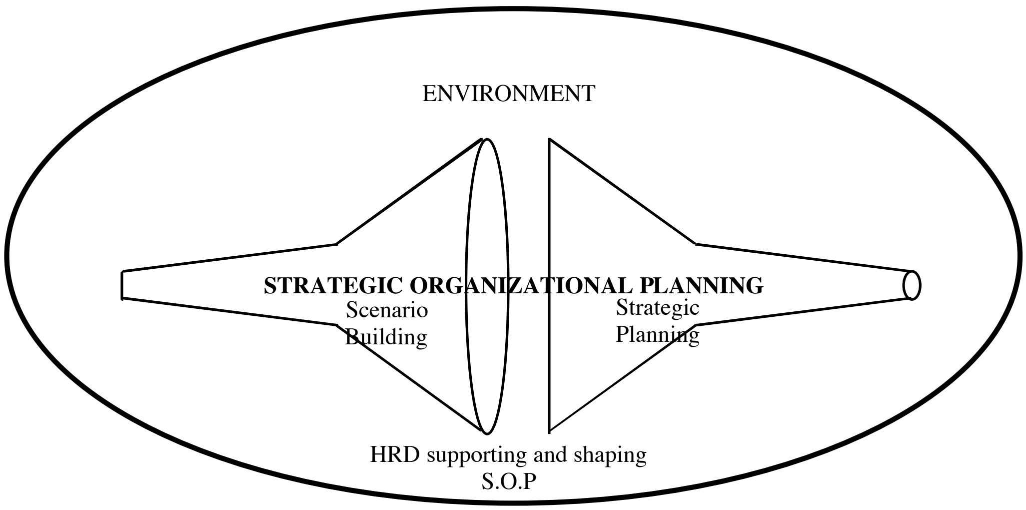
A search was conducted specifically concerning the definition of scenario planning. The method used to inform the definitional search involved accessing literature available through electronic databases, including ABI Inform, ERIC, PsychInfo, as well as electronic journals Interscience/Wiley, Catchword, ScienceDirect, and JSTOR. Each search was conducted using search criteria of "scenario planning" contained in the "keywords" field. These searches, conducted through several large search engines at a major university in the Untied States, yielded a total of eighty-three resources. Articles were screened according to relevance for the purposes of this study. Only scholarly articles from refereed journals were considered. For example, book reviews and editorials were not included in the final resource pool of thirty-four articles. The final selection criterion was whether or not the article contained an explicit definition of scenario planning. The eighteen remaining resources were examined for their definitions and implicit and explicit outcome variables. Figure 2.1 illustrates a review of definitions of scenario planning.

Figure 2.1. Scenario Planning Definitions and Dependent Variables as Reported in the Available Literature

Author	Date	Definition	Dependent Variables
Porter	1985	"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).	*A view of one possible future outcome*
Schwartz	1991	"A tool for ordering one's perceptions about alternative future environments in which one's decisions might be played out" (Schwartz, 1991, p. 45).	*Ordered perceptions about alternative future decision-making environments*
Simpson	1992	"The process of constructing alternate futures of a business' external environment" (Simpson, 1992, p. 10).	*Constructed alternate futures*
Bloom & Menefee	1994	"A description of a possible or probable future" (Bloom & Menefee, 1994, p. 223).	*A description of a future*
Collyns	1994	"An imaginative leap into the future" (Collyns, 1994, p. 275, in 5th discipline field book).	*An imagined future*
Thomas	1994	"Scenario planning is inherently a learning process that challenges the comfortable conventional wisdoms of the organization by focusing attention on how the future may be different from the present" (Thomas, 1994, p. 6)	*Challenged comfortable conventional wisdoms about the future*
Schoemaker	1995	"a disciplined methodology for imagining possible futures in which organizational decisions may be played out" Schoemaker, 1995, p. 25)	*Imagined possible decision-making futures*
Van der Heijden	1997	○ External scenarios are "internally consistent and challenging descriptions of possible futures" ○ An internal scenario is "a causal line of argument, linking an action option with a goal", or "one path through a person's cognitive map" (van der Heijden, 1997, p. 5)	*Descriptions of possible futures* *Explicit cognitive maps*
De Gues	1997	"Tools for foresight-discussions and documents whose purpose is not a prediction or a plan, but a change in the mindset of the people who use them" (De Gues, 1997, p. 46)	*Changed mindsets*
Ringland	1998	"That part of strategic planning which relates to the tools and technologies for managing the uncertainties of the future" (Ringland, 1998, p. 83).	*Managed future uncertainties*
Bawden	1998	"Scenario planning is one of a number of foresighting techniques used in the strategic development of organizations, which exploit the remarkable capacity of humans to both imagine and to learn from what is imagined". (University of Western Australia, GBN)	*Human imagination and learning made explicit*
Fahey & Randall	1998	"Scenarios are descriptive narratives of plausible alternative projections of a specific part of the future" (Fahey & Randall, 1998, p. 6)	*Plausible alternative projections of a specific part of the future*
Alexander & Serfass	1998	"Scenario planning is an effective futuring tool that enables planners to examine what is likely and what is unlikely to happen, knowing well that unlikely elements in an organization are those that can determine its relative success" (Alexander & Serfass, 1998, p. 35)	*Examined future likelihoods and unlikelihoods*
Tucker	1999	"Creating stories of equally plausible futures and planning as though any one could move forward" (Tucker, 1999, p. 70).	*Stories of equally plausible futures that inform planning*
Kahane	1999	"A series of imaginative but plausible and well-focused stories of the future" (Kahane, 1999, p. 511 in 5th discipline field book).	*Plausible stories of the future*
Kloss	1999	"Scenarios are literally stories about the future that are plausible and based on analysis of the interaction of a number of environmental variables" (Kloss, 1999, p. 73)	*Informed, plausible stories about the future*
Wilson	2000	"Scenarios are a management tool used to improve the quality of executive decision making and help executives make better, more resilient strategic decisions" (Wilson, 2000, p. 24)	*Improved executive strategic decision-making*
Godet	2001	"A scenario is simply a means to represent a future reality in order to shed light on current action in view of possible and desirable futures" (Godet, 2001, p. 63)	*A represented future reality*

It is necessary to note here that even among the most popular writings on scenarios, it was difficult to find definitions that captured explicit and precise meanings of scenario planning. The distinguishing factor for scenarios is that they are not predictions or forecasts. Scenarios are not concerned with getting the future "right", rather they aim at challenging current paradigms of thinking and broadcast a series of stories in which attention is directed to aspects that would have been otherwise overlooked (Shoemaker, 1995). Scenario stories can then be filtered into the strategic planning process as in the "strategic organizational planning model" (Swanson, Lynham, Ruona, & Provo, 1998, see Figure 2.2) integrating aspects of all of the developed scenarios, but the process of building scenarios is separate (Ringland, 1998).

Figure 2.2 The Strategic Organizational Planning Model (Swanson, Lynham, Ruona, & Provo, 1998)



In order to frame scenario planning, the major themes in the literature are presented and explored in greater depth. It is necessary to determine the impact that participation in scenario planning can have on business members' decision-making capabilities because they are directly related to business results (Schwartz, 1991). Scenario planning requires extensive time and financial resources and has been a coveted art with only a select few understanding the application methodologies. The long and short-term impacts of scenario planning are not fully understood, and the theory behind scenario planning is not firmly set in place (Geogantzas & Acar, 1995, Ringland, 1998, Schwartz, 1991, van der Heijden, 1997). Scenario planning as a change intervention also has the potential to affect the lives of all employees in entire business systems (Georgantzas & Acar, 1995, van der Merwe, 1994). Because of limited expertise, scenario planning is unavailable to many organizations, and the intensity of involvement, attention to detail and the scope of the methodology have made scenario planning an activity in which only the most financially secure companies can participate (Wack, 1985b).

An understanding of the changes in decision-making capabilities of scenario planning participants is necessary to determine precisely how organizational performance can be enhanced. Little is known about the effects, both short and long term, of scenario planning, and how those effects impact the capabilities of business leaders to make decisions. Furthermore, there are a variety of opinions regarding the method for conducting scenario planning (Gerogantzas & Acar, 1995, Ringland, 1998, Schwartz, 1991, van der Heijden, 1997). With business applications developing mainly out of practice (Wack, 1985, Ringland, 1995, Van derHeijden, 1997) scenario planning as a field has not had the opportunity to establish strong theoretical roots (Gergantzas & Acar, 1995). The absence of explicit theoretical roots has led to the application of scenario planning as something of a "club members only" philosophy, and there is a strong community of practicing scenario planners who have not the time to reflect upon the implications of their organizational interventions. This predicament is reminiscent of the conditions that led to the collapse of strategic planning in organizations in the 1970's (Mintzberg, 1980; Ringland, 1998). In hopes of gaining some insight to the current status of knowledge around scenario planning, this chapter is intended to provide a description of the field through an intense review of the available literature.

An analysis of scenario planning literature has revealed several themes and objectives. Major themes include history, scenarios as stories, the theory of scenarios, the effects of scenarios on decision making capabilities, creating "anticipatory memory" from scenarios, scenarios as tools for organizational learning, and the evaluation of scenario projects. These themes run consistently throughout the available material, although details are often lacking. It is an additional aim of this research to examine these themes in as detailed a manner as the literature provides.

History of Scenario Planning

Scenario planning first emerged for application to businesses in a company set up for researching new forms of weapons technology in the RAND Corporation. Herman Kahn of RAND Corporation pioneered a technique he titled "future – now" thinking. The intent of this approach was to combine detailed analyses with imagination and produce reports as though they might be written by people in the future. Kahn adopted the name "scenario" when Hollywood determined the term outdated, and switched to the label "screenplay". In the mid – 1960's, Kahn founded the Hudson Institute which specialized in writing stories about the future to help people consider the "unthinkable". He gained most notoriety around the idea that the best way to prevent nuclear war was to examine the possible consequences of nuclear war and widely publish the results (Kahn & Weiner, 1967).

Around the same time, the Stanford Research Institute began offering long-range planning for businesses that considered political, economic and research forces as primary drivers of business development. The work of organizations such as SRI began shifting toward planning for massive societal changes (Ringland, 1998). When military spending increased to support the Vietnam War, an interest began to grow in finding ways to look into the future and plan for changes in society. These changing views were largely a result of the societal shifts of the time.

The Hudson Institute also began to seek corporate sponsors, which exposed companies such as Shell, Corning, IBM and General Motors to this line of thinking. Kahn then published "The Year 2000" (Kahn & Weiner, 1967), "which clearly demonstrates how one man's thinking was driving a trend in corporate planning" (Ringland, 1998, p. 13). Ted Newland of Shell, one of the early sponsors, encouraged Shell to start thinking about the future.

The SRI "futures group" was using a variety of methods to create scenarios for the United States Education system for the year 2000. Five scenarios were created and one entitled "Status Quo Extended" was selected as the official future. This scenario suggested that issues such as population growth, ecological destruction, and dissent would resolve themselves. The other scenarios were given little attention once the official future was selected. The official future reached the sponsors, the U.S. Office of Education at a time when Richard Nixon's election as President was in full swing. The offered scenario was quickly deemed impossible because it was in no way compatible with the values that were advocated from the leader of the country (Ringland, 1998). SRI went on to do work for the Environmental Protection Agency with Willis Harmon, Peter Schwartz, Thomas Mandel and Richard Carlson constructing the scenarios.

Meanwhile, Professor Jay Forrester (1961) of the Massachusetts Institute of Technology was using similar concepts to describe supply and demand chains. The use of scenario concepts in his project were more to develop a model which would help people understand the nature of growth and stir up public debate. The results were published by Meadows in 1992 (Meadows et al, 1992).

Scenario planning at Shell was well on its way in the mid 1960's. Ted Newland and Pierre Wack suggested in 1967 that thinking six years ahead was not allowing enough lead time to effectively consider future forces in the oil industry (Wack, 1985a). Shell began planning for the year 2000. When the Yom Kippur war broke out and oil prices plummeted, Shell was prepared. The ability to act quickly has been credited as the primary reason behind the company's lead in the oil industry (van der Hiejden, 1997).

Shell's success with scenario planning encouraged numerous other organizations to begin thinking about the future. Because the oil shock was so devastating to views of a stable future, by the late 1970's the majority of the Fortune 1000 corporations had adopted scenario planning in one form or another (Ringland, 1998).

The success of scenario use was short lived. Caused by the major recession and corporate staffing reductions of the 1980's, scenario use was on the decline. It is also speculated that planners over-simplified the use of scenarios, confusing the nature of story telling with forecasting (Ringland, 1998; Godet & Roubelat, 1996). According to Kleiner (1996) the time had come for managers to realize that they did not have the answers. Michael Porter led a "back to the basics" approach suggesting that corporations use external forces as a platform for planning (1985). In this time of evaluating how planning happens many consulting firms began developing scenario planning methods. Huss & Honton, (1987) described three approaches to scenario building; 1) intuitive logics, introduced by Pierre Wack, 2) trend-impact analysis, the favorite of the Futures Group, and 3) cross-impact analysis, implemented by Battelle. Shell continued to have success with scenarios through two more oil incidents in the 1980's and slowly, corporations cautiously began to re-integrate the application of scenarios in planning situations. Scenario planning has been adopted at a national level in some cases, and its methods have been successful in bringing diverse groups of people together (Kahane, 1992; van der Merwe, 1994).

Planning in the Military

Military planning has long concentrated on strategy principles dating back to early Chinese philosophers such as Sun Tzu and ancient scholars such as Niccolo Machiavelli. These early opinions about battle positioning have heavily influenced modern thinking about strategy (Cleary, 1988; Greene, 1998). Through several world and national wars, the notion of planning for strategic warfare positioning has evolved dramatically (Frentzell, Bryson & Crosby, 2000). While the history of military planning is extensive and it has evolved in many ways completely on its own, military strategy has borrowed and contributed concepts from and to corporate planning (Frentzel et al., 2000). Specifically, this review considers the link between corporate and military planning related to scenarios.

As a result of the Second World War, planning became a top priority for all industries. The military took a heightened interest in the research coming out of the RAND corporation headed by Herman Kahn (Kahn & Weiner, 1967; Ringland, 1998). The developments in Kahn's "future-now thinking" quickly translated into military efforts to predict the future (Kahn & Weiner, 1967). Therefore military planning took on physicists and mathematicians specializing in modelling (Ringland, 1998). While much of the planning strategies used by the military are classified, it seems clear that the thinking going on in Stanford Research Institute's Futures Group, and that of Herman Kahn himself in the Hudson Institute provoked what became more widely known as simulations. Later on, Forrester's (1961) work at the Massachusetts Institute of Technology also contributed greatly to the development of simulations and his expertise was sought for military operations on several occasions.

Military groups began using simulations to allow individuals to experience situations without the implications of their actions in those situations translating into reality (Frentzel et al., 2000). The emphasis on war games, the advent of computer modelling, and other technology produced by the military and industry in the 1950's and 60's have led to elaborate training strategies involving virtual reality and devices such as flight simulators. While military planning has incorporated some of the early scenario planning concepts, the core point of differentiation has been a lasting focus on prediction in military planning (Frentzel et al., 2000).

Paradigms in Strategy

Because scenarios are closely related to strategic planning, it is necessary to outline the prevailing strategic views. Thinking on strategy within the last few decades has revealed the development of schools of thought in strategic perspectives. In order to place scenario planning in context, it is important to consider the backgrounds of each of these views. Van der Heijden (1997) identified three overarching paradigms of strategic management and planning. They are the rationalist, evolutionist and processual.

The Rationalist School

The rationalist school features a tacit and underlying assumption that there is indeed one best solution. The job of the strategist becomes one of producing that one best solution, or the closest possible thing to it. Classic rationalists include Igor Ansoff, Alfred Chandler, Frederick Taylor and Alfred Sloan (Micklethwait & Wooldridge, 1997). The rationalist approach to strategy dictates that an elite few of the organizations top managers convene, approximately once each year, and formulate a strategic plan. Mintzberg (1990) listed other assumptions underlying the rationalist school.

1) Predictability, no interference from outside
2) Clear intentions
3) Implementation follows formulation
4) Full understanding throughout the organization
5) Reasonable people will do reasonable things

The majority of practitioners and available literature on strategy is of the rationalist perspective (van der Heijden, 1997). Although it is becoming clear that this view is limited and though the belief in one correct solution wanes, the rationalist perspective is still currently alive and well.

The Evolutionary School

With an emphasis on the complex nature of organizational behavior, the evolutionary school suggests that a winning strategy can only be articulated in retrospect (Mintzberg, 1990). In this context it is believed that systems can develop a memory of successful previous strategies. In this case, strategy is thought to be a "process of random experimentation and filtering out of the unsuccessful" (van der Heijden, 1997, p. 24). The issue with this perspective is that it is of little value when considering alternative futures. This view also reduces organization members to characters of chance, influenced by random circumstances.

The Processual School

The processual school asserts that although it is not possible to deliver optimal strategies through rational thinking alone, organization members can instill and create processes within organizations that make it a more adaptive, whole system, capable of learning from its mistakes (van der Heijden, 1997; 2000). Incorporating change management concepts to influence processes, the processual school supports that successful evolutionary behavior can be analyzed and used to create alternative futures. van der Heijden (1997; 2000) offered the following examples of metaphors for explaining the three strategic schools:

1) The rationalistic paradigm suggests a machine metaphor for the organization
2) The evolutionary school suggests an ecology
3) The processual school suggests a living organism

Because van der Heijden viewed scenarios as a tool for organizational learning, he advocated the integration of these three strategic perspectives. "Organizational learning represents a way in which we can integrate these three perspectives, all three playing a key role in describing reality, and therefore demanding consideration" (van der Heijden, 1997, p. 49). It is widely accepted that effective scenario building incorporates all three of these perspectives (Ringland, 1998; Gerogantzas & Acar, 1995; Schwartz, 1991).

Planning Schools

Mintzberg & Lampel (1999) provided an overview of 10 "schools" of strategy. In an attempt to classify the vast literature around strategy and strategic planning, the authors devised ten schools according to ten different views regarding the intent and nature of strategy and strategic planning. Scenario planning represents a position that may incorporate several, if not all of the schools proposed by Mintzberg & Lampel, but it seems clear that scenarios and scenario planning can be coupled with a variety of strategic planning processes in an overall planning system (Swanson, Lynham, Ruona, & Provo, 1998). To illustrate this link, the ten schools of planning proposed by Mintzberg & Lampel are summarized.

The Design School

The Design school suggests that fit between the organization and its environment is the most important factor in implementing and considering strategy. By analyzing strengths, weaknesses, opportunities and threats, organizational leaders attempt to achieve a maximum fit with the environment through a "deliberate process of conscious thought" (Mintzberg & Lampel, 1999, p. 22). The design school is based on a relatively predictive model and aspects of it have been incorporated into many of the other schools (Mintzberg & Lampel, 1999).

The Planning School

The planning school has grown primarily out of Ansoff's (1965) work and dominated the conception of strategy through the 1960's. "Ansoff's book reflects most of the design school's assumptions except a rather significant one: that the process is not just cerebral but formal, decomposable into distinct steps, delineated by checklists, and supported by techniques (especially with regard to objectives, budgets, programs, and operating plans)" (Mintzberg & Lampel, 1999, p. 22).

The Positioning School

The positioning school was the dominant view in the 1980's and was given much support and influence by Porter (1980) and consulting firms such as Boston Consulting Group, and McKinsey & Company. "In this view, strategy reduces to generic positions selected through formalized analyses of industry situations. Hence, the planners become analysts" (Mintzberg & Lampel, 1999, p. 23). Drawing on roots in military strategy, the positioning school focused on data and strategy as a science.

The Entrepreneurial School

The entrepreneurial school focuses on the chief executive as the primary strategist. With a much smaller stream of literature and practice, the environmental school "centered the process on the chief executive; but unlike the design school and opposite from the planning school, it rooted that process in the mysteries of intuition" (Mintzberg & Lampel, 1999, p. 23). Thus, strategy was a more vague, metaphoric endeavor driven by the knowledge, skill, and perceptions of an individual.

The Cognitive School

Focusing on creating models of reality for executive teams to test strategies, the cognitive school suggests that strategy is a mental process. Cognitive maps, mental representations, mental models and other terms have been used to communicate the importance of understanding those mental processes. "Particularly in the 1980s and continuing today, research has grown steadily on cognitive biases in strategy making and on cognition as information processing, knowledge structure mapping, and concept attainment" (Mintzberg & Lampel, 1999, p. 24).

The Learning School

The learning school has emphasized planning as a learning activity, completely abandoning the notion that the future can be predicted. "Dating back to Lindblom's early work on disjointed incrementalism and running through Quinn's logical incrementalism, Bower's and Burgelman's notions of venturing, Mintzberg et al.'s ideas about emergent strategy, and Weick's notion of retrospective sense making, a model of strategy making as learning developed that differed from the earlier schools" (Mintzberg & Lampel, 1999, p. 24). This view also sees strategy as an emergent phenomenon and incorporates a cross-section of the organization into the planning process.

The Power School

The Power school has been divided into two perspectives: Micro power and Macro power. "Micro power sees the development of strategies within the organization as essentially political - a process involving bargaining, persuasion, and confrontation among actors who divide the power. Macro power views the organization as an entity that uses its power over others and among its partners in alliances, joint ventures, and other network relationships" (Mintzberg & Lampel, 1999, p. 25). Ultimately, the power school suggests that people in powerful positions devise strategies.

The Culture School

The culture school is the opposite of the power school. In the cultural view, strategies are devised by collective thought and contribution to the strategy process. The cultural school "focuses on common interest and integration - strategy formation as a social process rooted in culture" (Mintzberg & Lampel, 1999, p. 25). This view was popularized in the United States after Japanese management styles were observed at the height of their effectiveness in the 1980's.

The Environmental School

"In this category, we include so-called "contingency theory" that considers which responses are expected of organizations facing particular environmental conditions and "population ecology" writings that claim severe limits to strategic choice" (Mintzberg & Lampel, 1999, p. 25). The environmental school suggests that the goal of strategic planning is to prepare for as many environmental situations as possible. With a focus on contingency plans and preparedness, the environmental school represents a constantly reactionary stance to environmental conditions.

The Configuration School

The configuration school suggests the use and combination of multiple methods and views as an appropriate approach to strategy. "This school, more academic and descriptive, sees organization as configuration - coherent clusters of characteristics and behaviors - and integrates the claims of the other schools - each configuration, in effect, in its own place" (Mintzberg & Lampel, 1999, p. 26).

The ten schools proposed by Mintzberg & Lampel are intended to provide a means by which the diverse, complex and varied nature of the literature around strategy and strategic planning can be summarized. Some conceptual work has linked scenarios to strategic planning (Swanson, Lynham, Ruona & Provo, 1999) and this research intends to build on that work.

A unique perspective is achieved when the strategy paradigms and planning schools are combined in a matrix. Based on Mintzberg & Lampel (1999), the planning schools can be classified into strategy paradigms generally as depicted in Figure 2.3. The matrix provided in Figure 2.3 allows the strategist to further assess a variety of approaches to strategy.

Figure 2.3. Synthesis Matrix of Strategy Paradigms and Planning Schools.

Planning Schools	***Strategy Paradigms***		
	Rational	Evolutionary	Processual
Design School	X		
Planning School	X		
Positioning School	X		
Entrepreneurial School	X	X	X
Cognitive School		X	X
Learning School		X	X
Power School	X	X	
Cultural School		X	
Environmental School			X
Configuration School	X	X	X

Methods for Conducting Scenario Planning

The literature describes three overarching approaches to scenario building and development (Ringland, 1998). Kahn emphasized the application of reasoned judgment and intuition as a very qualitative approach to scenario planning (Kahn & Weiner, 1967). This approach was rooted in the beginnings of the science of futurology. Management scientists Amara & Lipinski applied a quantitative approach that they labeled operational research/management science (OR/MS) using structural algorithms and mathematical modeling (Amara & Lipinski, 1983, Georgantzas & Acar, 1995). The process quickly became computer driven. In an attempt to provide a solid middle ground, Millet & Randles (1986) generated procedural scenarios that incorporated intuitive and quantitative techniques.

Because it is the most detailed account of building scenarios, this section will concentrate on the methodology proposed by van der Heijden (1997). Many established scenario planners are reluctant to completely disclose their methodologies, and perhaps rightly so. An overview of other methodologies is given in this section following a detailed description of the process advocated by van der Heijden, with as much detail as was available.

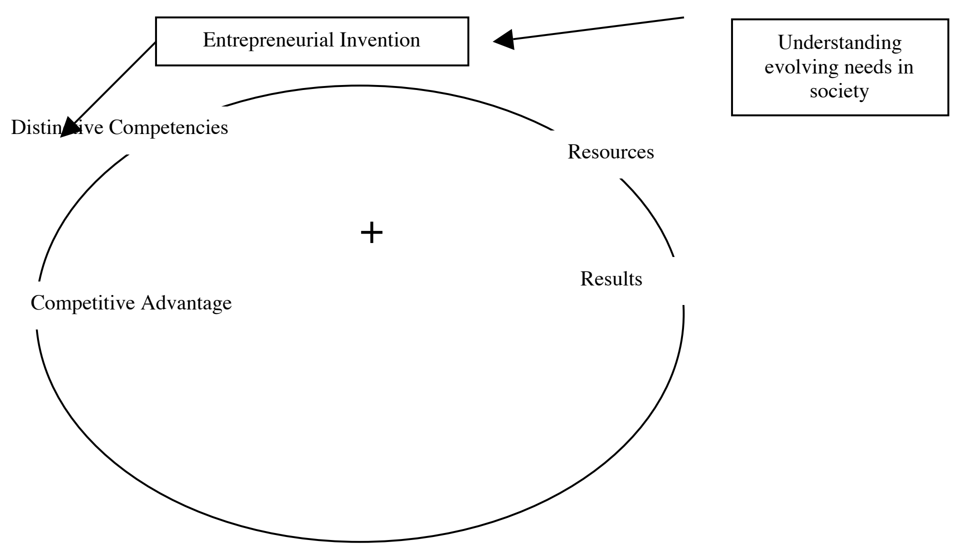
The Business Idea

At the core of scenario planning, Kees van der Heijden identified the concept of the business idea (1997; 1998). "The business idea is the organization's mental model of the forces behind its current and future success" (van der Heijden, 1997, p. 59). The business idea is constructed of principles, namely, profit potential and distinctive competencies. Profit potential refers to 1) creating a surplus for stakeholders, and 2) creating the expectation that a surplus will exist and grow in the future. Distinctive competencies are not "strengths" rather; they are unique competencies "based on tacit uncodified knowledge that cannot be copied" (van der Heijden, 1997, p. 63). Based on Rumelt's (1991) work, van der Heijden (1997; 1998) identified a list of five main sources of distinctiveness in two categories:

1) Uncodified institutional knowledge
    a) In networked people
    b) In embedded processes
2) Sunk costs/irreversible investments
    a) Investments in reputation
    b) In legal protection
    c) In specialized assets

Realized uniqueness in two of these sources can combine to form a competitive advantage, or unique capabilities that cannot be copied which contribute to profit potential (van der Heijden, 1997). The business idea is mapped as a systemic structure specifying the customer value created, the nature of the competitive advantage, the distinctive competencies and a positive feedback loop (see Figure 2.4).

Figure 2.4 The Generic Business Idea (van der Heijden, 1997).



The articulation of the business idea brings out the current position of the organization and specifies the conditions required in order to create a surplus of resources. The business idea also makes explicit the constraints to creating the surplus. In the process of mapping the business idea, organizations may encounter "limits to growth". Porter (1980) identified five limiting elements in his Five Force competitive model: (1) demand limits, (2) supply limits, (3) competition limits, (4) limits imposed by the possibility of new entrants, and (5) limits imposed by possible alternative and product or service substitutes. The business idea provides a powerful tool as it makes internal view of the organization explicit and does so in a holistic concept showing how the organization fits with the external environment (van der Heijden, 1997).

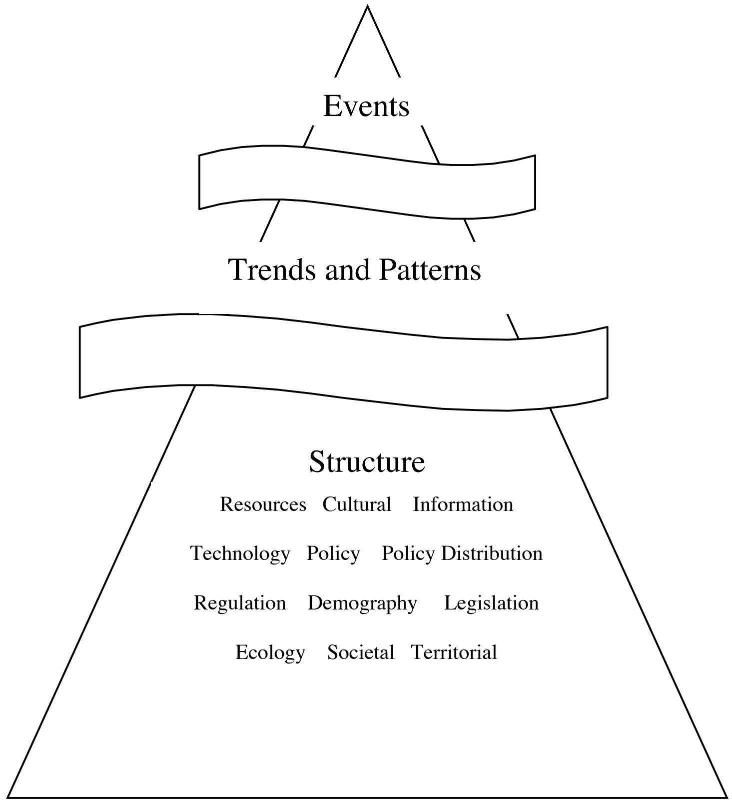
Once the business idea has been articulated, attention can be focused on uncertainty. van der Heijden offered three categories of uncertainty: risks, structural uncertainties and unknowables (1997). An assessment of risks recounts past events of a similar nature to estimate probabilities of outcomes. Structural uncertainties are concerned with possible events for which there is no evidence to judge the likelihood of a given outcome. Unknowables represent events that cannot even be imagined. “Scenarios can provide powerful help here, and many would argue that this is the most important use of scenarios” (Schwartz, 1991, p. 84). Uncertainties are most commonly compiled based on a series of in-depth open-ended interviews (van der Heijden, 1997).

With the business idea mapped and uncertainties documented, the focus can shift to the outside world in which the business idea must perform. This is the beginning of scenario construction. van der Heijden (1997; 1998) suggested the formation of a scenario team, made-up of members whom are able to “think the unthinkable”, follow intuition, let their imaginations run wild and suspend disbelief. The team begins to study and analyze the industry, seeking “remarkable people”. van der Heijden (1997; 1998) defined remarkable people as “those experts who are not in regular contact with the client organization, such that an original contribution may be expected. They could be academics, commercial researchers, writers, artists, consultants, or other perceptive business people.” (p. 84). These “remarkable people” present a workshop to organization members, detailing an outside perspective eliciting a first contribution. A discussion is then held in which organization members may dialogue, challenge and develop the unexpected views. It is natural for discomfort to emerge throughout these dialogues. “In scenario planning, if you frustrate people for a few days the subconscious takes over and you awake to find the scenario is there. The subconscious is more powerful than the conscious mind, however, it will not intervene until it has been frustrated” (Wack, 1985a, p 4.). van der Heijden (1997) presented five criteria for these early scenarios:

1) At least two scenarios are needed to reflect uncertainty
2) Each of the scenarios must be plausible
3) The scenarios must be internally consistent
4) The scenarios must be relevant to the clients concern
5) The scenarios must produce a new and original perspective on client issues

Through a series of workshops an overview of the sometimes seemingly chaotic first scenarios should be created. This is helpful in establishing links and connections between variables and data in the system. From this point, scenario building is largely a process of brainstorming, checking for plausibility, and playing the driving forces into different positions. Some common methods for fleshing out scenarios are: listing key patterns and trends, mapping causal relationships in influence diagrams, listing underlying driving forces and ranking driving forces by unpredictability and impact. A popular metaphor for thinking through the scenario building process is the “iceberg” metaphor (see figure 2.5).

Figure 2.5. The Iceberg Metaphor (van der Heijden, 1997).



Global Business Network

The overarching view utilized by the Global Business Network was born out of Shell's application of scenario technology. Pierre Wack first began applying Kahn's concepts in the 1960's and refined them into a proprietary framework stressing the big picture first, then zooming in on the details. Wack believed that to begin with the details was to miss some key dimensions of the building process (Wack, 1985a). Peter Schwartz took over as the head of Shell's planning division and eventually established his own company offering a variety of strategic business services worldwide. Schwartz (1991) offers a conceptual overview of the scenario building process in *The Art of the Long View*. This forms the basis of the approach used by the Global Business Network.

Step one is to identify a focal issue or decision. Scenarios are built around a central issue outward toward the external environment. Schwartz (1991) asserted that scenarios based first, on external environmental issues, such as high versus low growth, may fail to capture company specific information that makes a difference in how the organization will deal with such issues.

The second step is to identify the key forces in the local environment. This is logical following the selection of a key issue. Step two examines the factors that influence the success or failure of the decision or issue identified in the first step (Schwartz, 1991). Analyses of the internal environment and strengths and weaknesses are commonly conducted in this step.

Once the key factors have been identified, the third step involves brainstorming the driving forces in the macro-environment. These include political, economic, technological, environmental and social forces. Driving forces may also be considered the forces behind the key factors in step two (Schwartz, 1991).

Step four consists of ranking the key factors (from step two) and the driving forces (from step three) on the basis of two criteria: (1) the degree of importance for success and (2) the degree of uncertainty surrounding the forces themselves. "Scenarios cannot differ over predetermined elements because predetermined elements are bound to be the same in all scenarios" (Schwartz, 1991, p. 167).

The results of the ranking exercise are two axes along which the eventual scenarios will differ. Step five, then, is the development and selection of the general scenario logics according to the matrix resulting from the ranking exercise. The logic of a given scenario will be characterized by its location in the matrix. "It is more like playing with a set of issues until you have reshaped and regrouped them in such a way that a logic emerges and a story can be told" (Schwartz, 1991, p. 172).

Step six, fleshing out the scenarios, returns to steps two and three. Each key factor and driving force is given attention and manipulated within the matrix developed in the scenario logics of step four. Plausibility should be constantly checked from this point, for example, "if two scenarios differ over protectionist or non-protectionist policies, it makes intuitive sense to put a high inflation rate with the protectionist scenario and a low inflation rate with the non-protectionist scenario" (Schwartz, 1991, p. 178).

Step seven examines the implications of the developed scenarios. The initial issue or decision is "wind tunneled" through the scenarios. It is important to examine the robustness of each scenario through questions such as: Does the decision look good across only one or two scenarios? What vulnerabilities have been revealed? Does a specific scenario require a high-risk, bet-the-farm strategy?

The final step is to select "leading indicators" that will signify that actual events may be unfolding according to a developed scenario. Once the scenarios have been developed, it's worth spending some time selecting identifiers that will assist planners in monitoring the course of unfolding events and how they might impact the organization (Schwartz, 1991).

The French School

When he took over the Department of Future Studies with SEMA group in 1974, Michel Godet began conducting scenario planning. His methodology was extended at the Conservatoire Nationale des Ars et Metiers with the support of several sponsors. Godet's work is based on the use of "perspective", advocated by the French philosopher, Gaston Berger (Ringland, 1998). Godet's approach began by dividing scenarios into two categories: situational scenarios, which describe future situations, and development scenarios, which describe a sequence of events that lead to a future situation (Georgantzas & Acar, 1995). Godet also identified three types of scenarios that may exist in either category. Trend-based scenarios follow what is most likely, contrasted scenarios that explore purposefully extreme themes, and horizon/normative scenarios that examine the feasibility of a desirable future by working backward from the future to the present. Godet's approach has evolved and now includes several computer-based tools that help highlight interdependencies between interrelated variables that may be ignored by more simple procedures (Ringland, 1998). The French School approach is a structural analysis that is divided into three phases.

Phase one begins the process by studying internal and external variables to create a system of interrelated elements. This approach focuses on a detailed and quantified study of the elements and compilation of data into a database. A cross-impact matrix is constructed to study the influence of each variable on the others (Godet, 1996).

Phase two scans the range of possibilities and reduces uncertainty through the identification of key variables and strategies. Future possibilities are listed through a set of hypotheses that may point to a trend in the data (Godet, 1996). Advanced software reduces uncertainty by estimating the subjective probabilities of different combinations of the variables.

Phase three is the development of the scenarios themselves. Scenarios are restricted to sets of hypotheses and once the data has been complied and analyzed, scenarios are built describing the route from the current situation to the future vision (Godet, 1996).

The Futures Group

The Futures Group is a Connecticut based consulting firm that has developed a trend-impact analysis approach to scenario planning. This approach requires three phases, namely, preparation, development and reporting and utilizing (Ringland, 1998).

The preparation phase includes defining a focus, issue or decision, and then charting the driving forces. There are several questions that should be answered in this phase such as: What possible future developments need to be probed? What variables need to be looked at for assistance in decision-making? What forces and developments have the greatest ability to shape future characteristics of the organization? (Thomas, 1997).

The development phase includes constructing a scenario space, selecting alternative worlds to be detailed and preparing scenario contingent forecasts. Selecting a scenario space means examining the various future states that the drivers could produce. Illogical and non-plausible situations should be rejected. Selecting alternative worlds to be detailed involves limiting the number of future stories, since it would be impossible to explore every option. The key is to select *plausible* futures that will challenge current thinking. Preparing scenario contingent forecasts is listing trends and events that would be required for the plausible future to exist. Depending on the assumptions of each alternative world, indicators are selected that might "signal" the direction in which the organization is heading.

Reference Scenarios

Ackoff (1970, 1978 & 1981) identified four modes for organizations to cope with external change. *Inactivity* involves ignoring changes and continuing with business as usual. *Reactivity* waits for changes to happen and then developing a response. *Preactivity* involves trying to predict changes and establishing organizational position before they happen, and *proactivity* calls for interactive involvement with the external environment in order to "create the future for stakeholders" (Gerogantzas & Acar, 1995, p. 364). Within these four modes, Ackoff uses the term *reference scenario* to mean the reference projections a firm would have if there were no significant changes in the environment. Ackoff's call for strategic turnaround starts with an idealized scenario of a desirable future. To be effective, such a scenario should be interesting and *provocative* – it should show what to change to evade the mess of problems in an organization's given strategic situation.

Decision Strategies International

Single point estimate approaches to strategy have not fared well within the last decade (Schnaars, 1989). Shoemaker (1993) emphasized that scenarios are not point estimates. Georgantzas & Acar (1995) argued that Shoemaker correctly emphasized an actual outcome, "because, oddly enough, there is no longer any probability concerning whether a point estimate lies in a confidence range or not. Either it does or it does not" (p. 264). Shoemaker outlined an approach to scenario planning with many similarities to the methodology used by the Global Business Network.

Step one defines the scope of the project. This includes setting a time frame, examining the past to identify rates of change, and roughly estimate the expected future rate of change. "The unstructured concerns and anxieties of managers are good places to start" (Shoemaker, 1995, p. 28).

Step two is to identify the key stakeholders. Obvious stakeholders include customers, suppliers, competitors, employees, shareholders, and government. The identification of the roles that each of these groups might play, how the roles have changed in past years, and the distribution of power according to the issue, are all factors to be examined in this step.

Basic trends are identified in step three. The political, economic, societal, technological, legal, environmental, and industry trends are analyzed in connection with the issues from step one. "Briefly explain the trend, including how and why it exerts its influence on your organization" (Shoemaker, 1995, p. 28). Trends can be charted in influence diagrams or matrices to help make relationships explicit.

Step four considers the key uncertainties. What events, whose outcomes are uncertain, will significantly affect the issues of concern to the organization? A further examination of political, societal, economic, environmental, legal and industry forces emphasizing the most uncertain elements "will reveal the most turbulent areas" (Shoemaker, 1995, p.28). Relationships among the uncertainties should also be identified, for example, "if one economic uncertainty is 'level of unemployment' and the other 'level of inflation,' then the combination of full employment and zero inflation may be ruled out as impossible" (Shoemaker, 1995, p. 29).

Once the trends and uncertainties have been identified, initial scenario construction can begin. A simple approach is to identify extreme worlds by putting all positive elements in one, and all negatives in another. Alternatively, various strings of outcomes can be clustered around high or low continuity, finding themes or by degree of uncertainty (Shoemaker, 1995). The most common technique is to cross the top two uncertainties of a given issue (Shoemaker, 1992; 1995).

Step six checks the initial scenarios for plausibility. Shoemaker (1995) identified three tests for internal consistency, dealing with the trends, the outcome combinations, and the reactions of major stakeholders. The trends must be compatible with the chosen time frame, scenarios must combine outcomes that fit, for example, full employment and zero inflation do not fit, and the major stakeholders must not be placed in situations they do not like but have the power to change, for example, OPEC will not tolerate low oil prices for very long (Shoemaker, 1995).

From the process of developing initial scenarios and checking them for plausibility, general themes should emerge. Step seven is to develop learning scenarios by manipulating plausible outcomes. The trends may be the same in each scenario, but the outcomes, once considered plausible, can be shifted and given more or less weight in different scenarios. These scenarios "are tools for research and study rather than for decision-making" (Shoemaker, 1995, p. 29).

After constructing learning scenarios, areas that require further research are identified. These are commonly referred to as "blind spots" (Schwartz, 1991, Shoemaker, 1995, Georgantzas & Acar, 1995, van der Heijden, 1997). Companies can use these scenarios to study other industries, for example, to consider plausible outcomes of advances in multi-media and then study current research in that area.

Step nine reexamines the internal consistencies after completing additional research. Quantitative models are commonly developed in this stage. For example, Royal Dutch/Shell has developed a model that keeps oil prices, inflation, GNP, growth, taxes and interest rates in plausible balances. Formal models can be used to flesh out possible secondary effects and also serve as another check for plausibility (Shoemaker, 1995). The models can also help to quantify the consequences of various scenarios.

Step ten is to determine the scenarios to be used for decisions. Trends will have arisen that may or may not affect or address the real issues of the organization. Shoemaker (1995) identified four criteria for effective decision scenarios. First, scenarios must have relevance to be effective, but also challenge current thinking in the organization (Shoemaker, 1995, Schwartz, 1991). Second, scenarios must be internally consistent and plausible. Third, scenarios must be archetypal, or should describe fundamentally different futures, rather than simply vary on one theme. Finally, each scenario should describe an eventual state of equilibrium. "It does an organization little good to prepare for a plausible future that will be quite short" (Shoemaker, 1995).

Procedural Scenarios

Amara & Lipinski (1983) and Chandler & Cokle (1982) presented very similar methods for constructing scenarios, but prepare separate forecasts for each principal factor or variable. Chandler & Cokle (1982) "also define scenarios as the coherent pictures of different possible events in the environment whose effect on a set of businesses should be tested through linked models" (p. 132). The manipulation of macro-economic models is a mechanism by which vague assumptions are translated into projected values of wholesale prices, GDP, or consumer expenditures for an entire industry. The models used in these approaches are computer-driven (Georgantzas & Acar, 1995) and provide a good example of procedural scenarios incorporating intuitive and quantitative techniques.

Industry Scenarios

Porter (1985) asserted that scenarios traditionally used in strategic planning have stressed macroeconomic and macropolitical issues. He further claimed that in competitive strategy the proper unit of analysis is the industry and defines industry scenarios as the primary, internally consistent views of how the world will look in the future (Porter, 1985). The essence of this view holds that there are two loops in building these industry scenarios (Fahey, 1998). In this approach, industry analysis is within the larger unit of building industry scenarios. Industry focus scenarios can help an organization in analyzing particular aspects of a business (Porter, 1985), but it has been argued that beginning with a narrow focus will miss key dimensions (Wack, 1985a; Fahey, 1998).

Soft Creative Methods Approach

Brauers & Weber (1988) have formulated an approach with three basic phases: analysis, descriptions of the future states, and synthesis. The analysis phase brings organization members to a common understanding of the problem. Based on this consensus, the problem can be further bounded and structured. Brauers & Weber recommended the use of soft creative methods for the analysis phase, including morphological analysis, brainstorming, brain-writing, and the Delphi technique (1988). The second phase examines the possible development paths of the variables chosen in the analysis. The synthesis phase considers interdependencies among the variable factors to build different situations for the future states. These eventual scenarios are then fed through a complex computer program for linear programming and cluster analysis (Brauers & Weber, 1988).

Characteristics of Scenario Planning

From this review of scenario planning methods, it seems clear that some common themes run throughout. These themes are: the use of systems thinking, challenging the microcosm of decision-makers, the telling of multiple stories, broad-based scope, examining seemingly unrelated forces, requiring knowledge of management's deepest concerns, and focus on re-perceiving reality. Each of the methods described is also absent of any explicit reference to theory. These themes are extended and explained in further detail.

All of the examined methods incorporate some form of information as inputs, the information is manipulated into varying states through processes, and eventually a scenario is built that tells a story. Most of these methodologies then feed the information back for refining the stories. Because they require inputs, processes, outputs and feedback, scenario planning can be framed as a system (von Bertalanffy, 1967, Senge, 1990). Although it is not explicit in any of the approaches reviewed, a systems perspective is applicable.

The methods examined here all assert that scenarios must challenge the microcosm of decision-makers. Wack (1985a) asserted: "scenarios must come alive in 'inner space,' the manager's microcosm where choices are played out and judgment exercised" (p. 3).

Scenarios tell multiple stories. More than three stories becomes unmanageable (Wack, 1985b) and the ideal number "is one plus two; that is, first, the surprise free view (showing explicitly why and where it is fragile) and then two other worlds or different ways of seeing the world that focus on critical uncertainties" (Wack, 1985b, p. 9). van der Heijden suggested that more than two stories, but less than five are particularly helpful because they: 1) reflect the uncertainty inherent in the future, 2) allow a multi-disciplinary approach to developing and discussing theories about the world, 3) present findings in a tangible real-world context, and 4) use a causal mode of thinking, which is intuitively comfortable.

Scenarios are broad-based, not point-in-time projections. "Because scenario-driven planning does not solicit single-point forecasts from participants, it eliminates the need for any face-saving strategies" (Georgantzas & Acar, 1995). Managers who can adjust their thinking to see a wider range of possible futures will be in a much better position to take advantage of unexpected opportunities (Shoemaker, 1995). One of the most basic characteristics of scenario planning, the idea of multiple plausible outcomes is critical in order to challenge the assumptions of management.

The methods examined here all integrate seemingly unrelated forces. Economic, technological, environmental, competitive, political and societal forces are examined to develop what are called critical uncertainties and predetermined elements (Schwartz, 1991, van der Heijden, 1997, Ringland, 1998, Wack, 1985b, Shomaker, 1995, Georgantzas & Acar, 1995). Wack (1985b) identifies predetermined elements as "those events that have already occurred (or that almost certainly will occur) but whose consequences have not yet unfolded" (p. 77). Critical uncertainties are those events that can only be imagined (van der Heijden, 1997).

Scenarios require knowledge of the deepest concerns of managers and executives. Wack (1985a) noted, "We hit planning pay dirt with the 1973 scenarios because they met the deepest concerns of managers" (p. 89). Gerogantzas & Acar asserted that the overriding goal of scenario planning is to enrich the way managers think, learn, and feel about strategic situations by investigating what they are most concerned about (1995). A standard question offered by Schwartz is: "What keeps managers and executives awake at night?" (1991, p. 146).

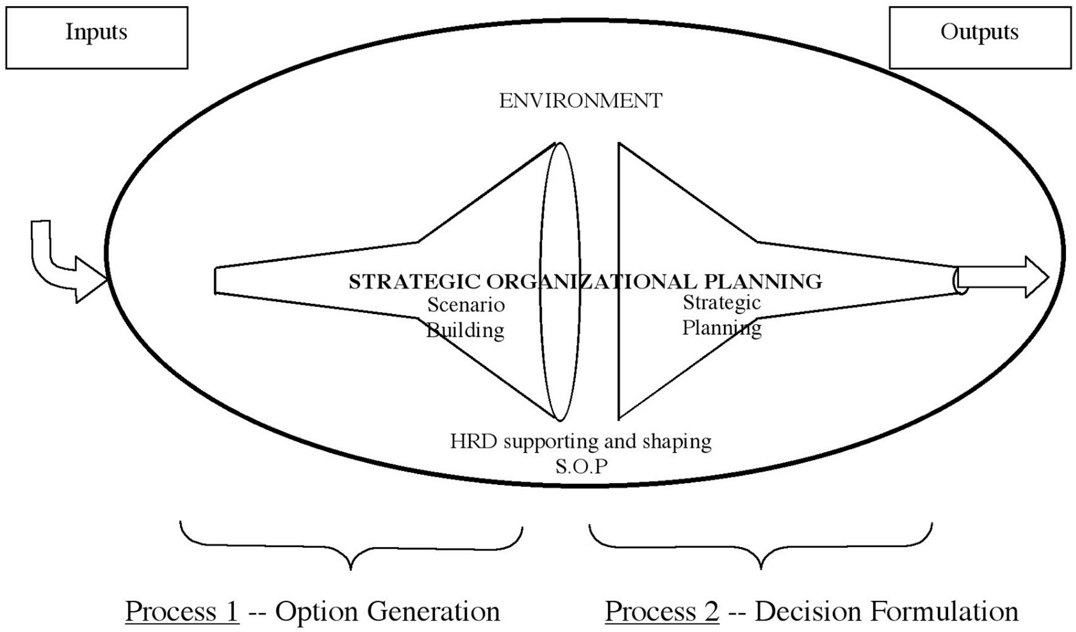
Wack (1985a) offered "the reperception of reality and the discovery of strategic openings that follow the breaking of the manager's assumptions (many of which are so taken for granted that the manager no longer is aware of them) are, after all, the essence of entrepreneurship" (p. 14). In many ways, scenario planning advocates the return to the sort of thinking required to start-up a business. The entrepreneurial element is advantageous when considering how to "begin again". This concept is evident in all of the methods reviewed.

None of the methods examined report informing theoretical domains, or specific theories required in scenario planning. van der Heijden's (1997) work suggested that the constructivist learning orientation and processual school of strategic thinking provide good fit with scenario planning, but his methods do not specify precisely how theories can enhance the process.

A General System for Scenario *Planning*

Scenario *planning* has been conceptualized as a system (Swanson, Lynham, Ruona & Provo, 1998). To expand on previous work, this chapter will conceptualize scenario planning as a series of inputs, processes and outputs in accordance with the model provided by Swanson et al. (1998) That is, a general system for scenario planning can be depicted as shown in Figure 2.6.

Figure 2.6. A General System of Scenario Planning



The importance of positioning scenario planning as a system as depicted in Figure 2.6 is that it includes two processes. The first is a process for option generation and the second is a process for decision formulation. Given that this review is focused on scenario planning, it will focus on the process used for option generation as the scenario building process also described in this chapter. The decision formulation process involves the use of scenarios to provoke learning, alter mental models, improve decision-making and improve performance. Thus, the core of this research and the presentation of a theory of scenario planning focuses on how these two processes interact in a scenario planning system.

A General Process for Scenario *Building*

The methods for building scenarios that have been outlined in this chapter have similarities and differences. While there is not agreement on exactly what set of steps constitutes a definitive approach to building scenarios, the methods outlined can be summarized into a general process for scenario building. Louis van der Merwe of The Centre for Innovative Leadership (1995) identified the following six steps, which integrate the methods available publicly today. These are:

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.
5) Develop narratives to make the scenarios relevant and compelling to decision makers.
6) Use scenarios to help decision makers "re-view" their strategic thinking.

These six steps are general and integrate the varied methods for building scenarios discussed in this chapter.

Alternative Strategic Interventions

It is important to acknowledge, however, that the process of generating options is not limited to the process of scenario building. While this research will focus on the scenario building process and its use in a planning system, the rival methods and approaches cannot go without mention. Cummings & Worley (2001) have suggested several alternative approaches to generating options in organizational environments. These strategic interventions (Cummings & Worley, 2001) were defined as (1) integrated strategic change (2) transorganizational development and (3) mergers and acquisitions. In addition, this comparison will feature Futuresearch (Wesisbord & Janoff, 1995) and a general summary of strategic planning. Each of these categories will be explained in brief, highlighting the features of each.

Integrated Strategic Change

Cummings & Worley (2001) described integrated strategic change as an intervention that brings an organization development perspective to traditional strategic planning. By this, the authors seem to have intended that strategic planning has notably displayed problems with implementation and therefore have resolved to involve managers and the human change component as major factors in the strategy process (Cummings & Worley, 2001). The major steps of integrated strategic change include (1) performing the strategic analysis, (2) exercising strategic choice, (3) designing the strategic change plan, and (4) implementing the strategic change plan.

Transorganizational Development

Transorganizational development, as a strategic option, was advocated as an intervention that improves the competitiveness of entire industries (Cummings & Worley, 2001). The authors suggested that by joining forces, multiple organizations can increase the overall competitiveness of several corporations, or even industries through joint ventures and integrating tasks, problems and issues. In essence, the stages of operation for such interventions include (1) the identification state, (2) the convention stage, (3) the organization stage, and (4) the evaluation stage. Overall, transorganizational development interventions aim to pool the resources of several organizations in efforts to increase the overall quality or competitiveness of industries across several organizations while each maintains its own identity.

Mergers & Acquisitions

Mergers & acquisitions involve the combination of organizations. That is, in the case of mergers, two corporations merge to become one, and in the case of acquisitions, one company acquires another simply through purchase (Cummings & Worley, 2001). Either is a strategic intervention in the sense that a company may increase its market share, reduce the effectiveness of competitors, or increase its resources based on its ability to command the resources of yet another company.

FutureSearch

Futuresearch is a multiple-day workshop intended to provide common ground for organizations to move forward (Weisbord & Janoff, 1995). While the concept of Futuresearch is commonly used to develop or revisit the vision and mission of a corporation, its usefulness in considering actions required to make organizations more strategic in their efforts is still unclear. The process for conducting Futuresearch generally (1) examines organizational history, (2) considers current trends, (3) examines what organizational stakeholders are “proud” and “sorry” about, concerning the present organizational status, (4) defines ideal future states of the organization, (5) identifies common ground for organizational stakeholders, and (6) suggests general methods for moving forward (Weisbord & Janoff, 1995).

Strategic Planning

Strategic planning is generally an ill-understood phenomenon that incorporates as many perspectives as there are authors writing on the topic. This chapter has previously summarized several “schools” of strategic planning according to Mintzberg & Lampel, (1999), however, generally, strategy can be thought of as attempts to increase the overall ability of an organization to “fit” with its environment and provide further ability to anticipate change such that the system is not at any time shocked by trends or other forces in the external or internal environment (Porter, 1980; Ansoff, 1965; Wilson, 1992; Drucker, 1964).

Figure 2.7. Summary Matrix of Alternatives to Scenario Planning.

Alternative		*Strengths*	*Weaknesses*	*Flexibility*
Scenario Planning		Emphasis on uncertainty and learning	Without a planning component, limited to exploring options	Considerable
Integrated Strategic Change		Focus on implementation	Failure to consider uncertainty	Limited
Transorganizational Development		Contributes to industry growth / collaborative	Failure to consider uncertainty	Limited
Mergers & Acquisitions		Increases resources / decreases competition	Failure to consider uncertainty	Limited
FutureSearch		Focus on dialogue and subjective component of strategy	Failure to consider uncertainty	Considerable
Strategic Planning		Logical process / Depends on approach	Failure to consider uncertainty	Limited / Depends on approach

Scenarios as Tools for Organizational Learning

De Geus defined organizational learning as “the process whereby management teams change their shared mental models of their company, their markets, and their competitors” (1988, p. 70). Although it was originally developed as a tool for strategic decision-making, scenario planning is increasingly noted as an important tool for learning (De Geus, 1988, Georgantzas & Acar, 1995, Kleiner, 1994, Schwartz, 1991, van der Heijden, 1997). Senge (1992) identified three stages of an effective organizational learning process: (1) mapping mental models, (2) challenging mental models, and (3) improving mental models. Scenario planning has been shown to meet all three of these stages (Georgantzas & Acar, 1995). Scenario planning has also been titled a tool for inquiry, reflection, and construction of mental models (Senge, Kleiner, Roberts, Ross and Smith, 1994).

De Geus (1997), as the head of planning at Shell, conducted a study on the average lifespan of several fortune 500 companies. His findings showed that one-third of those listed in 1970 had vanished by 1983. His findings also suggested that companies die because their managers focus on economic activities, and forget that they are a community of humans (De Geus, 1997). The oldest companies all had a striking capacity to institutionalize change and recognized that they had internal strengths that could be used and developed as organizational conditions changed (De Geus, 1997).

With a focus on institutional learning, De Gues has shifted the goal of planning at Shell. In studying how companies learn and adapt to environmental changes, Shell began changing the rules that managers had always known. For example, scenarios were developed that examined the implications of oil prices falling to $15 a barrel in 1985. (At the time, the price was $28 a barrel and $15 was regarded as the end of the oil industry). At first, managers were reluctant to consider such a serious problem, but they were asked to respond to these three questions: What do you think the government will do? What do you think your competition will do? And what, if anything will you do? The actual price of oil was rising at the time of the exercise, but on April 1, 1987, the actual price fell to $10 a barrel. The fact that Shell had "already visited the world of the $15 barrel helped a great deal" (De Geus, 1997, p. 73).

Out of this process, De Geus (1997) noted the development of shared language that makes the implicit knowledge of the learner explicit. Advocating that institutional learning begins with the calibration of existing mental models, De Geus wrote that "the only competitive advantage the company of the future will have is its managers' ability to learn faster that their competitors" (1997, p. 74).

Galer & van der Heijden (1992) suggested that there are two critical factors in the approach to business planning: organizational culture, and the degree of internal goal alignment. The cultural dimension runs from hierarchical mechanistic organizations on one hand to heterarchical network organizations on the other. Either of these can have a strong or weak goal orientation, according to the alignment of internal purposes.

Galer & van der Heijden (1992) asserted that the approach to planning is dictated in part by the cultural structure of the organization. A functional, hierarchical organization (Cummings & Worley, 2001) will tend to engage in planning in the traditional sense, namely in a centralized and bureaucratic way (Galer & van der Heijden, 1992). A network organization, with more divergence in its goals, will tend to approach planning with more emphasis on learning, because a dialogue is required to unify varying goals and purposes (Galer & van der Heijden, 1992). These two factors are charted in a planning matrix (See Figure 2.8).

Figure 2.8. The Planning Matrix (Galer & van der Heijden, 1992)

	Goal orientation	
	Strong	Weak
Mechanistic/hierarchical culture	Predict/design/control	Emergent
Networked/heterarchical culture	Logical incrementalism	Planning as learning

This matrix can be a helpful tool in a snapshot diagnosis of the culture's orientation to planning. Galer & van der Heijden (1992) suggested that according to the culture orientation to planning, different methods and practices are used.

Van der Heijden (1997) also identified the "strategic conversation" as an effective means for transmitting organizational learning. Most organization have formal processes for the exchange of ideas and views and these processes often become events such as meetings, budget systems, strategy reviews, cost-cutting exercises and marketing decision points (van der Heijden, 1997). "These processes are less effective than informal conversations because they have less relevance for the participants" (van der Heijden, 1997, p. 18). Van der Heijden (1997) suggested that the strategic conversation happens when people meet by chance outside of scheduled events, in corridors or lunchrooms. Because this conversation happens spontaneously and takes place in the zone of proximal development (De Geus, 1988, van der Heijden, 1997), it affects how individuals make sense of events and trends in the strategic situation.

It is through this informal conversation that learning about the strategic situation takes place (van der Heijden, 1997). Scenarios are particularly effective in transmitting strategic options within this conversation. However, the scenarios filtered into the conversation must meet the following criteria: simplicity and evocativeness, a short name, plausibility, and relevance (Schwartz, 1991, van der Heijden, 1997).

Creating "Anticipatory Memory"

A strange phenomenon has occurred with the use of scenario planning called "anticipatory memory". As Schwartz (1991) noted in the final step of his methodology, the selection of leading indicators and signposts, is critical to the realization that a given scenario may be unfolding. Sometimes the direction is obvious, but can also be very subtle. Indicators and signposts are selected to monitor, in an ongoing sense, the progress of the organization along the lines of a given scenario (Schwartz, 1991). As in the study conducted by De Geus (1988), having considered the $15 barrel of oil, and what the company would do in such a situation, Shell was prepared to act based on stories that had circulated throughout the organization. This is anticipatory memory -- the advantage created by having previously considered critical circumstances when they actually present themselves (Schwartz, 1991).

In essence, individuals create anticipatory memory constantly. It unfolds along the lines of logic, for example, if X happens, then I will do Y. When this concept is applied to an entire organization, the implications become very powerful. Coupled with the idea that the only competitive advantage of organizations of the future will be the ability of its managers' to learn faster than their competitors (De Geus, 1988), anticipatory memory is believed to decrease the response time of an organization to external changes in the environment because the situations have been considered (De Geus, 1998, Schwartz, 1991, van der Heijden, 1997).

Evaluating Scenario Planning

The evaluation component is nearly absent from the literature of scenario planning. This lack of evaluation can, in many ways be attributed to the lack of theory used to inform the process (Warfield, 1995). However, there are two research studies to note regarding the empirical examination of scenario planning.

One study conducted by Shoemaker (1995) at the University of Chicago revealed some insights. Sixty-eight MBA students were asked to identify critical issues in their daytime jobs. They were then asked to provide confidence ranges. Shoemaker (1995) described the following:

> For example, a student might estimate that sales for her company would be 50,000 units per year five years hence. Then she would determine that she was 90 percent sure that the actual sales volume would be between 30,000 and 70,000 and 50 percent sure that it

would be between 40,000 and 60,000. Each student also asked a colleague at work who was familiar with the issues for similar estimates. (p. 37)

Weeks later the students developed a few scenarios for the initial issues and the guesses and confidence ranges were taken again. New estimates were also gathered from a colleague after reviewing the scenarios. Confidence ranges were found to widen about 50 percent. The scenarios were found to have a greater impact on best guesses than on ranges of confidence.

While this study did not evaluate the effects of an implemented scenario project, it seems to reveal that considering options will have an impact on perceptions of outcomes in the scenario planning process. This was, however, the only study found that evaluated the effects of scenario planning in any form. Scenario planning, developed in practice and proprietary in nature, is gaining exposure to academic examination, but has not been thoroughly documented as a discipline.

Phelps, Chan, & Kapsalis (2001) conducted an empirical study of the effects of scenario planning on participant firm performance in two major scenario planning projects. Their study involved an analysis of firm financial data as well as participant perceptions. Their results revealed that scenario planning appears to affect managers' abilities to consider alternatives that they would not have previously considered, and that participation in scenario planning seems to produce financial benefits if decision-makers are able to challenge what they believe to be true. The study also revealed that firm size tends to affect both perception and financial results. This study marks the only true attempt at experimental research in the domain of scenario planning.

Theory Building Research Methods

The themes revealed in this chapter outline the key characteristics of scenario planning and advocate the use of scenarios for enriching traditional strategic planning. Scenarios have also been suggested as a means for developing organizational learning and decision-making, however, further research is necessary in these areas. Perhaps most critical to the maturation of scenario planning, is the construction or designation of theory that informs the process. This review has revealed tremendous variety in the method of conducting scenario planning; however, none of the documented methods for conducting scenario planning provide any theoretical insight. The history of scenario planning is documented in this chapter with the intention of outlining the context out of which scenario planning as a process has grown. Lacking in theory or the result of proprietary applications, the current state of scenario planning must move toward the establishment of sound theoretical bases for the rigorous and detailed study of the process. Further, theory will assist in the development of evaluative processes, or methods for measuring the impact of scenario planning on the decision-making and learning and performance processes of organizations.

While the process of scenario planning has proven itself in some specific situations, without explicit theoretical foundations or a sound means for measuring the effects of participation in scenario planning, it is not likely that the process will develop further. Furthermore, in the absence of these two critical elements, it is unlikely that the practitioner or scholar will be able to attribute any increases in organizational effectiveness, organizational learning, or decision-making capacities to their organizational scenario planning interventions. It is even less likely that results will be replicable. This chapter has outlined the background and context of scenario planning and has advocated some particular points that if addressed, could greatly improve scenario planning practice and research.

Given the established lack of theory informing the application of scenario planning processes, several options might be considered in addressing the theory deficiency. These options are 1) theory building through grounded theory research (Egan, 2002), 2) theory building through meta-analysis research (Yang, 2002), 3) theory building through social construction research (Turnbull, 2002), 4) theory building through case study research (Dooley, 2002), and 5) theory building through quantitative research (Lynham, 2002; Dubin, 1978).

Egan (2002) provided an analysis of grounded theory research as a method for building theory. In doing so, he revealed that grounded theory research is a process that allows the researcher to discover theory "through the rigors of social research" (p. 277). Egan (2002) also stated that grounded theory research is not based on a specific theoretical framework. Thus, the theoretical framework emerges and changes as new data are gathered. Grounded theory research contributes most effectively to creating, refining, coding, and categorizing themes as they emerge from data (Egan, 2001). The theory resulting from grounded theory research can be a set of propositions, and while grounded theory research "has been identified as having the capacity to predict" (Egan, 2002, p. 280) grounded theory research does not require the identification of specific research hypotheses.

Defined as: "the application of statistical procedures to collections of empirical findings from individual studies for the purpose of integrating, synthesizing, and making sense of them" (Niemi, 1986, p. 5), meta-analysis research has not often been used as a tool for theory building. A key strength of meta-analysis research in theory building is a powerful capacity to synthesize multiple existing empirical studies (Yang, 2002). In this way, meta-analysis research is valuable in building reliability and validity for existing theories. Yang (2002) noted that meta-analysis is much less useful in "developing and testing a revolutionarily new theory" (p. 315) because of its reliance on multiple existing empirical studies.

Social constructionist research replaces the notions of validity, reliability and generalizability with the notions of confirmability, and authenticity (Turnbull, 2002). The social constructionist builds theory with a goal of understanding "how actors intersubjectively create, understand, and reproduce social situations" (Turnbull, 2002, p. 319). Overall, social constructionist research stands on vastly differing assumptions than those of quantitative research. Social constructionist research particularly lends itself to the individual's ability to understand the phenomenon under investigation (Turnbull, 2002) and is therefore valuable in deriving the concepts that might later formulate a quantitative model with specified research hypotheses.

"Case study research is one method that excels at bringing us to an understanding of a complex issue and can add strength to what is already know through previous research" (Dooley, 2002, p. 335). Some important advantages of case study research are that it can include multiple cases, can include quantitative, qualitative or mixed data, and can accommodate multiple research paradigms (Dooley, 2002). Case study research also provides an immediate tie to evidence, although an inability to recognize which are the most important relationships is a common problem. Case study research presents its greatest strength as a strategy for "holding together multiple methods" and multiple cases.

Theory building through quantitative research, specifically Dubin's (1978) detailed method, is an empirical view of theory building from start to finish. That is, Dubin's (1978) method is comprised of 1) developing the units of the theory, 2) specifying the laws of interaction describing the relationships among the units, 3) determining the boundaries within which the theory is expected to function, 4) identifying the system states in which the theory is expected to function, 5) specifying the propositions, or truth statements about how the theory is expected to operate, 6) identifying the empirical indicators used to make the propositions testable, 7) constructing hypotheses used to predict values and relationships among the units, and 8) conducting research to test the predicted values and relationships. Dubin's (1978) method is comprehensive and is the only theory building strategy reviewed in this chapter that sees the process through from the designation of the theory components, to the empirical testing of hypothesized relationships.

Meta-analysis research is not applicable to the scenario planning process because there are simply not enough empirical studies to support the method. All of the other research methods reviewed in this chapter would contribute to the development of theory and research practices in scenario planning. Considering the bias toward practice and the application of scenario planning, both grounded theory research and case study research would be excellent and reasonable strategies for building theory in scenario planning, however, neither strategy requires the identification and testing of hypothesis.

Conclusions

Two major conclusions are drawn from the review of the literature. First, a theory of scenario planning is needed. Second, Dubin's (1978) detailed theory building method is judged the most appropriate research method for building a theory of scenario planning. This second position is taken for several reasons: (1) it is the most comprehensive method of those reviewed, (2) it requires that the researcher/theorist construct a theoretical model based on conceptual and logically connected ideas, (3) it requires the translation of that theoretical model into testable hypothesis about how the theory works in practice, (4) it requires that the theoretical model be tested in order to claim that a theory exists and finally, and (5) through the identification of hypothesis it provides a demand for empirical research.

Chapter Three

METHODOLOGY

The general purpose of this chapter is to present the methodology used for this research. Specifically, this chapter:

1) States the research question,
2) Provides an overview of Lynham's (2002a) general method of applied theory building research,
3) Provides a detailed account of Dubin's (1978) theory building research methodology, and
4) Provides the connection between the research questions and the proposed methodology for this study.

The Research Question

The problem underlying this study is that there has been no theoretical inquiry into scenario planning. Currently operating in the practice of scenario planning is a plethora of methods, none of which have an established a theoretical grounding or means for measuring the impact of the process. Given this state of practice, the focus of this study is to develop a theory of scenario planning that makes its theoretical roots explicit and provides the means for developing evaluative methods. Therefore, the proposed research question is:

Can a theory of scenario planning be developed?

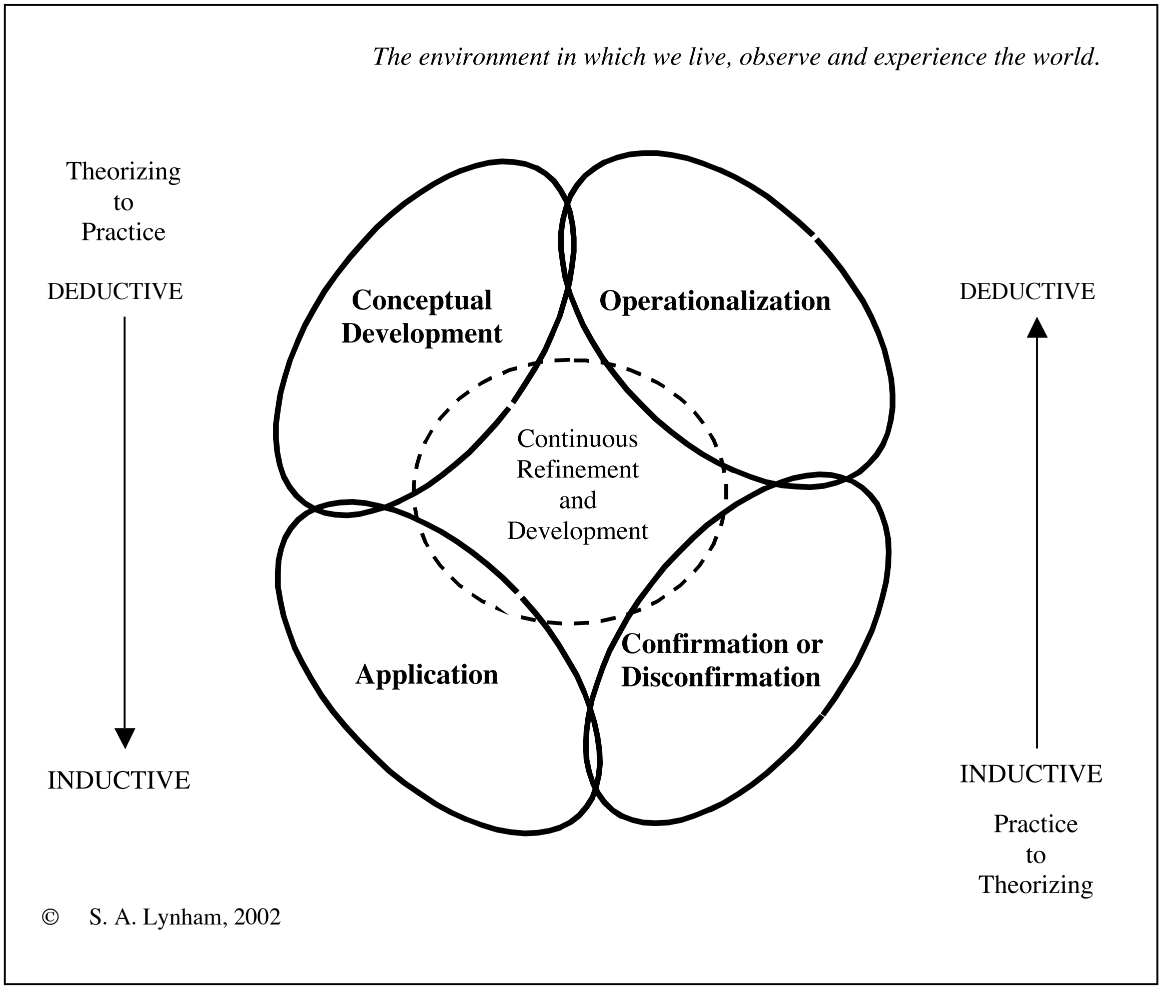
With the awareness that scenario planning has been applied in economic (Tessum, 1997; Behravesh, 1998), public policy (Bonnett & Olson, 1998; Ringland, 2002b), government (Stokke, Ralston, Boyce & Wilson, 1990), corporate, and national domains (Sunter, 1987; 1992; 1996; Kahane, 1998), the intent of this research is to construct a theory of scenario planning that can integrate and be applied in all of these perspectives. Through the incorporation of literature from multiple cultural and historical views, scholarly inquiry, and rigorous analysis and synthesis, the resulting theory will not be limited to a specific domain of application and is therefore intended as a general theory of scenario planning. While there are many definitions of the term "theory" to choose from, this research will employ the term theory as it was defined by Gioia & Pitre: "Theory helps us understand (describe, explain, and sometimes predict) what happens in practice" (1990, p. 4). Therefore, the purpose of a theory of scenario planning will be to aid in understanding, describing, explaining, and perhaps predicting what happens in the application of scenario planning.

The Methodology of This Study

This study will use Lynham's (2002a) General Method of Applied Theory Building Research as its overall methodology (see Figure 3.1). Lynham's general theory building research method will be enhanced by the use of Dubin's (1978) specific eight-step theory building research method.

The general phases of Lynham's methodology include: Conceptual Development, Operationalization, Confirmation or Disconfirmation, Application, and Continuous Refinement and Development. Descriptions of these phases follow.

Figure 3.1. The General Method of Applied Theory Building Research (Lynham, 2002a, p. 231)



Conceptual Development

"The purpose of this phase is therefore to develop an informed conceptual framework that provides an initial understanding and explanation of the nature and dynamics of the issue, problem or phenomenon that is the focus of the theory" (Lynham, 2002b, p. 16). For the purposes of this study, the conceptual development phase will consist of the identification of the core theoretical domains that will inform a general theory of scenario planning. This phase will also include an initial idea about how these theoretical domains are related to, or influence each other. The output of this phase will include a conceptual model of a theory of scenario planning that incorporates the core theoretical domains and displays how they influence each other. Also resulting from this phase will be the general limitations and conditions under which the model is expected to operate.

Operationalization

"The purpose of the Operationalization phase of theory building research is essentially to get the theoretical framework ready to take to practice---so that it can be confirmed and/or tested in its real world context" (Lynham, 2002a, p. 17). The operationalization of a theory of scenario planning, therefore, will consist of the conversion of the elements expressed in the conceptual development to observable or confirmable components in the form of hypotheses, empirical indicators, or knowledge claims.

Confirmation or Disconfirmation

This phase involves the planning, design, implementation, and evaluation of a rigorous confirmation-disconfirmation agenda. The goal of this phase is to confirm the contextual relevance of the theoretical framework of the theory in the domain that it is to be applied.

Application

This phase features the application of the theory to problems in the real world for which it was designed. Practitioners can provide insight and judge the usefulness of the theory in the application phase, which allows the theorist to use this experience and learning to further refine the theory.

Continuous Refinement and Development

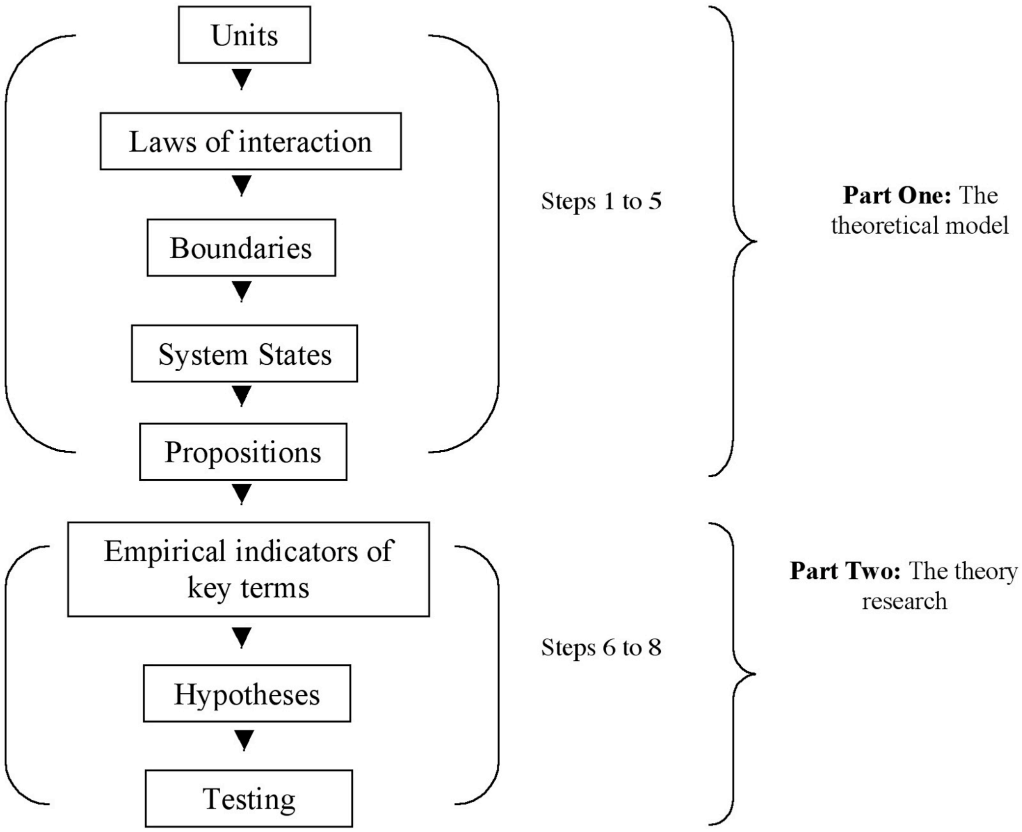
Theories are never complete; rather, they require continuous adjustment and refinement as practice and application further inform their conceptual frameworks. This phase also ensures that theories are kept current, promotes trustworthiness, and suggests discarding aspects of the theory that are found to be irrelevant, extraneous, or proven false.

This study will follow Lynham's (2002a) general model through to the confirmation stage, thus the goal of this study is to emerge with a confirmed theory that is ready for application in practice, complete with a detailed research agenda and several testable hypotheses.

Dubin's Eight-Step Theory Building Method

Lynham's (2002a) general model provides an overview of the general phases of the theory building process. At one further level of detail, Dubin's (1978) specific eight-step theory building research methodology will be used to formulate a theory of scenario planning and fulfill the first three phases of Lynham's (2002a) general method.

Figure 3.2 Dubin's (1978) Eight-Step Theory Building Research Methodology



Dubin's Eight step theory building methodology (1978) is comprised of (1) developing the units of the theory, (2) specifying the laws of interaction describing the relationships among the units, (3) determining the boundaries within which the theory is expected to function, (4) identifying the system states in which the theory is expected to function, (5) specifying the propositions, or truth statements about how the theory is expected to operate, (6) identifying the empirical indicators used to make the propositions testable, (7) constructing hypotheses used to predict values and relationships among the units, and (8) conducting research to test the predicted values and relationships. Dubin's (1978) method can also be divided into two components (1) the theoretical model and (2) the theory research. The completion of steps one through five results in a theoretical model. Once the theorist begins specifying empirical indicators (Step six) the model becomes a theory and thus the remaining steps deal with the theory research.

This research will complete steps one through seven, specifying multiple hypotheses to test and set up the methods by which to test them, however, this research will not conduct the empirical testing of the multiple hypotheses developed as the core of this research.

The development of the units of the theory refers to the building blocks of the theory. The units of the theory are the things that constitute the subject matter under examination. The output of this stage is often simply the designation of the units to be incorporated into the theory development.

Specifying the laws of interaction among the units of the theory requires that relationships among the units be made clear. A change in one variable may result in changes in other variables and these changes are to be made explicit in Dubin's step two.

Step three defines the domain in which the theory is expected to operate. The identification of the boundaries of the theory is important in clarifying the aspects of the real world that the theory is attempting to model. The boundaries also clarify the limited portion of the world in which the theory is set.

Specification of system states is the task of step four in Dubin's method. System states represent the conditions under which the theory is expected to operate. There can be numerous varying system states for the theory, or there can be few, but each system state is distinctive.

Step five requires the specification of propositions. 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 only to the logic designated by the theory builder for distinguishing truth and false statements.

Empirical indicators are selected in step six. An empirical indicator is "an operation employed by a researcher to secure measurements of values on a unit" (Dubin, 1978, p. 182). Dubin (1978) stressed that empirical indicators are operations performed by observers using a specific instrument.

The identification of hypotheses occurs in step seven. Dubin (1978) stated that hypotheses are "the predictions about values of units of a theory in which empirical indicator are employed for the named units in each proposition" (p. 206). Hypotheses establish the link between the empirical world and the theoretical model that has been under construction.

Step eight requires that the theoretical model is tested empirically in practice. Dubin (1978) specified several strategies for testing complex theoretical models that can commonly have over 20 hypotheses. These strategies will be reviewed after the detailed method for constructing a theoretical model is outlined.

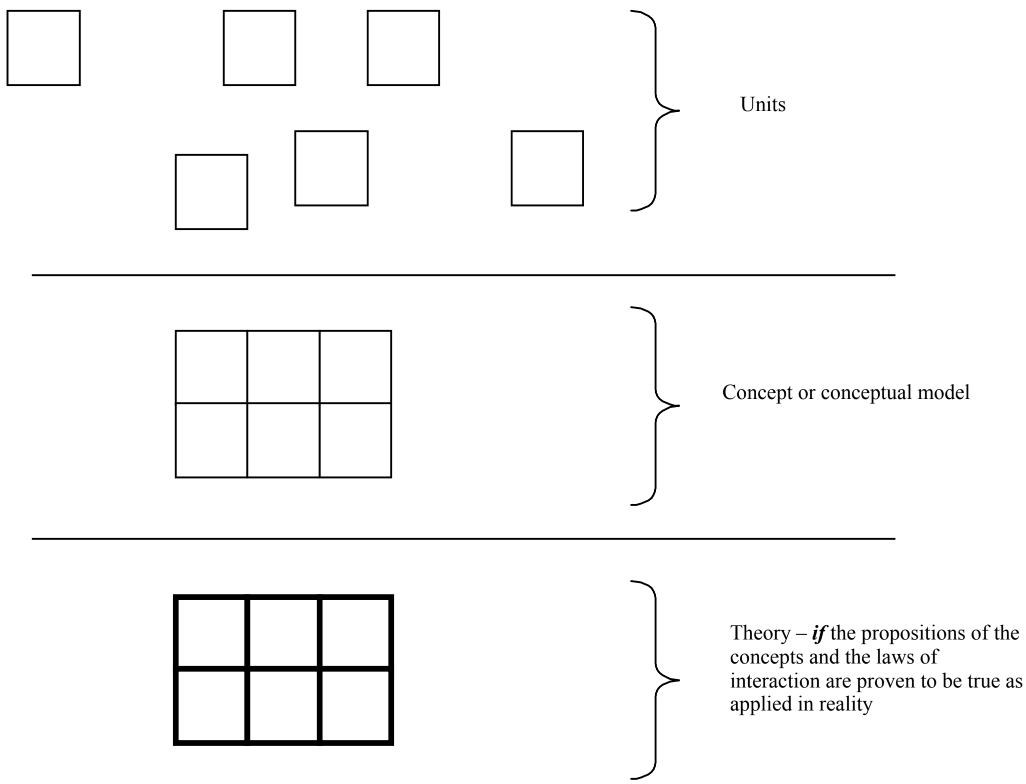
Step One -- The Units of a Theory

Dubin (1978) made several preliminary distinctions. These are between concept and unit, between thing and property of thing, between unit and event, between attribute and variable, between real and nominal, between primitive and sophisticated, and between collective and member. Each of these distinctions will be described in brief before examining the units of a theory of scenario planning.

Concept and Unit

The core challenge of this phase of theory building is to translate concepts to units (Dubin, 1978). The distinction between these two terms begins with the requirement for a scientist to conceptualize the things to which attention is given, but Dubin (1978) pointed out that the term *concept* can be used to denote "whole theories, or laws of science or even 'conceptual frameworks'" (p. 38). Thus, the term *units* is employed to describe the pieces that collectively make up the subject matter of the investigation at hand. This hierarchy is displayed visually in Figure 3.3. The important point to glean from this hierarchy of theory building components is that “units are not by themselves the sufficient components of a theory” (Dubin, 1978, p. 39).

Figure 3.3. Hierarchy of Theory Building Components



Thing or Property of Thing

Another challenge is faced with the consideration of examining the units, or the properties of the units in constructing a conceptual model of a theory. Dubin (1978) argued that humans have limitations on their abilities to comprehend wholes, and humans attempt to compensate for their own limitations by only choosing the properties that are observable and comprehendible. As a result, humans and scientists deal with “selected concrete or abstract characteristics of things rather than with things as wholes” (Dubin, 1978, p. 41). An important advantage of focusing on the properties of the units is the imagination afforded in opportunities for testing propositions and relationships between properties.

Unit and Event

The distinction between unit and event is needed for the purposes of any scientific theory and is based on the number of possible occurrences. An event can occur only once, whereas a unit of a theory can count multiple times. Dubin (1978) recognized two key reasons for this distinction 1) separating historical explanation from theory and 2) avoiding the problem of all things being unique at all points in time.

Attribute and Variable

Units of theories can be either attributes or variables. Dubin (1978) defined an attribute as "a property of a thing distinguished by the quality of being present" (either it is present or it is not), and a variable as "a property of a thing that may be present in degree" (p. 44). The significance of this distinction is that when variables are present in the units of a theory, the focus concentrates on the degree of presence of the property under investigation.

Real and Nominal

Units can be either real or nominal, although the ultimate distinction is made by the determination of empirical indicators. Real units are those for which there are likely to be empirical indicators. Nominal units are those for which empirical indicators are considered unlikely.

Primitive and Sophisticated

Primitive and sophisticated units are differentiated by definition. Primitive units are undefined. Sophisticated units are well defined. Dubin (1978) provides the example of a scientist inserting an X into an equation and then solving for X. The X is a primitive unit.

Collective and Member

The final distinction is between a class being considered as a unit and the members of a class being considered as units. At different times the theorist-researcher may want to treat a collective group of individuals with a common characteristic as a unit, and then at other times they may each individually be treated as units. The importance of this distinction is noted when considering what happens when both kinds of units are involved in the same theory. This can create problems for the theorist in dealing with the difference in unit classification.

Dubin (1978) also distinguished among several different types of units. For the purposes of this paper and in the interests of space, these different types of units are presented in Figure 3.4.

Figure 3.4. Types of Units

Unite Type	Description
Enumerative Units	Enumerative units are characteristics of things that hold true in all possible conditions of the thing.
Associative Units	Associative units are characteristics of things that hold true only in some conditions of the thing.
Relational Units	Relational units identify properties that are derivable from at least two other properties.
Statistical Units	Statistical units summarize the distribution of a property in a thing.
Summative Units	Summative units represent entire complex things by drawing together a number of different properties under one label.

At this point it is logical to ask the question: Is it okay to mix different kinds of units within the same theory? Dubin (1978) provided several guidelines and restrictions when mixing 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 or things to be included.

Each of these guidelines has a lengthy and complicated logical explanation. For further clarification or explanation of the reasoning behind these guidelines, please see Dubin (1978). By combining the initial distinctions and types of units, a matrix of unit selection possibilities is created as show in Figure 3.5.

Figure 3.5. Unit Selection Matrix.

Unit Type	*Initial Distinction*							
	Attribute	Variable	Real	Nominal	Primitive	Sophisticated	Collective	Member
Enumerative Units								
Associative Units								
Relational Units								
Statistical Units								
Summative Units	Guideline 3 states that these units cannot be included in a thoeretical model or potential theory.							

Criteria for Evaluating the Units of a Theory

Dubin (1978) suggested five criteria for evaluating the status of the units selected for constructing a given theory. They are 1) rigor and exactness 2) parsimony 3) completeness 4) logical consistency and 5) conformity to the limitations on employment and combinations of the units. Each of these criteria is described in further detail.

Rigor and exactness. The rigor and exactness of the units of a theory refer to the type of units employed by the theoretical model. Variable units are deemed more exact than attribute units because variable units specify the degree to which the characteristics of the given unit are present, whereas attribute units are required only to state the presence or non-presence of the characteristic (Dubin, 1978).

Parsimony. Parsimony in theory building refers to the fact that a minimum number of units is used to construct the theoretical model (Dubin, 1978). Parsimony can be assessed by incorporating no unnecessary units, assumptions, or complexity into the theoretical model.

Completeness. The criterion of completeness pertains only to associative units Dubin, 1978 -- see Figure 3.4). Associative units have possible zero values, and therefore, predictions about the model must include those states in which the values of those associative units pass zero and become negative values. Completeness is important when testing theory and will be discussed in greater detail.

Logical consistency. The choice of units and types of units translated directly to the ways in which the researcher-theorist can test the theoretical model. For example, it has been illustrated that choosing associative units has implications for the values of those units, and therefore also for the testing of that theory. Logical consistency refers again to the choice of units. A theoretical model of only enumerative units has only positive values as possible outcomes. Thus, there are limitations placed on the possible results determined by the choice of types of units.

Conformity to limitations of unit combinations. This criteria relates to the assessment of the units employed by a theoretical model in view of Dubin's (1978) guidelines for mixing unit types. These guidelines have been discussed and are incorporated into Figure 3.5.

Step Two -- Laws of Interaction

Dubin (1978) defined laws of interaction as "the linkages among units of a model" (p. 90). It is important to specify that laws of interaction describe the *relationships* among the different units. Equally important is the notion that relatedness does not imply causality. For example, when riding in an aircraft, one might experience turbulence. Often immediately before a bit of turbulence the "fasten safety belt" sign becomes lighted. These two events can be described as *related*, but with certainty, the "fasten safety belt" sign lighting does not *cause* turbulence. Sometimes this occurs in reverse -- the "fasten safety belt" sign lights up *after* the turbulence. The same logic applies: the turbulence does not *cause* the "fasten safety belt" sign to light.

Long (2002) stressed the following five conditions as necessary but not necessarily sufficient in the declaration of causality:

1) A theoretical or common sense linkage between *X* and *Y*
2) Empirical association (correlation) between *X* and *Y*
3) Elimination of common causes: some other variable, *Z*, must be ruled out as a cause of the correlation between *X* and *Y*
4) Responsiveness: altering *X* leads to an alteration of *Y*
5) Asymmetry: *X* must cause *Y* and not vice versa

Laws of interaction deal with variance among the units. Dealing with variance among units means narrowing the range of values for one unit by associating them with the values of other units. Dubin (1978) identified three general categories of laws for expressing relationships among units:

1) Categoric interactions
2) Sequential interactions
3) Determinant interactions

Categoric Interactions

"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.

Categoric laws are also the most common laws of interaction in the social and behavioral sciences.

Sequential Interactions

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 succeeds another.

Determinant Interactions

"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. There are two components of a determinant law, namely, 1) the specific relation is declared and 2) determinate values are included in the law of interaction.

Negative Laws

The usual statement of a negative law is the null hypothesis -- that there is no relationship between the values of one unit and the values of another. Negative laws *do not* imply that the values of one unit are negatively related to the values of another unit, or that the resultant value of one unit is zero or a negative number.

Efficiency

Efficiency refers to the range of possible values of one unit as related to the values of another through some law of interaction. Dubin (1978) identifies four levels of law of interaction efficiency:

1) Presence-absence -- Unit X will have some values when unit Y has some values.
2) Directionality -- Values of unit X will increase when the values of unit Y increase.
3) Covariation -- The values of unit X and unit Y will vary together.
4) Rate of change -- The rate of change in the values of one unit and the associated rate of change in the values of another unit are both described.

Catalysts

The catalyst unit in a model can be defined as the unit whose presence is required for the interaction among any units to occur. A catalyst may be any type of unit, although its significance rests on how it relates, or its law of interaction with other units (Dubin, 1978). Perhaps most important regarding the catalyst is that its law of interaction must be such that the value of the catalytic unit is not dependant on the value of any other variable -- it must be independent.

Holding Constant

A common tactic in empirical research is to hold one specific variable at a constant value. For example, if a study involves people and it is thought that a specific eye color is lawfully related to other units, then the sample is limited to people with that specific eye color. "The act of holding constant as a research tactic serves to reduce the scope of the theoretical model being tested by deliberately eliminating one or more units from possible inclusion in the model. In this very operation the researcher admits that the model being tested is, by definition, incomplete" (Dubin, 1978, p. 118). While the results of holding a unit constant might inform the researcher or theorist, the model must be tested again later, including all of the required units.

Criteria for Evaluating the Laws of Interaction

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. While there is no fast rule for determining the appropriate level of complexity or the appropriate number of laws of interaction for any given model, the criteria of parsimony is satisfied by designating the minimum number of laws of interaction needed for making the nature of the interrelation of the units clear and explicit.

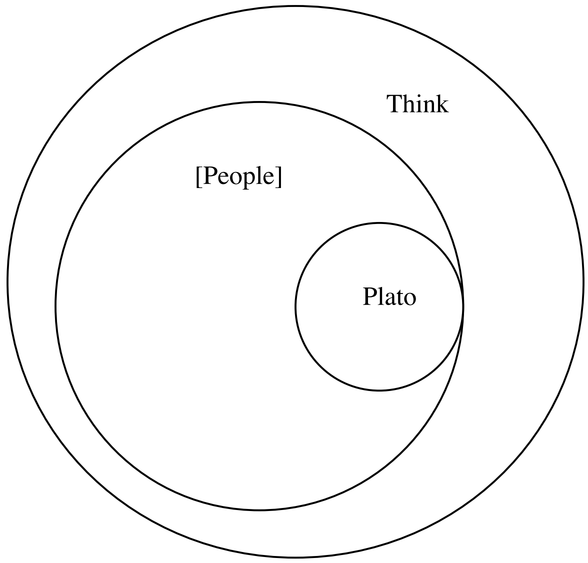
Step Three -- The Boundaries of a Theory

"A theoretical model is said to be bounded when the limiting values on the units comprising the model are known" (Dubin, 1978, p. 126). Boundaries, therefore describe the limits of the theoretical model. The limiting values can be determined by criteria that are internal to the system or model, and also by criteria that are external to the system or model. Each will be described in further detail.

Boundary-Determining Criteria

There are two generally recognized boundary conditions when discussing systems -- open and closed. Open boundaries imply that exchange takes place across the boundary between some element of the system and its external environment. Closed boundaries imply that such exchange does not occur (Dubin, 1978). The criteria for determining the boundary of the theoretical model are equally applicable to both the units of the theory and the laws of interaction among the units of the theory. This simply means that the units as well as the laws of interaction must be contained by the boundary of the system. There are two general approaches to uncovering boundary-determining criteria. The first is a logical test. Dubin (1978) suggested the syllogism: "All [people] think; Plato is a [person]; therefore, Plato thinks" (p. 127) as an appropriate logical test. This syllogism can be displayed in a diagram as in Figure 3.6.

Figure 3.6. Syllogism as a Logical Test for Approaching Boundary-determining Criteria (Dubin, 1978, p. 128).



In this test, the units employed and the laws by which they interact all prove that they hold. In this example Plato and men are in the same domain and share the same boundary-determining characteristic; think. The second approach is an empirical test. An empirical test that proves Plato and men to be in the same domain (if there was some doubt) would also satisfy the requirement. "Dimensional unity" (Dubin, 1978, p. 128) among the units and laws of interaction is required by either of these approaches. Failure by either of these two measures means the model is inconsistent.

Interior Boundary Criteria. Interior boundary criteria are those criteria for determining the boundaries of the theoretical model that are derived from the nature of the units and the laws that relate them. Dubin (1978) stated four interior boundary determining criteria, namely, 1) the truth tables of the theorist 2) probable limits for values of the units 3) "subsetting the property space" (Dubin, 1978, p. 131) and 4) the alignment between the laws of interaction and the domain of the theory.

Exterior Boundary Criteria. According to Dubin (1978) "the most commonly encountered circumstance in which an exterior criterion determines the boundaries of a model is the one in which the model builder admits, after testing the model empirically, that he cannot account for the empirical results" (p. 133) without introducing another variable that intervenes with the model. In this case, the intervening variable must be added to the theoretical model as it re-determines the boundary, or is required to establish the proposed boundary.

Theoretical and Empirical Boundaries

It is common for researchers to state that the findings drawn from their studies do not apply outside of the domain in which the study was conducted. In the case of theory building, this is because it is assumed that other models will have other boundary-determining criteria (Dubin, 1978). Before a theoretical model is tested, these boundaries can only be theoretical and are determined by logic. Once the model has been tested, the researcher has empirical evidence to confirm that the boundaries are adequate, in which case the boundaries become empirical, or that they are inadequate, in which case the boundary-determining criteria can be re-defined (Dubin, 1978).

Domain Size and Criteria

"There is an inverse relationship between the number of boundary determining criteria employed in a model and the size of the domain covered by the model" (Dubin, 1978, p. 134). Simply stated, this means that with each additional boundary, a greater restriction is placed upon the laws of interaction in the model. Thus, the fewer the boundaries, the more generalizable the model becomes.

Criteria for Evaluating the Boundaries of a Theory

Dubin (1978) identified homogeneity, generalization, and empirical testing as the core criteria for assessing the boundaries of a theory.

Homogeneity. Homogeneity refers to the level at which the units and laws of interaction satisfy "the conditions contained in a single boundary-determining criterion and are therefore homogeneous on the criterion" (Dubin, 1978, p. 136). This implies that additional boundary-determining criteria will increase the homogeneity of the units and laws contained within those criteria.

Generalization. The extent to which the model is generalizable depends on the size of the domain in which the model is expected to operate (Dubin, 1978). A model is therefore made more generalizable by removing one or more boundary-determining criteria.

Empirically testing the boundaries. An empirical test of the boundaries of a theoretical model can produce three consequences for the model, namely, 1) the logically derived theoretical domain is confirmed as the empirical domain, 2) the *empirical domain is greater* than the logical theoretical domain, and 3) the *theoretical domain is greater* than the empirical domain (Dubin, 1978). In any case that the two domains do not match, the boundary-determining criteria must be revisited and altered until a match is achieved (Dubin, 1978).

Step Four -- System States

Dubin (1978) submitted "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). In order 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 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.

Recurrence of System States

It is important to note that system states can recur, proceed in a specific order, or be extremely rare. System states can recur with frequency, thus denoting an importance of that state, for example the sleeping state for humans fulfills an important biological function, and recurs within a general time frame (Dubin, 1978).

Indicating System States

According to Dubin (1978) system states are often designated by examining the laws of interaction. "A system characterized by a categoric law of interaction typically has the following format: 'If…, then… under the conditions of…' (p. 152). Determinant laws also indicate a system state. Dubin (1978) provides the following formula "A change in value of A (in a given direction; by a given amount; in and by both) is accompanied by a change in values of B (in a given direction, by a given amount, in and by both) under conditions…." (p. 153). In the case of a sequential law of interaction: "A change in the value of A (in a given direction; by a given amount, in and by both) is followed in time by a change in the value of B (in a given direction; by a given amount, in and by both)" (p. 153).

The importance of system states is that they help the theorist determine: 1) the conditions necessary for the theoretical model to operate, 2) the state in which the theoretical model ceases to exist, 3) find patterns in the succession among system states that might allow predictions of future system states, and also 4) to determine if, and in what state the system is permeable.

Criteria for Evaluating System States

Dubin (1978) provided three criterions of system states, namely, 1) inclusiveness 2) that individual units have determinant values in a given state and 3) 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; while the determinant values measured in criterion two imply that the values measured are distinctive for that state of the system. Criterion three simply bounds states of the system to time frames in which they occur.

Step Five -- Propositions

Propositions introduce the idea of prediction into the theory building equation (Dubin, 1978). Dubin 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" (1978, 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" (1978, p. 160) as a replacement for the term "truth statement" if the connotations of the latter term cause problems.

The important point in specifying propositions is to continue the clear logical path set up by the theory builder from the start. Thus, the employment of the term "logical consequence", "truth statement" or "proposition" is simply to establish the consistency of the theory builder's logic. It is therefore clear that 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 also stressed the distinction between propositions and set membership. By this distinction, he intended that, referring to the earlier example of Plato, an assertion could be made that Plato is a member of the [people] set. This statement is true, but is not a proposition. To clarify, propositions must also be truth statements about the "model in operation" (Dubin, 1978, p. 163).

Propositions and Prediction

"Quite simply, the use of the theoretical model is to generate predictions or to make truth statements about the model in operation" (Dubin, 1978, p. 163). Accordingly, propositions are prediction statements because they state what will be true having established the units, laws of interaction, boundaries and system states of the theoretical model. However, propositions are not used to evaluate the empirical adequacy of the model. "Since the model is a synthetic product, being constructed logically and intellectually by the theorist, all truth statements about the model must also be synthetic. This synthetic quality of the propositions makes clear that we are not talking at this point about the empirical adequacy of the propositional statements" (Dubin, 1978, p. 164).

Prediction and Unit Values

As the process of the theoretical model is documented by the laws of interaction or the description of how the units relate to one another, the outcomes of the theoretical model must be statements of value (Dubin, 1978). Propositions take the form of "if…then" statements and are commonly linked as follows:

If (*a*), then (*b*);
If (*b*) then (*c*); etc.

Types of Propositions

Dubin (1978) identified three types of propositions, namely, 1) propositions about the values of individual units of the theoretical model, 2) propositions about the system state that involves a prediction about values of all units, and 3) propositions about the transition of the system from one state to another that involves predictions about values of all units.

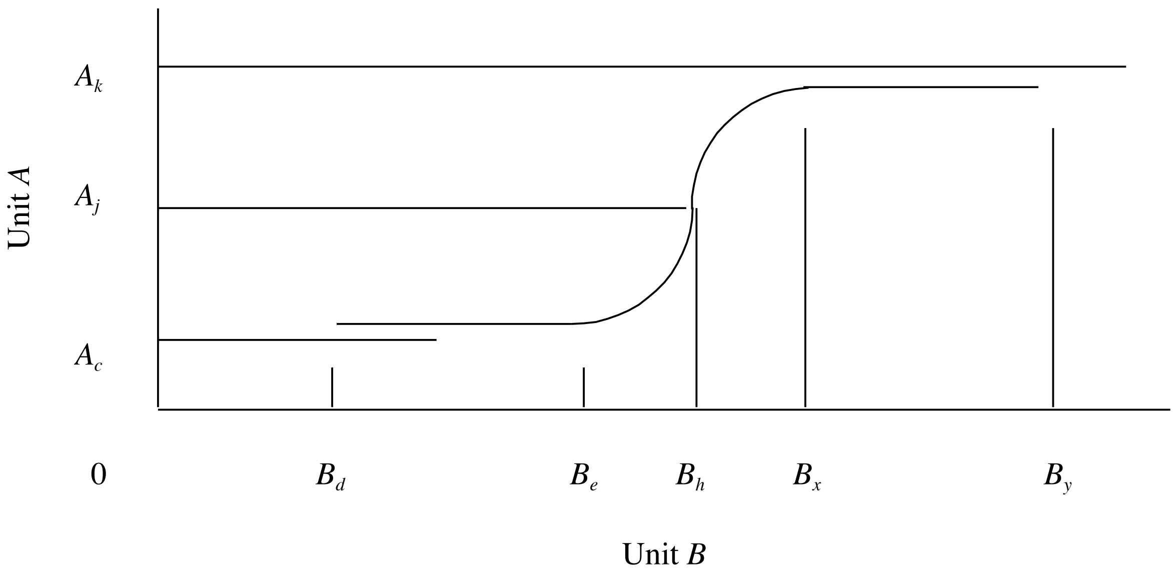
Number of Propositions in a Model

As numbers are infinite, theoretically there are an infinite number of possible propositions. In the standard prediction equation $Y = a + bX$ there are an infinite number of potential values for X. However, in the social sciences, this is not practical. 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). This number is still excessive in all but the simplest of models, or those involving two or fewer units. Thus, one strategy for including the appropriate propositions is to specify those propositions that identify critical or limiting values for the unit or units involved.

Strategic Propositions

Strategic propositions are those that identify specific critical or limiting values of units. To borrow Dubin's (1978) example:

Figure 3.7. Identifying Strategic Propositions (Dubin, 1978, p. 169).



"Some significant areas are (1) the point A_jB_h, where the curve inflects or changes from increasing at an increasing rate to increasing at a decreasing rate; (2) the region B_d - B_e, where significant changes in the value of B are accompanied by very minor changes in the value of A, and the similar region B_x - B_y; and (3) the values A_c and A_k which are limiting values of the relationship" (p. 168). The use of strategic propositions offers parsimony for an otherwise redundant and sometimes trivial list of propositions, and indicates where something is happening to the value of a unit that demands attention.

Propositions and Laws of Interaction

Propositions differ from laws of interaction according to one level of detail. More specifically, a collection of propositions may be analyzed to reveal the underlying law of interaction upon which they are based (Dubin, 1978). Dubin (1978) also stated three points of differentiation between propositions and laws of interaction, namely, 1) the form and content of the statements are different, 2) the uses are different, and 3) an inductive leap is required to work from a set of propositions to the underlying law of interaction. In essence, "the law of interaction tells us what the relationship is, and the proposition states what the predicted values of the units will be" (Dubin, 1978, p. 170).

Negative Propositions

A common assumption is that negative propositions can be equated with null hypotheses. On the contrary, a null hypothesis is a statement of no relationship, whereas a negative proposition states the inverse of the proposition. For example, for the proposition "high personal income is associated with high social status", the negative proposition would be that "high personal income is associated with low social status". Negative propositions are used in cases where empirical indicators are difficult to secure because they identify another kind of empirical indicator -- the absence or opposite of what is stated in the proposition. Thus, "the confirmation of the negative proposition leaves the model intact as having been supported by the empirical test" (Dubin, 1978, p. 174).

Criteria for Evaluating the Propositions

Dubin (1978) stated that propositions are evaluated according to three key criteria, namely, (1) consistency, (2) accuracy and (3) parsimony.

Consistency. Each proposition must be derived logically from the same system of logic.

Accuracy. Accuracy refers to whether or not the propositions follow logically from the units, laws, boundaries and system states specified thus far.

Parsimony. Parsimony again refers to the use of strategic propositions so as to minimize the number of propositions to those that are critical, or reveal that some change is occurring in some other part of the theoretical model. The use of such propositions keeps the complexity of the model to a minimum, but still covers the important transitions in the operation of the theory itself (Dubin, 1978).

Step Six -- Empirical Indicators

An empirical indicator is "an operation employed by a researcher to secure measurements of values on a unit" (Dubin, 1978, p. 182). Dubin (1978) stressed that empirical indicators are operations performed by observers using some kind of instrument.

Operationism

Dubin used the term operationism, drawing on the work of Bridgman (1922, 1927) and Bentley (1954) to indicate the focus on setting up the empirical tests for the propositions. Thus, operationism refers specifically to the empirical testing of propositions. Given this, an important consideration is that operationism relates strictly to testing propositions, and not to the formulation of the model. Operationism can be thought of as the preparation of the theoretical model for empirical testing through the designation of empirical indicators, including both the operation employed by the researcher and the instrument used to secure measures.

Reliability

Empirical indicators must produce reliable results, or, more specifically, values that do not differ from observer to observer. Dubin (1978) suggested the use of the phrase "as measured by" (such as, the value of unit *A* as measured by) to describe the empirical indicator used to produce the unit values.

Empirical Indicators and Units

Several types of units were introduced in the section detailing the conceptualization of a theoretical model. Dubin (1978) specified that empirical indicators differ according to the type of units employed by the model. Because an enumerative unit is a characteristic of a thing in all of its conditions, the empirical indicator used to establish the value of that unit must logically produce only nonzero values. This is generally the same for associative units, except that because associative units are characteristics of units in *some* conditions, empirical indicators for associative units may have real zero values. Empirical indicators for relational units must be based on the interaction between properties of a unit where relational units are defined as those units having "a property characteristic of a thing that can be determined only by the relation among the properties of the thing: (Dubin, 1978, p. 188). Statistical units already incorporate empirical indicators by their titles. Recall that statistical units can be of three classes: 1) those summarizing a central tendency, 2) those summarizing dispersion of distribution, and 3) those defining the position of a unit within a distribution (Dubin, 1978). Summative units are not relevant in the discussion of empirical indicators as they have been deemed inappropriate for theory building.

Other Empirical Indicators

Dubin described two additional classes of empirical indicators, namely, absolute indicators, and relative indicators. Absolute indicators are "absolute in the sense that there can be no question as to what they measure" (Dubin, 1978, p. 193). Race and gender are examples of absolute indicators. Relative indicators are indicators that "may be employed as empirical indicators of several different theoretical units" (Dubin, 1978, p. 195).

Multiplicity of Indicators

Dubin (1978) discussed the difficult problem in the social sciences defined by the situation that the same theoretical unit may be measured by more than one empirical indicator. This occurs when 1) the population sample is ordered in the same way by the values measured by several empirical indicators, and 2) the employment of each empirical indicator produces a different ordering in the sample according to its values.

The first case can be explained by considering the classic problem of having correlated measures. Correlated measures simply indicate that "two measures are identical in their ordering of the sample population" (Dubin, 1978, p. 197), (such as in the situation that two measures essentially measure the same thing). In this case, the measures are *not* independent of each other. The presence of correlated measures has implications for the power of the statistical tests, and therefore, it is desirable to select one of the two measures. Dubin (1978) suggested that one indicator may be more readily employable, simpler to work with, or cheaper to use, and that any of these are appropriate grounds on which to select one.

The second case is one in which multiple empirical indicators produce different orderings of the sample population. In this situation, different measures of the same theoretical unit are producing different results. It is evident, then, that the two measures do not measure the same theoretical unit and a decision must be made regarding which indicator measures the theoretical unit (Dubin, 1978). The other indicators are then discarded.

Validity

Dubin stated that validity is "a man-made consensus and is nothing more than a conventional agreement among a group of interested students and spectators that the empirical indicator and the theoretical unit whose values it measures are homologous" (1978, p. 200). Logically, then, validity is questioned when the conventional agreement is broken. Dubin (1978) examined the traditional criterion measure method for establishing the validity of empirical indicators and concluded that this classical test of validity invariably results in the case of multiplicity of indicators in which the measures are predicted. As an alternative, Dubin suggested the use of the ability for all sample population members to have an equal chance of achieving the same score via a given indicator. Thus, "empirical indicators are valid if all members of a sample studied have the possibility of securing any of the scores measured by the indicator" (Dubin, 1978, p. 204).

Criteria for Evaluating the Empirical Indicators

Dubin (1978) specified two criteria for evaluating empirical indicators. They are (1) that the operation of measurement is specified, and (2) that the results produced by the operation are identified.

Operation of measurement. This criteria is met simply by specifying how the researcher will measure the empirical indicator. By describing the process of measurement, the researcher satisfies this requirement.

Results produced. The second criteria for evaluating the empirical indicators is that the results of the measurement operation are reported.

Step Seven -- Hypotheses

Dubin (1978) stated that hypotheses are "the predictions about values of units of a theory in which empirical indicators are employed for the named units in each proposition" (p. 206). Hypotheses establish the link between the empirical world and the theoretical model that has been under construction. Researchers often state hypotheses without supplying the scientific path to that hypothesis which sometimes gives the impression that hypotheses are constructed on an *ad hoc* basis. If following Dubin's (1978) methods provides an accurate assessment of scientific inquiry, hypotheses are not *ad hoc* at all, rather, they are "predictions of the values on units that are derivable from a proposition about a theoretical model" (p. 206).

Hypotheses and Propositions

"Every hypothesis is homologous with the proposition for which it stands. The homology is determined by the dimensionality of the theoretical definition of the units contained in the proposition" (Dubin, 1978, p. 207). Thus, each proposition will have at least one hypothesis that represents it. It is common, however, for each proposition to reveal several testable hypotheses.

Number of Hypotheses

Each proposition has the possibility of converting to many hypotheses. "The general rule is that a new hypothesis is established each time a different empirical indicator is employed for any one of the units designated in a proposition" (Dubin, 1978, p. 209). Thus, as the number of propositions increases, so does the number of possible hypotheses. Ultimately, however, the question of number of hypotheses is a question of research preferences and energy posed to a discipline and its researchers.

Extensive, Intensive and Inductive Tests

Dubin (1978) identified three key strategies for constructing and testing hypotheses; they are 1) extensive, 2) intensive, and 3) inductive. The extensive strategy essentially tests each of the strategic propositions, or locations where something notable is happening between units. A test of each strategic proposition provides an adequate test of the whole theory in an economic fashion. The intensive strategy sees the researcher focusing intensely on a small number of strategic propositions, with particular emphasis on generating multiple hypotheses for each strategic proposition (Dubin, 1978). The inductive strategy starts with *ad hoc* hypotheses (a researcher simply finds and uses an instrument) and then works backward to determine the proposition and eventually define a theoretical model. Any of these approaches are acceptable for testing a theoretical model; however, the research agenda must be prioritized, and clearly, a starting point must be chosen. For the purposes of theory building research, most researchers will make a conscious choice in constructing a theoretical model and then proceed to test it via either the extensive or intensive strategy. It is also important to note that these three strategies are not mutually exclusive and that any combination of strategies may be used (Dubin, 1978).

Step Eight -- Testing a Theory of Scenario Planning

Step eight of Dubin's (1978) method of theory building research requires the conduct of empirical research to test, confirm, and verify the hypotheses defined earlier in the process. The testing phase provides the theorist with confirmation that the theory, indeed, represents the phenomenon it purports to represent in the way it claims to represent them. Testing also provides the means by which to refine the theory and adjust it such that it *will* represent reality in the way it claims to in the case that testing reveals hypothesis that cannot be confirmed.

Connecting the Research Question and the Methodology

Given the lack of theory and theory development pertaining to the scenario planning process, it has been established that the intent of this study is to develop a theory of scenario planning. The core research question is:

Can a theory of scenario planning be developed?

Several of the research methods would be appropriate in this theory building research question and several would contribute valuable insights into the practice and operation of scenario planning (Lynham, 2002a). Dubin's (1978) quantitative method has been selected for this study to connect the research question and the research methodology. It was selected because (1) it is the most comprehensive method of those reviewed, (2) it requires that the researcher/theorist construct a theoretical model based on conceptual and logically connected ideas, (3) it requires the translation of that theoretical model into testable hypothesis about how the theory works in practice, (4) it requires that the theoretical model be tested in order to claim that a theory exists, and finally, (5) through the identification of hypothesis it provides a demand for the empirical research.

Chapter Four

SCENARIO PLANNING THEORY DEVELOPMENT

This chapter has several purposes. Specifically, those purposes include:

1) Presenting the units of a theoretical model of scenario planning
2) Presenting the laws of interaction among the units of a theoretical model of scenario planning
3) Presenting the boundaries of a theoretical model of scenario planning
4) Presenting the system states of a theoretical model of scenario planning
5) Presenting the proposition of a theoretical model of scenario planning

Thus, the task of this chapter is to formulate a theoretical model of scenario planning (Dubin, 1978). More specifically, this chapter will complete the first five steps of Dubin's (1978) theory building method.

Each unit of the theoretical model will be introduced, including its definition, description, and classification according to Dubin's (1978) specifications. Finally, the units will be assessed according to Dubin's (1978) criteria.

Following the presentation of the units of a theoretical model of scenario planning, will be the introduction of the laws of interaction among those units. The laws will be presented according to Dubin's (1978) two classifications of laws, namely, (1) categoric and (2) sequential laws of interaction. Once presented, the laws of interaction will be considered in light of the evaluation criteria outlined in Chapter three.

Once the laws of interaction have been established, the boundaries of the theoretical model of scenario planning will be introduced. The boundaries of a model define the domain or domains in which the theory is expected to operate. These boundaries will then be assessed according to Dubin's (1978) criteria for evaluation.

The system states of a theoretical model of scenario planning will also be defined and then evaluated according to their corresponding criteria.

Finally, the propositions of a theoretical model of scenario planning will be presented along with their criteria for assessment and implications.

Step One -- Selecting the Units of the Theoretical Model of Scenario Planning

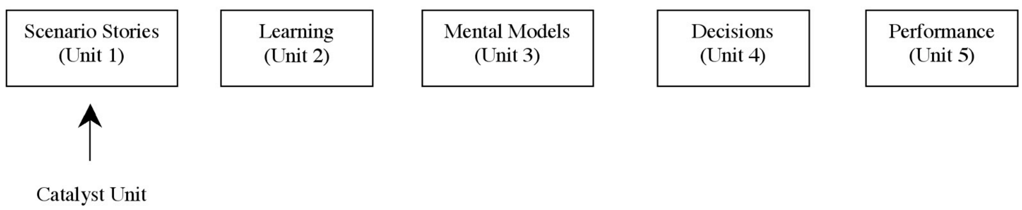
Dubin (1978) stated that "in principle there are no limitations on the selection of units to be employed in a theoretical model. The theorist has unlimited opportunities to employ units of his [or her] choice. Once he [or she] has made a selection, the constructed models must conform to the limitations set forth in the previous section for employment and combination of units" (p. 78). While this flexibility in determining the units of the theory allows the theorist complete control of this part of the process, Dubin (1978) also offered that: "descriptive research is the stuff out of which the mind of [a person], the theorist, develops the units that compose his [or her] theories. The more adequate the description, the greater is the likelihood that the units derived from the description will be useful in subsequent theory building" (p. 87). Descriptive research is often a prelude to theory building and it assists the theorist in developing the required content expertise for theory construction (Torraco, 2002).

In this chapter, the proposed units of a theoretical model of scenario planning will be described. Each unit will be described in terms of Dubin's (1978) initial distinctions and types of units. After the selected units are described, it will be stated how these units conform to the guidelines for combining units as set forth by Dubin (1978). The units of a theoretical model of scenario planning are:

1) Scenarios
2) Learning
3) Mental models
4) Decisions
5) Performance

The units of a theoretical model of scenario planning are also displayed in Figure 4.1.

Figure 4.1. The Units of a Theoretical Model of Scenario Planning



The use of these units is intended to begin to describe what the phenomenon of scenario planning is and how it works (Torraco, 1997). Practice of scenario planning has been overtaken by the terminology of scenario *building*. It is therefore necessary at this point to reiterate the distinction between *scenario building* and *scenario planning*. *Scenario planning* is taken to indicate the overarching system of positing plausible alternative future environments and using these environments for learning, changing thinking or for testing or “windtunneling” (van der Heijden, 1997, p. 57) executive decisions and exploring their implications. *Scenario building* is taken to mean the process of constructing the stories themselves, as a component of the larger scenario planning system. Scenario building is conceptualized as a process in the planning system.

Unit 1 -- Scenarios

Scenarios are selected as a unit of the theory 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. While 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. Scenarios have been defined as: “tools for ordering one’s perceptions about alternative future environments in which one’s decisions might be played out. Alternatively: a set of organized ways for use to dream effectively about our own future” (Schwartz, 1991, p. 4).

Description. Scenarios carry the characteristics of narratives or stories. Van der Heijden (1997) identified the following characteristics of scenarios: (1) the scenario is a narrative that links historical and present events with hypothetical events in the future, (2) each scenario should carry an integrated structure or storyline as a whole that can be expressed in a simple diagram, (3) each scenario is internally consistent, that is, the succession of events do not contradict each other and they are plausible, (4) scenarios reflect predetermined elements, or "those events that have already occurred (or which almost certainly will occur) but whose consequences have not yet unfolded" (Wack, 1985a p. 4), and (5) variables are clearly expressed along with leading indicators or signposts are identified.

Classification of the Unit. Scenarios are enumerative units because they are either evident in the planning process or they are not -- it holds true in all conditions of scenario planning that scenarios will be employed in the process. Scenario planning, by definition, requires the use of scenarios, thus it will not be considered scenario planning unless the planning effort utilizes scenarios. Scenarios are also attribute units for much the same reason; they are distinguished by the "quality of being present" or not (Dubin, 1978, p. 44). Therefore, the theory of scenario planning under development will assume that either scenarios are used in the planning system, or they are not. Scenarios are real units in that empirical indicators of their existence in the planning process are readily available. Given that a core output of the scenario planning process are stories themselves (Chermack & Lynham, 2002) the determination of empirical indicators is not a difficult procedure -- either they are used in the planning system, or they are not. Scenarios are also considered sophisticated units because they are well defined, and they are well defined within the context of scenario planning (van der Heijden, 1997, Ringland, 1998). Finally, scenarios will be treated as a collective unit for the purposes of the theory presented because it is not necessary for the theory to specify individual scenarios. Literature presented in chapter two also clarified that scenario planning must make use of more than one scenario, and in fact, many practitioners have suggested that three scenarios seems to be the most appropriate and manageable number (van der Heijden, 1997; Schwartz, 1990).

Unit 2 -- Learning

Learning is selected as a unit of the theory of scenario planning based on supporting evidence in the scenario planning literature (Schwartz, 1991; van der Heijden, 1997; de Geus, 1988, Hamel & Prahalad, 1998) 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 re-perceive (Wack, 1985c) the organization and its environment, and the ability to re-perceive requires that individuals and groups learn something new about the organization and its environment as well as to raise up the present and past perceptions of the organization (Wilson, 1992, 2000; Godet, 1987, 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" (Oxford English Dictionary, 2001).

Description. Scholars in the field of Human Resource Development (HRD) have identified five metatheories of learning, namely, behaviorism, cognitivism, humanism, social learning, and constructivism (Swanson & Holton, 2001). While 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, cognitivsm and constructivism (de Geuss, 1998; van der Heijden, 1997; Chermack & van der Merwe, 2003). Therefore, principles of social, cognitive, and constructivist learning are found in descriptions of how learning takes place in scenario building and planning systems.

Classification of the Unit. Learning is required for successful scenario planning. Learning will be considered an enumerative unit because learning must hold true in all conditions of scenario planning to ensure the success of the process. While considerable effort is intended to provoke learning in current scenario planning practices, the reality of these practices is that a lack of learning often contributes to the failure of the process (Fahey & Randall, 1998; Godet, 2000; Wack, 1985a). Therefore, it is contended that learning is fundamental to provoking the shift in thinking required to consider plausible forces that have the potential to affect the organization. Learning is considered an attribute unit because, given the argument that learning is essential for the success of the scenario planning process; it must be distinguished by the "quality of being present" (Dubin, 1978, p. 44). Learning will be considered a real unit because empirical indicators can be selected with ease. For example, learning can be measured by observation or by the administration of type of instrument; however, learning will most prominently present itself in the alteration of mental models and improvement in decision-making. Learning is a very sophisticated unit in that it is extremely and specifically defined in several domains and according to several varying philosophies. Learning will also be treated as a collective unit in this research.

Unit 3 -- Mental Models

Mental models are selected as a unit of the theory of scenario planning because of their prevalence in the scenario planning literature and their reported significance (Senge, 1990; Weick, 1979, 1990; Wack, 1985c; Morecroft, 1990, 1992). The learning that takes place in scenario planning is often a result of changing the assumptions that are taken for granted regarding many aspects of the organization and its environment (Senge, 1990). Mental models encompass those assumptions, and thus re-perceiving 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; 1985c).

Definition. Senge (1990) defined mental models as "deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action. Very often, we are not consciously aware of our mental models or the effects they have on our behavior" (p. 8).

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. Doyle & Ford (1998) explored the concept of mental models in detail: "Mental models are thus the stock in trade of research and practice in system dynamics: they are the 'product' that modelers take from students and clients, disassemble, and reconfigure, add to, subtract from, and return with value added" (p. 4). After providing a comprehensive literature review of the terms from both the systems dynamics and cognitive psychological perspectives, and some discussion in *Systems Dynamics Review*, Doyle & Ford (1999) eventually offered the following revised definition: "A mental model of a dynamic system is 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).

Classification of the Unit. Mental models are enumerative units because it "holds true in all conditions" (Dubin, 1978 p. 44) of scenario planning that *some* sort of mental model is operating. Mental models are attribute units because they "are distinguished by the quality of being present" (Dubin, 1978, p. 44). The theoretical model under development will assume that each individual operates under a mental model. Further, mental models can be shared in some aspects, sometimes creating a group mental model, or what Weick & Roberts (1993) referred to as a "collective mind" or what van der Heijden (1997) referred to as a "strategic conversation"; lending to even more variety in terms of the mental model present. This chapter assumes that mental models can be extracted and analysed using a variety of methods and that through the use of these methods, empirical indicators for the presence of mental models can be developed. Thus, mental models are real units. Mental models are sophisticated in that they are well defined and have a coherent and precise set of assumptions that can be surfaced. This research will also treat mental models as a general category that is affected during the scenario planning process. Thus, mental models will be treated as a collective unit.

Unit 4 -- Decisions

Decisions are a unit of the theory of scenario planning because they embody the action component of the planning system. Given the general system of planning presented in chapter two, decision-making marks the second process in the planning system and is based on re-perceptions generated in the scenario *building* process.

Definition. A decision is an act or process of arriving at a single determination after considering multiple options. To decide, then, as an action, is to select as a course of action or to come to a choice -- to choose one among many. Plainly, a decision is "an act or process of reaching a conclusion or making up one's mind" (Oxford English Dictionary, 2001).

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 (Morecroft, 1983; Mintzberg, 1995). The challenge in this situation becomes providing the decision-maker with an adequate amount of the right information at the right time. Scenarios are advocated as one means of providing this kind of information in this way. A key assumption with regard to decisions in this context is that decision-making is conceived of as a process requiring multiple decisions rather than a single decision (Brehmer, 1990; 1992).

Classification of the Unit. Decisions are enumerative units because all possible conditions of planning, and in this case, scenario planning, involve decisions. Chermack &

Lynham (2002) described decision improvement as a primary output of the scenario planning process. Decisions are attribute units simply because they are "distinguished by the quality of being present" (Dubin, 1978, p. 44). Empirical indicators for decisions are readily available, and so, decisions are real units. Decisions are sophisticated units because they are well defined, and further, the context in which these decisions must take place is also well defined. Brehmer (1990; 1992) suggested 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.

Decisions will also be treated as a collective unit for the purposes of the theory presented. In this case, it is preferred to treat decisions as a common characteristic of scenario planning and therefore a collective unit.

Unit 5 -- Performance

Performance improvement is seen as the primary outcome of the planning system in this research. The other units of a theory of scenario planning are seen as performance drivers (Swanson, 1999). To clarify, scenarios, learning, mental models, and decisions are things that affect performance, but do not embody performance themselves. Performance in the context of planning can be focused or general. For example, such performance outcomes might include a focused outcome such as increased shareholder value, or a more general outcome such as better or ongoing fit with and assessment of the business environment (Drucker, 1964; Ansoff, 1965; Mintzberg, 1980, 1994).

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 over the intended outcome of HRD interventions. The perspective advocated here is that performance is *necessary*, although not necessarily *sufficient*. HRD professionals must provide performance improvement in order to demonstrate an understanding of the business itself. In this view, without the conversation about performance, the conversation about learning (and other outcomes) can never realistically be had. Paradoxically, it can also be argued that learning is required to improve performance. Clearly, the responsible practitioner must address both of these perspectives and concerns, and the position argued in this paper is that the scenario planning system inherently requires that both learning and performance are necessary outcomes.

Classification of the Unit. Performance will be considered an enumerative unit because this theoretical model of scenario planning requires that performance improvement be an outcome of the process. Performance improvement must hold true in all instances of scenario planning. Performance units must therefore be attribute units because they "are distinguished by the quality of being present" (Dubin, 1978, p. 44). There are clear empirical indicators for performance improvement thus, performance units are real, and because performance improvement is well defined, they are sophisticated units.

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. They are:

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 units of a theoretical model of scenario planning are displayed in Figure 4.2 in a matrix categorized by unit types.

Figure 4.2. Matrix of Unit Types Including the Units of a Theoretical Model of Scenario Planning.

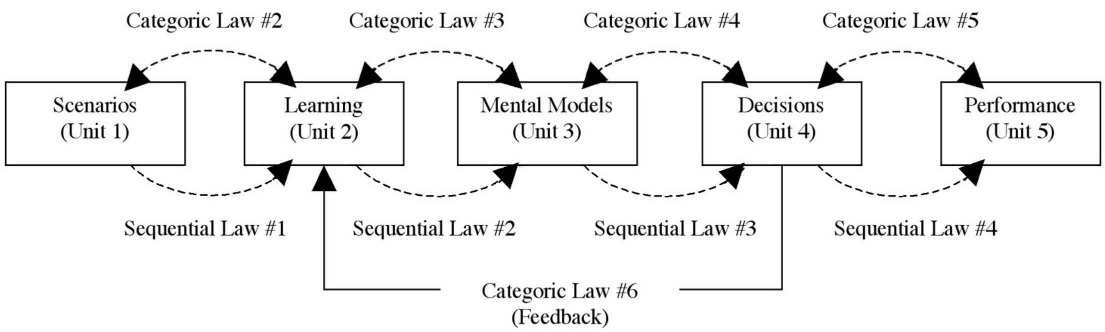
Unit Type	*Initial Distinction*							
	Attribute	Variable	Real	Nominal	Primitive	Sophisticated	Collective	Member
Enumerative Units	Scenarios Learning Mental models Decisions Performance		Scenarios Learning Mental models Decisions Performance			Scenarios Learning Mental models Decisions Performance	Scenarios Learning Mental models Decisions Performance	
Associative Units								
Relational Units								
Statistical Units								
Summative Units	Guideline 3 states that these units cannot be included in a theoretical model or potential theory.							

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). The logic for selecting only enumerative units follows the argument that in all possible conditions of successful scenario planning, the units proposed in the theory must hold true. Alternatively, the units proposed are intended as characteristics of things that hold true in all possible conditions of successful scenario planning (Dubin, 1978). According to Dubin (1978) the theorist does not yet need to be concerned with the actual practice of the phenomenon under study. At this stage the theorist is given control of the theoretical model and it is only when testing the operation of the theory in the real world that the theorist becomes concerned with the empirical validation of the model itself. Given that this theory building effort is believed to be the first of its kind in the domain of scenario planning, the theory of scenario planning does not yet have to account for what happens in practice. Thu, the use of the terms "all possible conditions of successful scenario planning" is intended to illustrate that this model is the product of how the theorist understands the model to operate. The testing of the model will produce the fit or lack of fit of the model with actual scenario planning practices.

Step Two -- 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 five categoric 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 importance of the time element in scenario planning. The model does not include any determinant laws and designates scenario stories as catalyst units. 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 4.3.

Figure 4.3. The Laws of Interaction in the Theoretical Model of Scenario Planning



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.

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. Categoric laws are also the most common laws of interaction in the social and behavioral sciences.

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.
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 succeeds 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 mental models
3) Mental models precede improved decision-making
4) Improved decision-making precedes improved performance.

The time sequence moves all through the model, which means that there is a specific order (as described by the sequential laws of interaction employed by the model) through which the units of the model must interact.

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 theory of scenario planning does not incorporate any determinant interactions. There is not enough research regarding scenario planning to specify the relationships of the elements involved to a level at which the values of one unit can determine the values of another.

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

The laws incorporated in the theoretical model of scenario planning are directional. Efficiency at the directional level means that an increase in the value of one variable implies an increase in the value of another variable (Dubin, 1978). 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 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 laws of interaction that link the units of a theoretical model of scenario planning are as minimal as could be formulated while meeting the conceptualization of the theorist. That is, 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 conceptualized by the theorist.

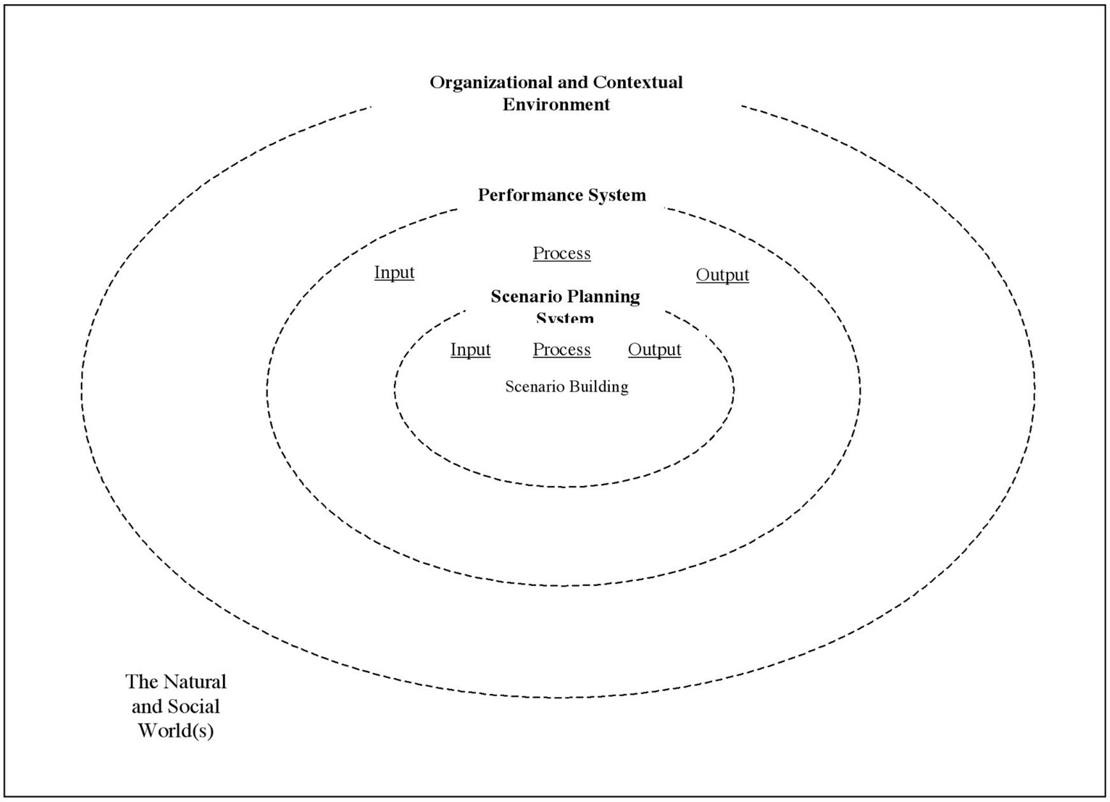
Step Three -- The Boundaries of the Theoretical Model of Scenario Planning

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. There are 4 boundaries for the theoretical model of scenario planning:

1) A process boundary
2) A planning system boundary
3) A performance system boundary
4) An organizational and contextual environment boundary

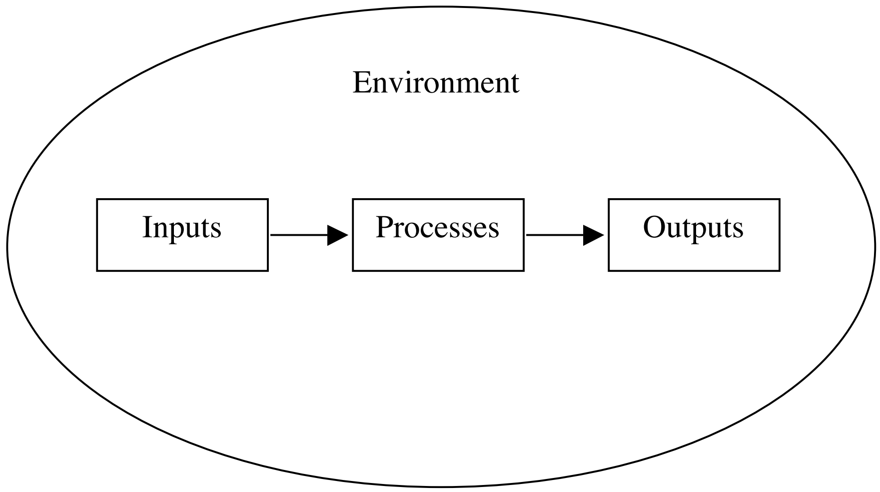
The boundaries of a theoretical model of scenario planning are identified and depicted graphically in Figure 4.4.

Figure 4.4. The Boundaries of a Theoretical Model of Scenario Planning



All boundaries in the theoretical model are open boundaries (as denoted by the dashed lines in Figure 4.4.) 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. Swanson (1994) used the diagram in Figure 4.5 to denote the view of organizations as simple systems. Following the logic employed by the system diagram and earlier work on scenarios as part of a larger planning system, scenario *building* is positioned as a process within the planning system (Swanson, Lynham, Ruona & Provo, 1998).

Figure 4.5. An Organization as a Simple System (Swanson, 1994).



There are two generally recognized boundary conditions when discussing systems -- open and closed (Dubin, 1978). Open boundaries imply that exchange takes place across the boundary between some element of the theory and its external environment. Closed boundaries imply that such exchange does not occur (Dubin, 1978). The criteria for determining the boundary of the theoretical model are equally applicable to both the units of the theory and the laws of interaction among the units of the theory. This simply means that the units as well as the laws of interaction must be contained by the boundaries of the system. There are two general approaches to uncovering boundary-determining criteria, logical testing, and empirical testing.

The boundaries of the theoretical model of scenario planning advocated in this research are identified through the use of syllogism as a logical test. Using syllogism suggests the identification of four important domains that bound the theory of scenario planning: (1) the domain of processes ((3) the domain of human populated systems and (4) the natural and social worlds.

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 (van der Heijden, 1997; Ringland, 1998, 2002; van der Heijden et al., 2002; de Geus, 1998). While there is little agreement on the specific steps of the process, it is a process nonetheless (Ringland, 1998; Georgantzas & Acar, 1995; Wilson, 1992). Louis van der Merwe of The 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.
5) Develop narratives to make the scenarios relevant and compelling to decision makers.
6) Use scenarios to help decision makers "re-view" their strategic thinking.

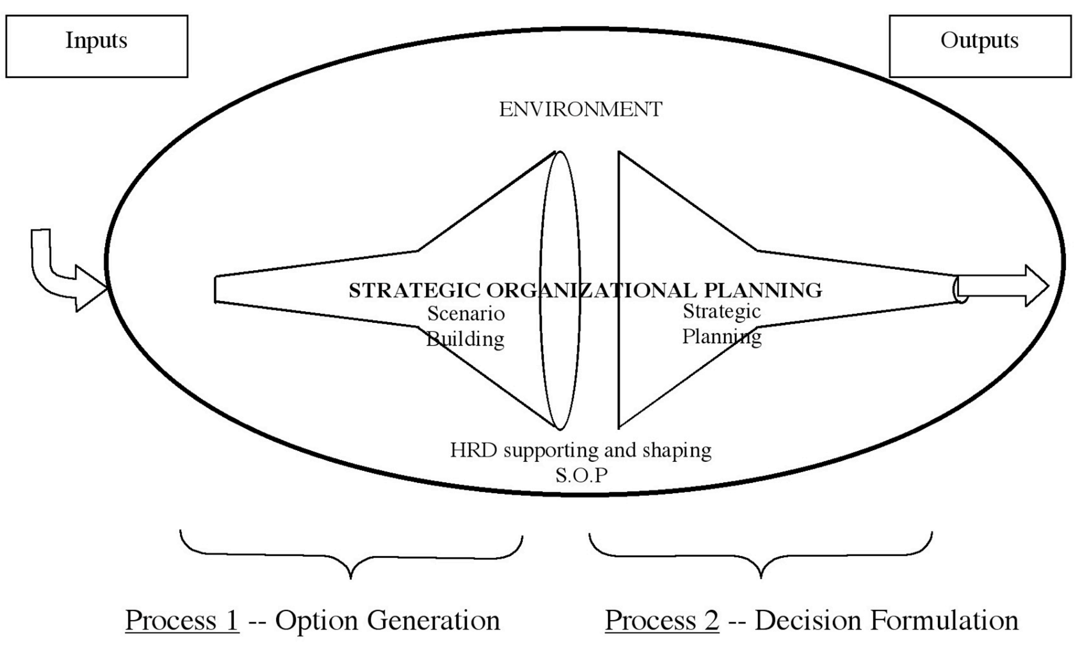
Suffice it to say that a theory of scenario planning is bounded first by the process domain and that there are a defined set of steps commonly used to engage in the process of building scenarios which defines scenario planning.

The process boundary is considered an open system boundary (von Bertalanffy, 1969; Dubin, 1978) as the movement of information, refinement of steps, facilitation method, among other variables must all be allowed for in adjusting scenario planning to the given setting and situation in which it is applied (Ringland, 1998; Wack, 1985a).

The Boundary of Planning Systems

Scenario *planning* is a system (Mintzberg, 1994; Porter, 1985; Ringland, 1998; Wack, 1985a). This system has as one of its processes, scenario *building* (see Figure 4.6 for a visual depiction of this system).

Figure 4.6. The Scenario Planning 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.

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. Therefore, performance in a non-profit organization would involve a core service related to the mission of the organization. For example, Habitat for Humanity might measure its performance in a given location by the number of houses built.

Given the use of this boundary in a theoretical model of scenario planning, the theoretical model proposed will not be limited to for-profit organizations. The boundary of performance system includes education systems, non-profit, for-profit, government agencies among many other types of performance systems. The criteria for classification as a performance system in this case are that the system strives to produce or provide some valued, mission-related output (Swanson, 1999). Based on this logic, because of the boundary of performance systems, a theory of scenario planning will apply to and function in any performance system.

The Boundary of Organizational and Contextual Environment

Every performance system operates in a contextual environment (Rummler & Brache, 1995). This contextual environment commonly includes varying forces that pose challenges to the system. Systems constantly exchange information with their environments and in so doing, they are shaped and affected by them. Organizations also play a role in shaping their own environments.

With regard to planning, forces in the contextual environment are commonly social, technological, economic, environmental, and political forces (Ringland, 1998). Often, these forces are the focus for scenario planning professionals. The 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).

The organizational and contextual environment includes the varying social, technological, economic, environmental and political forces that influence the organization system that utilizes the scenario building process, and scenario planning system to make sense of them.

Assessing the Boundaries of a Theoretical Model of Scenario Planning

The boundaries conceptualized for a theoretical model of scenario planning have identified the domains in which the theory is expected to apply. Thus, the theoretical model of scenario planning is expected to operate (1) from a process of scenario building, (2) in a planning system, (3) in a performance system, (4) within a varied organizational / contextual environment, in the natural and social worlds. The 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.

The boundaries proposed for a theoretical model of scenario planning meet Dubin’s criteria for homogeneity (1978) as each boundary was derived using the logic of the theorist, each boundary “sub-sets the property space” (Dubin, 1978,p. 131) and each boundary includes the laws of interaction. Further, according to Dubin (1978) only one of these criteria are required to designate the boundaries. More criteria satisfied can be translated to increased homogeneity.

Dubin (1978) also discussed generalizability as a means for evaluating the boundaries of a theory. Essentially, his discussion centered on the notion that as the number of boundaries increases, generalizability decreases. The importance of this discussion is relevant to the empirical testing of the boundaries and mainly concerns the results, however, the intent of using generalizability as a boundary evaluation criteria is to provide the theorist with a preliminary view that empirical results falling outside of the designated boundaries are dismissed as irrelevant until the model is adjusted (Dubin, 1978).

The final criterion for evaluating the boundaries involves empirically testing them (Dubin, 1978). To this point in the development of a theory of scenario planning, the boundaries of the theory have been derived through internal criteria, the laws of interaction, and the logic of the theorist. The empirical validation of the boundaries will follow the implementation of several studies designed to validate a theory of scenario planning in applied settings. These studies are proposed in Chapter 5.

Step Four -- 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). In order 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 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.

Scenario planning is conceptualized as a system itself. Naturally then, the scenario planning system will vary and transition among several states. In order 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 (for example, if the unit “scenarios” were coded 0, this would be taken to indicate that the scenarios have not been developed). The laws of interaction have indicated that a theory of scenario planning occurs along a time sequence. That is, actions with regard to specific units precede actions with regard to others. As the system transitions from state to state, the unit values shift from 0 to 1.

According to Dubin (1978) the states in which the values are undefined are the transition states of the theory.

As the theory of scenario planning moves through its sequence of states, the unit values shift from 0 to 1. This demonstrates that as each unit value shifts, the theory transitions from one state to the next. There are six system states in the theoretical model of scenario planning:

1) System State One -- Non-operation
2) System State Two -- Scenario generation
3) System State Three -- Reflection and learning
4) System State Four -- Revealing and altering mental models
5) System State Five -- Improving decision-making
6) System State Six -- Assessing implications and performance

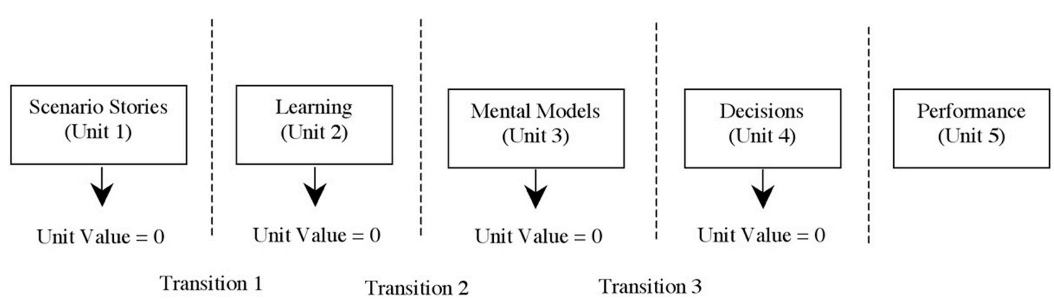
System State One -- Non-Operation

Figure 4.7 shows the theoretical model of scenario planning in a state of non-operation, or prior to the development of scenarios. This is system state one. In it, the values of each unit are known to be zero. System state one is also defined by the fact that its values persist over some course of time. This course of time, also known as its 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 one can be defined using Dubin's (1978) logic by the following statement:

If all unit values in a theory of scenario planning are equal to zero, then the theory is in a state of non-operation under the conditions that no scenarios have been developed.

Figure 4.7. System State One in a Theoretical Model of Scenario Planning -- Non-operation



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). Here the importance of distinguishing between scenario *building* and scenario *planning* becomes clear: Scenario *building* is a process used to generate plausible options and expand thinking about the possibilities of the situation or issue under consideration. Scenario *planning* is the entire system that generates scenarios, and in addition, uses them to provoke learning, alter mental models, examine potential decisions, and "windtunnel" (van der Heijden, 1997) the organization and its resources.

As each unit is incorporated and affected, the theoretical model transitions through six system states as depicted in Figures 4.8, 4.9, 4.10 and 4.11.

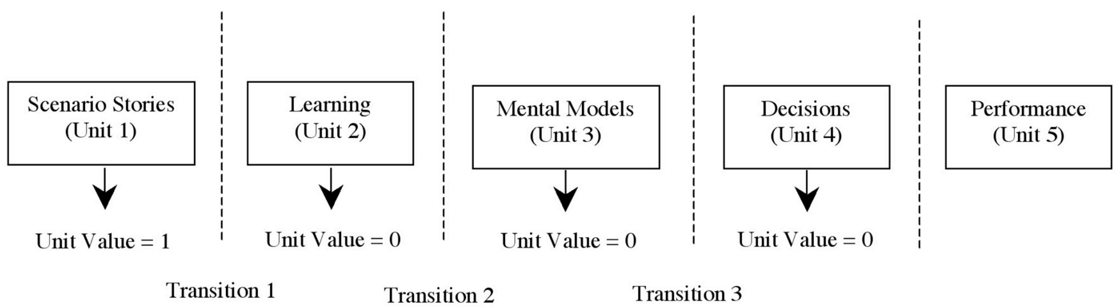
System State Two -- Scenario Generation

Figure 4.8 denotes that scenarios have been created and incorporated into the next state of the planning system. This is system state two. 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 two 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.

Figure 4.8. System State Two of a Theoretical Model of Scenario Planning -- Scenario Generation



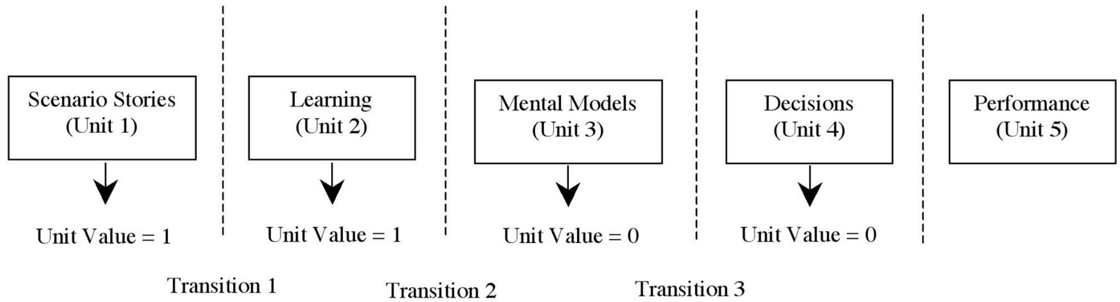
System State Three -- Learning and Reflection

Figure 4.9 indicates that the scenarios have been used to trigger learning among the participants in the planning system.

System state three 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.

Figure 4.9. System State Three of a Theoretical Model of Scenario Planning -- Learning and Reflection



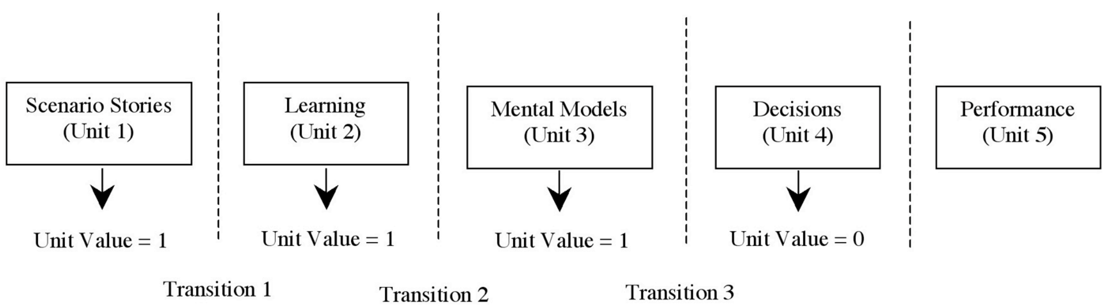
System State Four -- Revealing and Altering Mental Models

The unit value shift in mental models denoted in Figure 4.10 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 four 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.

Figure 4.10. System State Four of a Theoretical Model of Scenario Planning -- Revealing and Altering Mental Models



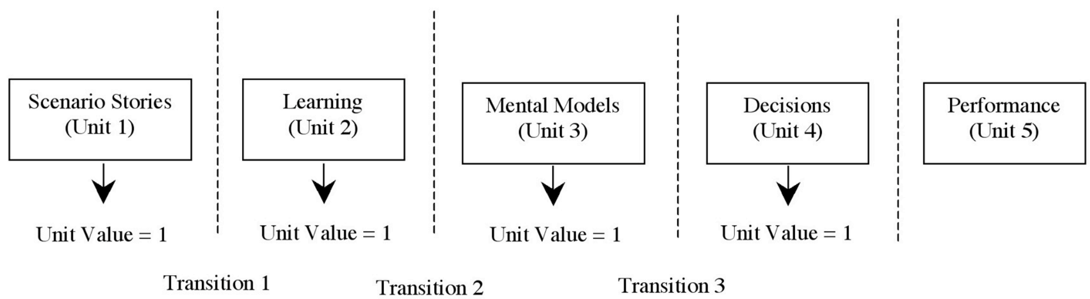
System State Five -- Improving Decision-Making

Figure 4.11 displays the theoretical model of scenario planning in a state 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 five 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.

Figure 4.11. System State Five of a Theoretical Model of Scenario Planning -- Improving Decision-Making



System State Six -- 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 impact 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 ways:

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. In this sense, the original reasoning for engaging in scenario planning may simply be one of ongoing monitoring or assessment of plausibilities. 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, 1) inclusiveness, 2) that individual units have determinant values in a given state, and 3) 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; while the determinant values measured in criterion two imply that the values measured are distinctive for that state of the system. Criterion three 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, alter mental models, improve 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, yet 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 Five -- Propositions of a Theory of Scenario Planning

Propositions introduce the idea of prediction into the theory building equation (Dubin, 1978). Dubin 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" (1978, 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" (1978, p. 160) as a replacement for the term "truth statement" if the connotations of the latter term cause problems. The important point in specifying propositions is to continue the clear logical path set up by the theory builder from the start. Thus, the employment of the term "logical consequence", "truth statement" or "proposition" is simply to establish the consistency of the theory builder's logic. It is therefore clear that 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 also stressed the distinction between propositions and set membership. By this distinction, he intended that, referring to the earlier example of Plato, an assertion could be made that Plato is a member of the [people] set. This statement is true, but is not a proposition. To clarify, propositions must also be truth statements about the "model in operation" (Dubin, 1978, p. 163). The outcomes of the theoretical model must be statements of value (Dubin, 1978). Propositions take the form of "if…then" statements and are commonly linked as follows:

If (*a*), then (*b*);
If (*b*) then (*c*); etc.

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). While Dubin suggested that this number of propositions is also potentially excessive, it seems adequate for the theory of scenario planning that has been proposed thus far. 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.*

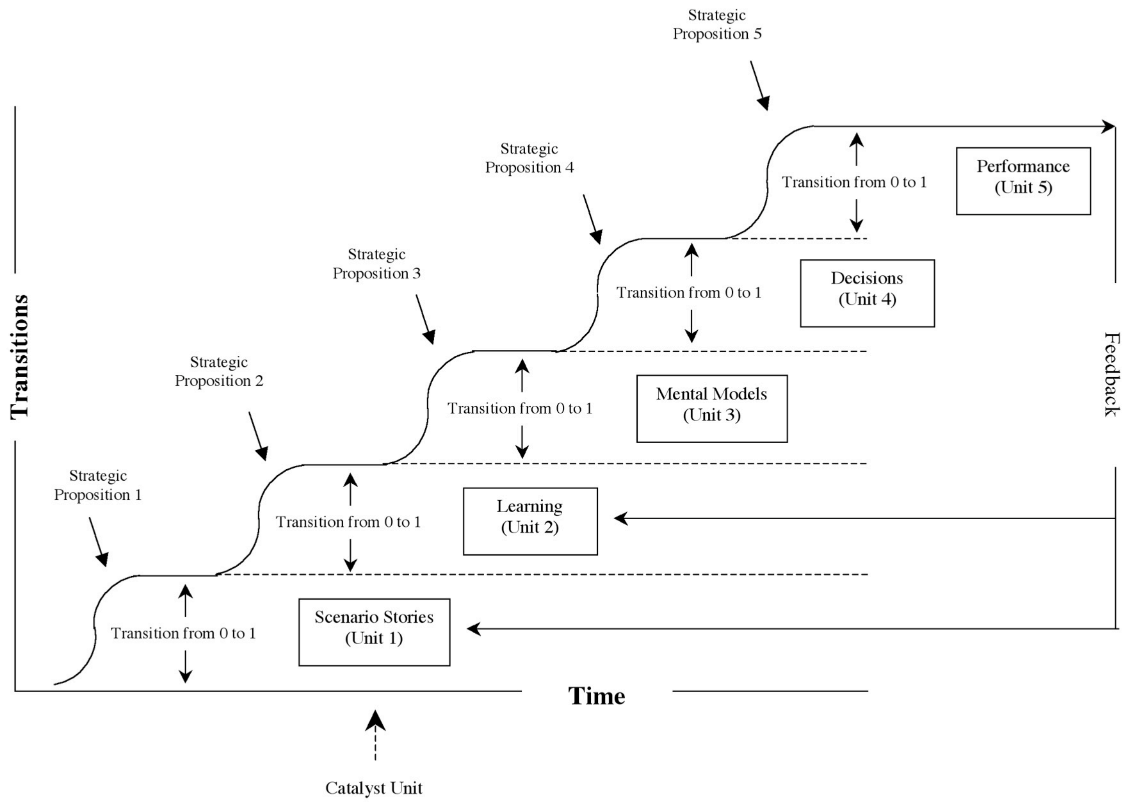
STRATEGIC PROPOSITION 3: *If a change in mental models alters decision-structure, then a change in mental model implies a change in the approach to decision-making.*

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 4.12. Figure 4.12 locates the strategic propositions as the theoretical model transitions through its varying states.

Figure 4.12. Locating the Strategic Propositions Within an Operating Theoretical Model of Scenario Planning



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.

Summary of Scenario Planning Theory Development

The completion of Dubin's steps one through five 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 chapter has 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 chapter is that is provides a logical model upon 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 chapter completes the construction and presentation of a theoretical model of scenario planning. As Chapter Five will specify empirical indicators and hypotheses, a terminology shift is noted as the model becomes a theory at the point of specification of empirical indicators (Dubin, 1978). The model then becomes a Theory of Scenario Planning (TSP).

To briefly summarize the model, each step will be presented again in simple form.

The ***units*** of a theoretical model of scenario planning are:
1) Scenarios
2) Learning
3) Mental Models
4) Decisions
5) Performance

The Laws of interaction of a theoretical model of scenario planning are as follows:

The ***categoric laws*** of the theoretical model are stated as follows:
1) All units are required for the theoretical model to function
2) There is a greater-than-chance probability that scenarios are associated with learning.
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.

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 mental models
3) Mental models precede improved decision-making
4) Improved decision-making precedes improved performance

The ***boundaries*** of a theoretical model of scenario planning include:
1) A process boundary
2) A planning system boundary
3) A performance system boundary
4) An organizational and contextual environment boundary

The ***system states*** of a theoretical model of scenario planning are:
1) System State One -- Non-operation
2) System State Two -- Scenario generation

3) System State Three -- Reflection and learning
4) System State Four -- Revealing and altering mental models
5) System State Five -- Improving decision-making
6) System State Six -- Assessing implications and performance

The ***propositions*** of a theoretical model of scenario planning are:

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.*

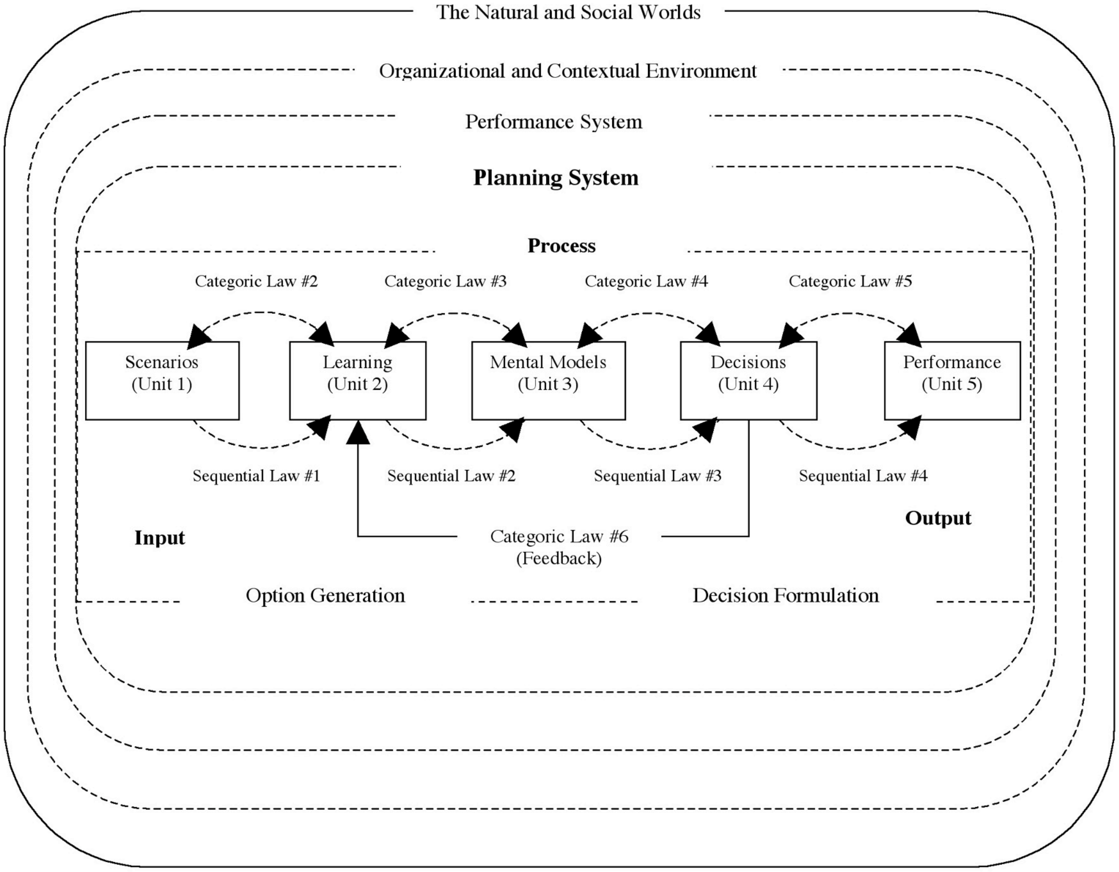
STRATEGIC PROPOSITION 3: *If a change in mental models alters decision-structure, then a change in mental model implies a change in the approach to decision-making.*

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 theoretical model is summarized in Figure 4.13, complete with its units, laws of interaction, boundaries, system states and propositions.

Figure 4.13. The Theoretical Model of Scenario Planning



Chapter Five

SCENARIO PLANNING THEORY RESEARCH

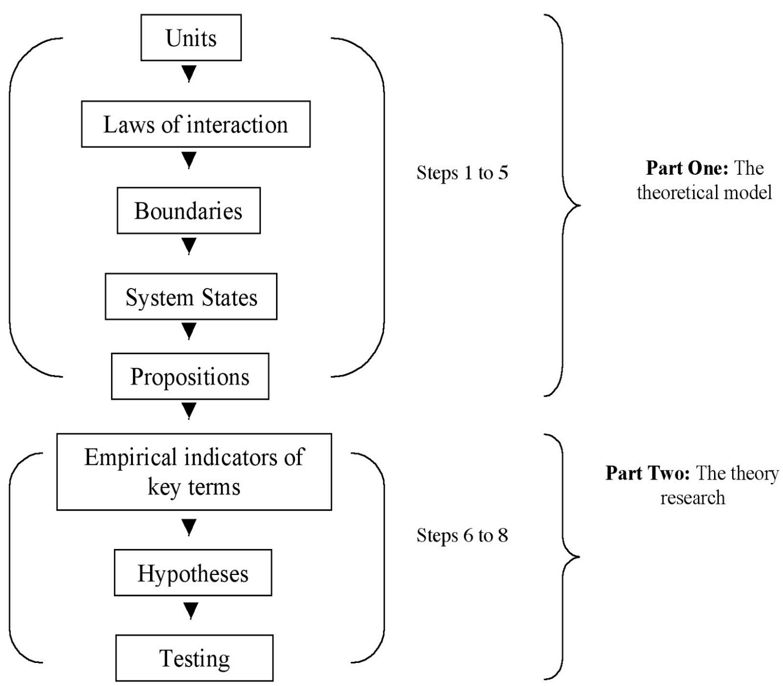
This chapter has three core purposes. Specifically, those purposes include:

1) Presenting the empirical indicators of the theory of scenario planning,
2) Presenting the hypotheses about the theory of scenario planning, and
3) Describing approaches to testing the theory of scenario planning.

Thus, the overall purpose of this chapter is to operationalize the theoretical model of scenario planning. That is, this chapter aims to "get the theoretical framework ready to take to practice---so that it can be confirmed and/or tested in its real world context" (Lynham, 2002a, p. 17). The operationalization of the theoretical model, therefore, will consist of the conversion of the elements expressed in the conceptual development to observable or confirmable components in the form of hypotheses, empirical indicators, or knowledge claims.

To do so, this chapter will operationalize the theoretical model by completing steps six through eight of Dubin's (1978) Theory Building Research Methodology. This portion of the theory building cycle is depicted in Figure 5.1.

Figure 5.1. Dubin's Eight Step Theory Building Research Methodology



An important consideration at this point is that once the theorist begins specifying empirical indicators, the theoretical model becomes a theory (Dubin. 1978). Therefore, at this point, this research will begin referring to the *Theory of Scenario Planning* (TSP).

In this chapter, the empirical indicators will be defined. Empirical indicators are observations made by the researcher with an instrument and include the instruments themselves. The empirical indicators will also be examined according to Dubin's (1978) criteria.

Finally, this chapter will define multiple research hypotheses for testing the theory of scenario planning.

Step Six -- Empirical Indicators of a Theory of Scenario Planning

An empirical indicator is "an operation employed by a researcher to secure measurements of values on a unit" (Dubin, 1978, p. 182). Dubin (1978) stressed that empirical indicators are operations performed by observers using some kind of instrument. Empirical indicators must produce reliable results, or, more specifically, values that do not differ from observer to observer. Dubin (1978) suggested the use of the phrase "as measured by" (for example, the value of unit *A* as measured by) to describe the empirical indicator used to produce the unit values. Dubin described two additional classes of empirical indicators, namely, absolute indicators, and relative indicators. Absolute indicators are "absolute in the sense that there can be no question as to what they measure" (Dubin, 1978, p. 193). Race and gender are examples of absolute indicators. Relative indicators are indicators that "may be employed as empirical indicators of several different theoretical units" (Dubin, 1978, p. 195).

Dubin (1978) examined the traditional criterion measure method for establishing the validity of empirical indicators and concluded that this classical test of validity invariably results in the case of multiplicity of indicators in which the measures are predicted. As an alternative, Dubin suggested the use of the ability for all sample population members to have an equal chance of achieving the same score via a given indicator. Thus, "empirical indicators are valid if all members of a sample studied have the possibility of securing any of the scores measured by the indicator" (Dubin, 1978, p. 204).

Therefore, the empirical indicators of a *Theory of Scenario Planning* (TSP) will be explained in detail. It is appropriate to assert that all of the empirical indicators to be used are relative indicators, and all are considered valid measures according to Dubin's (1978) discussion. Another problem at this point includes the fact that few instruments have been developed and validated that measure changes and improvements in the units of a *Theory of Scenario Planning* (TSP), and therefore, the empirical indicators will be general in the sense that such changes or improvements may be measured by *any* instrument that measures the stated changes in the units. Further, it is possible that several instruments may be developed to measure the stated qualities.

Scenarios constitute the catalyst unit of the theory (Dubin, 1978). Therefore, there is no empirical indicator required to provide a measurement of scenarios utilized in the planning system. By simply verifying that scenarios are used as the basis of the planning system, the researcher or theorist can confirm their presence. Thus the empirical indicators begin with measurements of learning. The empirical indicators for a *Theory of Scenario Planning* (TSP) are as follows

EMPIRICAL INDICATOR 1: *The value of unit (learning) will increase as a result of participation in scenario planning as measured by any instrument that measures learning about the strategy and strategic context of the organization.*

EMPIRICAL INDICATOR 2: *The value of unit (mental models) will increase as a result of participation in scenario planning as measured by any instrument that measures the adjustment and alteration of mental models pertaining to the strategy and strategic context of the organization.*

EMPIRICAL INDICATOR 3: *The value of unit (decisions) will increase as a result of participation in scenario planning as measured by any instrument that measures the improvement of decision-making pertaining to the strategy and strategic context of the organization.*

EMPIRICAL INDICATOR 4: *The value of unit (performance) will increase as a result of participation in scenario planning as measured by any instrument that measures firm performance.*

Assessing the Empirical Indicators

Dubin (1978) specified two criteria for evaluating empirical indicators. They are (1) that the operation of measurement is specified, and (2) that the results produced by the operation are identified.

Operation of measurement. This criteria is met simply by specifying how the researcher will measure the empirical indicator. By describing the process of measurement, the researcher satisfies this requirement.

Results produced. The second criteria for evaluating the empirical indicators is that the results of the measurement operation are reported.

A *Theory of Scenario Planning* (TSP) specifies the operation of measurement in terms of multiple measurement devices. The reasoning behind this is simply that the theory may require the development of instruments specifically for the purpose of assessing the units of the theory in the scenario planning context. However, by describing the process of measurement, the criteria of operation of measurement has been satisfied.

Because this research has undertaken the construction of a *Theory of Scenario Planning* (TSP) it has no results to produce in specific terms of the empirical indicators stated. However, as the testing of a *Theory of Scenario Planning* gets underway, those results will certainly be reported in efforts to validate scenario planning practices.

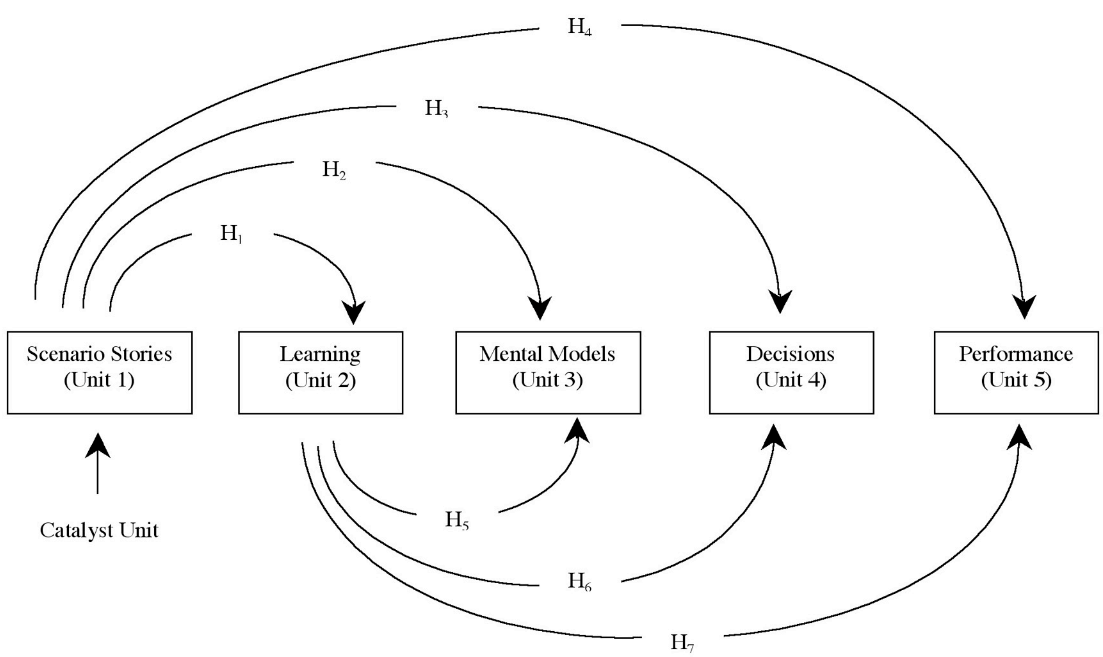
Step Seven -- Hypotheses of a Theory of Scenario Planning

Hypotheses are "the predictions about values of units of a theory in which empirical indicator are employed for the named units in each proposition" (Dubin, 1978, p. 206). Hypotheses establish the link between the empirical world and the theoretical model that has been under construction. "Every hypothesis is homologous with the proposition for which it stands. The homology is determined by the dimensionality of the theoretical definition of the units contained in the proposition" (Dubin, 1978, p. 207). Thus, each proposition will have at least one hypothesis that represents it. It is common, however, for each proposition to reveal several testable hypotheses. Each proposition has the possibility of converting to many hypotheses. "The general rule is that a new hypothesis is established each time a different empirical indicator is employed for any one of the units designated in a proposition" (Dubin, 1978, p. 209). Thus, as the number of propositions increases, so does the number of possible hypotheses. Ultimately, however, the question of number of hypotheses is a question of research preferences and energy posed to a discipline and its researchers.

The hypotheses for a *Theory of Scenario Planning* (TSP) are depicted in Figures 5.2 and 5.3 and include four domains mirroring the units of the theory, namely:

1) Participation in scenario planning
2) Learning
3) Mental models
4) Decision-making

Figure 5.2. Hypotheses One through Seven in a Theory of Scenario Planning (TSP)



Participation in Scenario Planning

The following hypotheses pertain to participation in scenario planning. Generally, each hypothesis states the anticipation of a correlation between scenario planning and each other unit of the theory.

HYPOTHESIS 1: *There will be a positive relationship between participation in scenario planning and learning.*

HYPOTHESIS 2: *There will be a positive relationship between participation in scenario planning and altered mental models.*

HYPOTHESIS 3: *There will be a positive relationship between participation in scenario planning and improved decision-making.*

HYPOTHESIS 4: *There will be a positive relationship between participation in scenario planning and firm performance.*

Learning

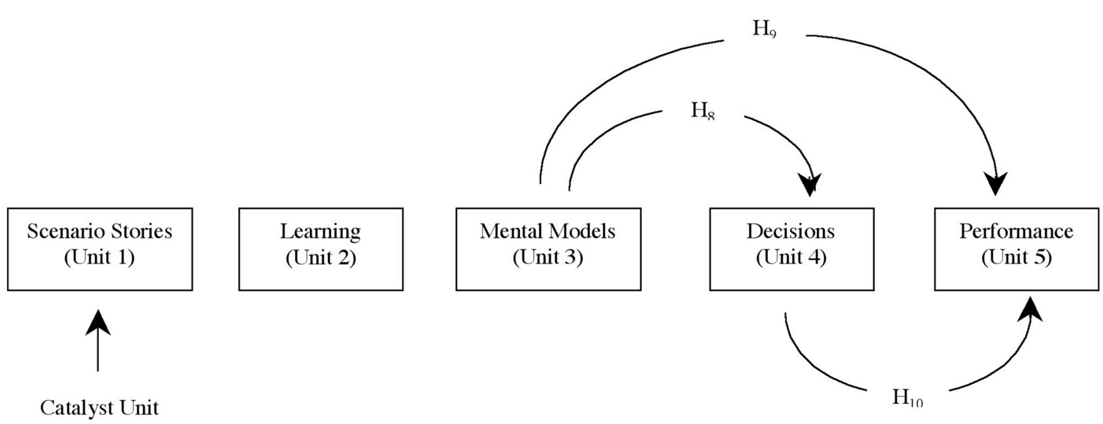
The following hypotheses pertain to learning in the strategic context brought about by engaging in scenario planning.

HYPOTHESIS 5: *There will be a positive relationship between learning and altered mental models.*

HYPOTHESIS 6: *There will be a positive relationship between learning and improved decision-making.*

HYPOTHESIS 7: *There will be a positive relationship between learning and firm performance.*

Figure 5.3. Hypotheses Eight through Ten in a Theory of Scenario Planning (TSP)



Mental Models

The following hypotheses pertain to altered mental models in the scenario planning system.

HYPOTHESIS 8: *There will be a positive relationship between altered mental models and decision-making.*

HYPOTHESIS 9: *There will be a positive relationship between altered mental models and firm performance.*

Decision-making

The following hypothesis represents the anticipated relationship between improved decision-making and firm performance.

HYPOTHESIS 10: *There will be a positive relationship between improved decision-making and firm performance.*

Additional Hypotheses

In addition to the hypotheses stated that anticipate a relationship between and among each of the units of the theory, there are several additional hypotheses that are implied by the logic of a *Theory of Scenario Planning* (TSP) and they provide the basis for several further empirical studies to validate and confirm the theory. Such further hypotheses are:

HYPOTHESIS 11: *Collective variance in use of scenarios and learning accounts for variance in firm performance.*

HYPOTHESIS 12: *Collective variance in use of scenarios, learning, and altered mental models accounts for variance in firm performance.*

HYPOTHESIS 13: *Collective variance in use of scenarios, learning, altered mental models and decision-making accounts for variance in firm performance.*

HYPOTHESIS 14: *Differing levels of participation in scenario planning account for variance in firm performance.*

Hypotheses eleven through fourteen are specifically aimed at studies more complex than simple correlations. These hypotheses indicate the use of multiple regression and one-way ANOVA designs to test the *Theory of Scenario Planning* (TSP).

Assessing the Hypotheses

According to Dubin (1978) each proposition must indicate at least one hypothesis. Further, Dubin (1978) suggested that an appropriate number of hypotheses is the same as the number of different empirical indicators used to test the theory, although ultimately, the number of hypotheses for a given theory is a question of energy and dedication.

The *Theory of Scenario Planning* (TSP) proposed in this research utilizes a minimum of one hypothesis for each proposition, and in some cases, provides multiple hypotheses for given propositions. Thus, the hypotheses specified in this research meet Dubin's (1978) criteria.

Step Eight -- Testing a Theory of Scenario Planning

Testing any theory requires extensive effort and a variety of studies aimed at validating or confirming the theory. This, of course, is the same with regard to a *Theory of Scenario Planning* (TSP). Given the identification of empirical indicators and hypotheses in this chapter, testing a *Theory of Scenario Planning* (TSP) could proceed along many lines of inquiry. Further, it is beyond the scope of this research to test the *Theory of Scenario Planning* (TSP), however, an agenda for testing the theory is described in full.

An Agenda for Testing the Theory of Scenario Planning (TSP)

The purpose of this section is to suggest several studies for confirming the *Theory of Scenario Planning* (TSP). Based on the empirical indicators and hypotheses identified in this chapter, it is appropriate to move forward with the specification of several studies that would allow for the *Theory of Scenario Planning* (TSP) to be tested. While there may be virtually endless ways in which to do so, the following studies are a foundation for testing the theory as it has been described.

Testing the Correlations Between and Among the Units of a Theory of Scenario Planning (TSP)

Some statistically simple studies to begin confirming the proposed theory of scenario planning include basic correlations between and among the units. These correlations can be conducted in two ways: (1) using existing measures for assessing the correlations between and among each of the units, and (2) developing specific measures for assessing the correlations between and among each of the units in scenario planning.

Scenarios = X, Learning = Y
Learning = X, Mental Models = Y
Mental Models = X, Decision-Making = Y
Decision-Making = X, Performance = Y

This process would require the identification of existing or development of several surveys or tests that would measure exposure to scenario stories or the scenario planning process and learning, learning and the alteration of mental models, altered mental models and decision-making, decision-making and performance. The data collection instruments would consist of questionnaires and/or checklists such that higher scores would be indicative of more exposure to scenarios and higher learning, learning and altered mental models, altered mental models and decision-making, decision-making and performance. The research hypotheses identified in chapter five were:

HYPOTHESIS 1: *There will be a positive relationship between participation in scenario planning and learning*.

HYPOTHESIS 2: *There will be a positive relationship between participation in scenario planning and altered mental models*.

HYPOTHESIS 3: *There will be a positive relationship between participation in scenario planning and improved decision-making*.

HYPOTHESIS 4: *There will be a positive relationship between participation in scenario planning and form performance*.

HYPOTHESIS 5: *There will be a positive relationship between learning and altered mental models*.

HYPOTHESIS 6: *There will be a positive relationship between learning and improved decision-making*.

HYPOTHESIS 7: *There will be a positive relationship between learning and firm performance*.

HYPOTHESIS 8: *There will be a positive relationship between altered mental models and decision-making*.

HYPOTHESIS 9: *There will be a positive relationship between altered mental models and firm performance*.

HYPOTHESIS 10: *There will be a positive relationship between improved decision-making and firm performance*.

Using the covariance formula for each above stated hypothesis:

$$\text{cov}_{XY} = S_{xy} = \sum_{i=1}^{N} \frac{(X_i - \overline{X})(Y_i - \overline{Y})}{(N-1)}$$

The resulting data would indicate a positive or negative association, but the scale depends on varying measures of x and y, (one for each) so, the scores are converted to z-scores:

$$\text{r} = \frac{S_{xy}}{S_x S_y} = \frac{\sum_{i=1}^{n} (x_1 - \overline{x})(y_1 - \overline{y}) / (n-1)}{S_x S_y}$$

$$= \sum_{i=1}^{N} \frac{Z_{X_1} Z_{Y_1}}{(N-1)}$$

r then estimates ρ, but because $E(r) \neq \rho$, r is adjusted as follows:

$$radj = \left[\frac{1-[(1-r^2)(N-1)]}{(N-2)}\right]^{1/2}$$

The scale for evaluating the strength of the X,Y relationship can be characterized as:

$0 < r < .20$ weak-positive
$.20 < r < .40$ moderately weak-positive
$.41 < r < .60$ moderate-positive
$.61 < r < .80$ moderately strong-positive
$r > .80$ strong-positive

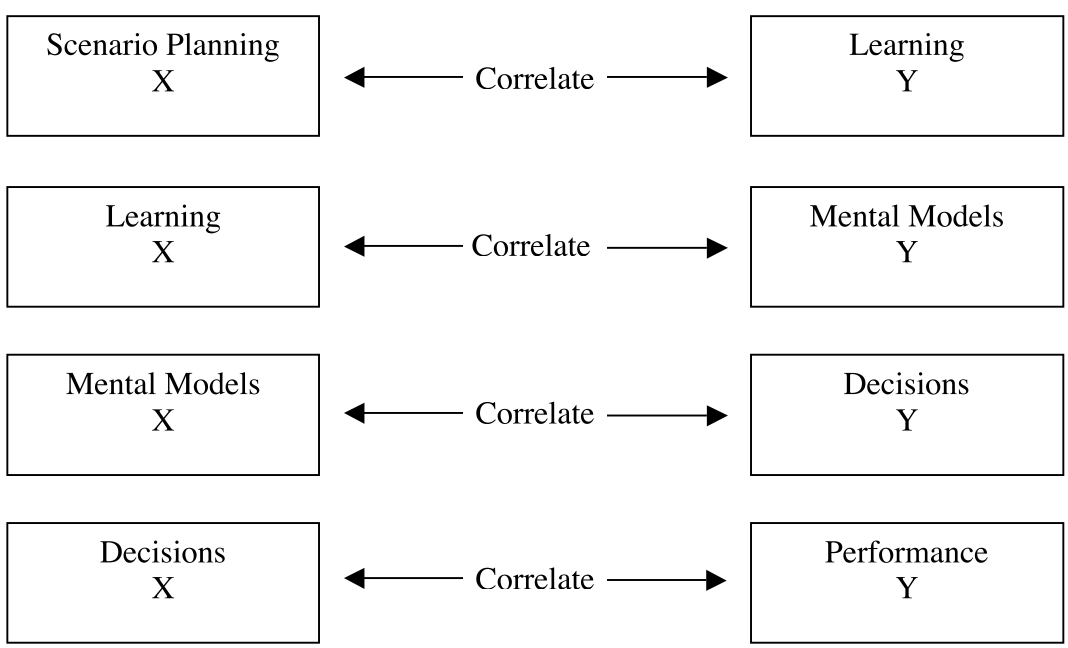
However, R^2 is a more accurate measure and is more commonly used to indicate the strength of a correlation as it expresses the percentage of variance accounted for. At this point, assumptions must be checked and evaluated:

1) Linearity
2) Range restriction or truncation
3) Homoscedasticity
4) Outliers
5) N large enough to ensure r is a good estimator of ρ. (n =150 greater)

Scatterplots, and descriptive statistics are the primary means by which these assumptions can be checked.

This process would be conducted for each pair of variables in a *Theory of Scenario Planning* (TSP), which may require the development of measurement instruments for each two variable correlation. Thus, a research agenda for scenario planning to test this theoretical model is evident. The model for correlation testing might look something like this:

Figure 5.4. A Model for Testing Correlations in a Theory of Scenario Planning (TSP)



The next step would logically be to test the correlation scores for significance. To do this, the Fisher r-to-z transformation is used. The Fisher r-to-z is more flexible that the t-test because it allows: $Ho: \rho = c$ to be tested, where c can be any number between -1 and 1. The transformation is:

$$r' = (.5)\ln[(1+r)/(1-r)]$$

Then, recalling the steps for hypothesis testing:

1) specify research hypothesis
2) obtain sample, perform experiment, obtain data
3) set up null and alternative hypotheses
4) identify test statistic and find its distribution under Ho
5) carve sampling distribution into retain/reject regions and find the critical values
6) compare observed test statistic to critical values, retain or reject Ho

Assuming that steps one to three are completed (and the test is for a strong hypothesized relationship among all variables) the test statistic is r'. Then, we transform r' to z-score for ease of interpretation as:

$$z = [r' - E(r')]/\sigma_{r'}$$

This transformation will result in a score of standard deviations. z is now our test statistic, and so consider ± 1.96 as the critical values (under approximately normal distribution $\alpha = .05$). Based on the z-score, retain or reject Ho. Now, a confidence interval about $\rho_{r'}$ must be constructed. The formula for a confidence interval is as follows:

$$prob[-1.96 < (r' - \rho_{r'})/\sigma_{r'} < 1.96] = .95$$

Next, the resulting value must be converted back to the ρ metric using tables (such as Howell, 2001, p. 682).

Each of these relationships can be expressed in terms of an additional regression model (such as a regression or predictive model being constructed for the relationship between scenarios and learning, between learning and the alteration of mental models, between the alteration of mental models and decision-making capabilities, and finally between decision-making capabilities and performance). Additionally, there will be opportunities to provide t-tests over long-term results, and ANOVA analyses for multiple groups.

The first problem to be faced here is a lack of data. So, a great deal of effort must be aimed at developing/testing/validating instruments that will measure the relationships presumed to exist. Accordingly, there will likely be issues relating to access, small sample sizes, and other logistical problems. Given the ad hoc nature of outlining these studies, from this point forward, the focus will be on the studies, and not the issue with data collection and access. However, these are important issues to consider in moving forward with confirming a *Theory of Scenario Planning* (TSP).

Regression and Predictive Models

Regression and predictive models attempt to illustrate the ability of one or more variables to predict outcome values of another variable. This section considers attempts to predict firm performance from the other units in a *Theory of Scenario Planning* (TSP).

Constructing the Regression model. Regression employs a mathematical model (equation) that will serve as a prediction model. The equation of this line in population form is:

$Yi = b * Xi + a * + \varepsilon i$
where b* is the population slope, a* is the population intercept and εi represents error. The slope tells us the expected change in Y per unit increase in X and the intercept tells us the predicted value of Y when X=0.
In practice, we use the equation
$\hat{Y}_i = bX_i + a$
where $\hat{Y}_i$ is the predicted value of the dependent variable Y for the ith subject and estimate error as $\hat{\varepsilon}_i = (Y_i - \hat{Y}_i)$.
When we solve for a and b, we find:
$a = \overline{Y} - b\overline{X}$, and
$b = \text{cov}_{xy} / S^2{}_x$
$b = r(Sy / Sx)$
$$b = \sum_{i=1}^{N} (Y_i - \overline{Y})(X_i - \overline{X}) / \sum_{i=1}^{N} (X_i - \overline{X})^2$$

From here, the best-fit line can be mapped on a scatterplot of values of (such as scenarios and learning, learning and mental models, mental models and decision-making, decision-making and performance) and then the mathematical, predictive equation for each relationship can be calculated. Depending on the strength of those relationships, the predictive capabilities granted through this statistical analysis can be assessed. The amount of deviation in Y that can be explained by its relationship to X can then be accounted for.
$SS_{Total}\ (SSY) = SS_{Residual} + SS_{Explained}$
or
$$[\sum_{i=1}^{N} (Y_i - \hat{Y}_i) / (N - 2)]^{1/2}$$
This is the standard error of estimate. (Note that r^2 produces the same information, just on a different scale).
SSExplained/SSY, then produces the measure of explained variance.

Assessing the Statistical Adequacy of the Model. The next step in constructing regression models is to assess the statistical fit of these models to the dependant variable data. The underlying assumptions are:

1) Linearity
2) Range restriction/truncation
3) Homoscedasticity
4) No outliers
5) Sample size large enough (N > 150)

Residuals and scatterplots can be used to determine the fit of these models.

Evaluating the Practical Utility of the Model. In evaluating the practical utility of the model, useful questions include: Are the results worthwhile? Is there anything worth reporting? Is this model of use to the field? (Howell, 2001).

Testing Slopes for Significance

Whatever the returned value of the slope in the regression model, it contains sampling error, so it should be tested using: H_0: $b^* = 0$ vs. H_1: $b^* \neq 0$ at $\alpha = .05$.

Recall the steps for hypothesis testing:

1) Specify hypothesis
2) Obtain sample and perform study
3) Set up null and alternative hypotheses
4) Identify test statistic and find its sampling distribution under Ho
5) Carve the sampling distribution into acceptance and rejection regions and find the critical values
6) Compare the observed test statistic to the critical values and decide to retain or reject H_0.

Assuming steps 1-3 are complete, *b* will serve as the test statistic. In practice, *b* is transformed to the form:

$t = (b - E(b) / SD(b)$

because it reports the values in standard deviation units. The sampling distribution of this test statistic does not follow a z distribution, rather, a t distribution, such that

$E(t) = 0$

and

$Var(t) = df / (df - 2)$

Hypothesis Testing Applied to Means

Proceeding with hypothesis testing applied to means only makes sense if there are multiple groups each with scores on the given instruments, which have not yet been developed, and as has been established in chapter two, there is minimal research data to support such studies. While these will certainly be important measures, it does not make sense to outline this portion of the research agenda at this point, as these instruments must be constructed and there is so much data yet to be gathered.

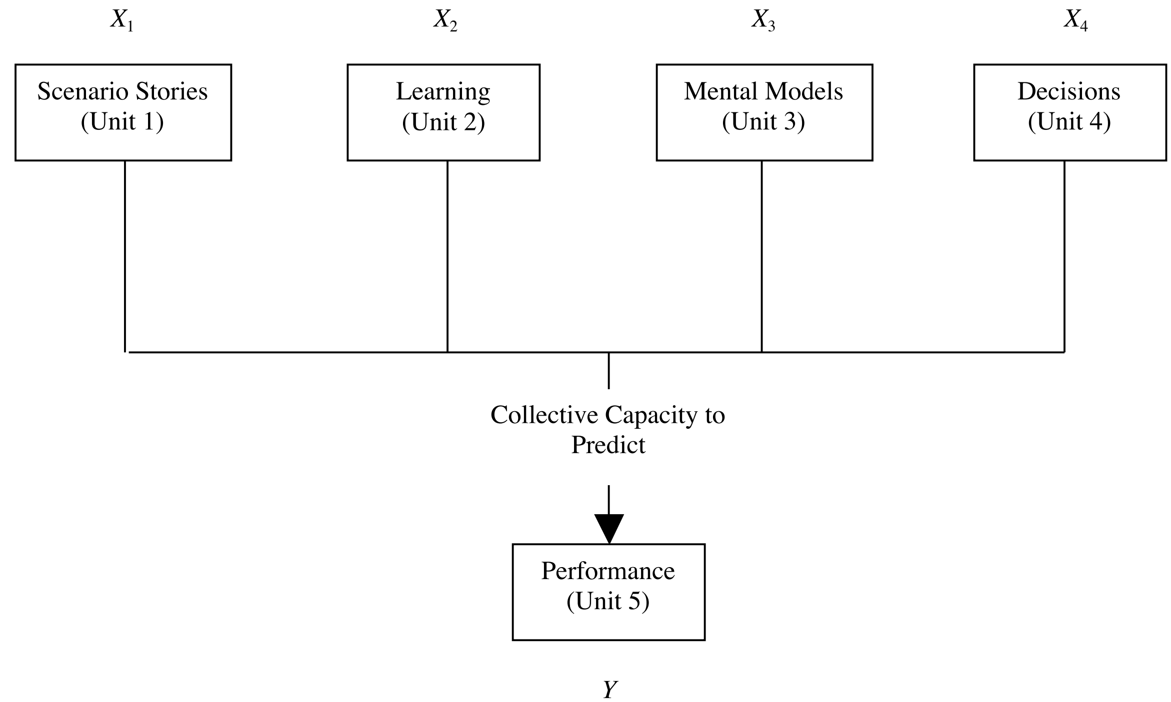
Tests to conduct here might include:

1) One Sample t-test for a Mean
2) Matched-Pairs t-test
3) Classical Two Sample t-test for a Mean
4) Welsch-Aspin
5) ANOVA
6) Post-hoc Multiple Comparison Procedures

Multiple Regression

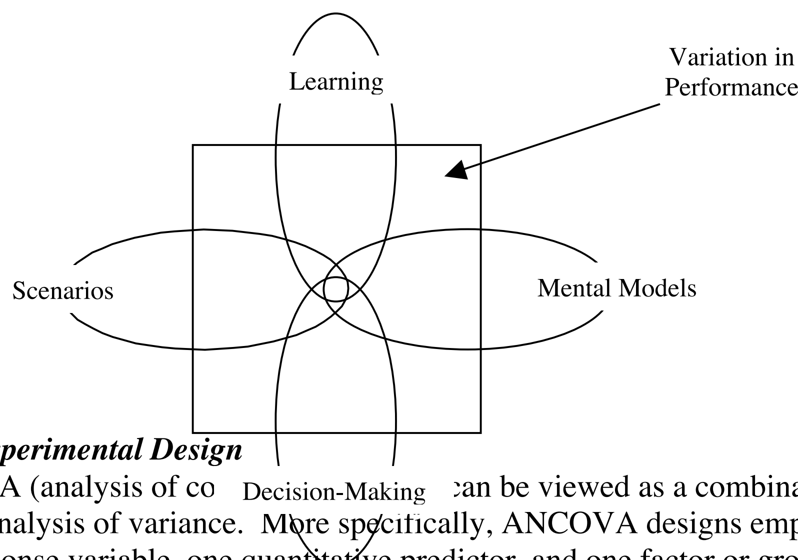
The use of multiple regression indicates the capacity of multiple variables to predict, or account for variance in a response variable. The proposed *Theory of Scenario Planning* (TSP) incorporates several variables, presumably correlated. The next logical step in statistically testing the model would be to designate a primary response variable based on the literature surrounding the scenario planning phenomenon, and then test the capability of the other variables claimed important in the success of the process to predict the primary response variable. In this case, the theoretical model positioned as a multiple regression problem is posited as such:

Figure 5.5. Multiple Regression Model of a Theory of Scenario Planning



The use of multiple regression in this situation will also allow the partitioning of variance accounted for by different combinations of the variables.

Figure 5.6. Partitioning Variance in a Theory of Scenario Planning



ANCOVA in Experimental Design

ANCOVA (analysis of co [illegible] can be viewed as a combination of multiple regression and analysis of variance. More specifically, ANCOVA designs employ one quantitative response variable, one quantitative predictor, and one factor or grouping variable with two or more levels. The goal of ANCOVA designs is to provide higher power for the test of group differences on the response variable (Long, 2002). The design for an ANCOVA in an experimental design might consist of the following:

Figure 5.7. ANCOVA in Experimental Designs to Measure the Effects of Scenario Planning

Time Sequence				
	1	2	3	4
Experimental Procedures	*C* is measured	Random Assignment based on *X*	Manipulation is carried out	*Y* is measured

In this design, *C* is to be the "pre" scores on some measure of scenario planning effectiveness. *Y* will be the "post" scores on that same measure of scenario planning effectiveness. *X* will be the random assignment to a treatment or control group.

Given a limited sample size (likely in the case of scenario planning) the ANCOVA will be used to boost power (Long, 2002). We can therefore randomly assign subjects to a treatment condition in which the subjects will receive extensive exposure to scenario planning as a specific planning process, or to a control condition in which the subjects receive no planning process.

Summary

This chapter has specified the empirical indicators and hypotheses of a *Theory of Scenario Planning* (TSP). To summarize, they are as follows:

Empirical Indicators of a Theory of Scenario Planning

EMPIRICAL INDICATOR 1: *The value of unit (learning) will increase as a result of participation in scenario planning as measured by any instrument that measures learning about the strategy and strategic context of the organization.*

EMPIRICAL INDICATOR 2: *The value of unit (mental models) will increase as a result of participation in scenario planning as measured by any instrument that measures the adjustment and alteration of mental models pertaining to the strategy and strategic context of the organization.*

EMPIRICAL INDICATOR 3: *The value of unit (decisions) will increase as a result of participation in scenario planning as measured by any instrument that measures the improvement of decision-making pertaining to the strategy and strategic context of the organization.*

EMPIRICAL INDICATOR 4: *The value of unit (performance) will increase as a result of participation in scenario planning as measured by any instrument that measures firm performance.*

Hypotheses of a Theory of Scenario Planning
HYPOTHESIS 1: *There will be a positive relationship between participation in scenario planning and learning*.

HYPOTHESIS 2: *There will be a positive relationship between participation in scenario planning and altered mental models*.

HYPOTHESIS 3: *There will be a positive relationship between participation in scenario planning and improved decision-making*.

HYPOTHESIS 4: *There will be a positive relationship between participation in scenario planning and firm performance*.

HYPOTHESIS 5: *There will be a positive relationship between learning and altered mental models*.

HYPOTHESIS 6: *There will be a positive relationship between learning and improved decision-making*.

HYPOTHESIS 7: *There will be a positive relationship between learning and firm performance*.

HYPOTHESIS 8: *There will be a positive relationship between altered mental models and decision-making*.

HYPOTHESIS 9: *There will be a positive relationship between altered mental models and firm performance*.
HYPOTHESIS 10: *There will be a positive relationship between improved decision-making and firm performance*.

HYPOTHESIS 11: *Collective variance in use of scenarios and learning accounts for variance in firm performance*.

HYPOTHESIS 12: *Collective variance in use of scenarios, learning, and altered mental models accounts for variance in firm performance*.

HYPOTHESIS 13: *Collective variance in use of scenarios, learning, altered mental models and decision-making accounts for variance in firm performance*.

HYPOTHESIS 14: *Differing levels of participation in scenario planning account for variance in firm performance*.

The significance of this chapter is that by specifying the said empirical indicators and hypotheses, it has operationalized the theory thereby preparing it for testing in the real world.

This chapter has further suggested the use of simple correlations, several grouping of models for multiple regression, and ANCOVA designs as experimental studies to test the *Theory* *of Scenario Planning* (TSP). While these options certainly do not exhaust the possibilities for testing the theory, they do serve as a starting point. Such studies test the theory, and in addition, such studies will validate general scenario planning practices. As more research is conducted around the scenario planning system, it will be possible to expand studies to include ANOVA, MANOVA, Factorial ANOVA, mixed models and longitudinal designs. The studies outlined here are intended to test the theory proposed and provide a foundation for further scenario planning research.

Chapter Six

IMPLICATIONS OF A THEORY OF SCENARIO PLANNING (TSP)

Chapter One introduced the problem statement for the research presented in this thesis:

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

Chapter One also provided recognition that current scenario planning practitioners should be applauded for their efforts in developing scenario planning in practice. Such efforts have led to a variety of approaches to carrying out scenario planning. Further, Chapter One outlined the link between scenario planning and human resource development.

Chapter Two provided a detailed review of literature related to scenario planning and further established the problem statement outline in Chapter One. Core components and themes presented in Chapter Two included several methods for conducting scenario planning, the relevance of some foundational strategy literature, a general *process* for scenario *building* and a general *system* for scenario *planning*. Additionally, the review of literature revealed several approaches to theory building to address the problem statement outlined in Chapter One. Dubin's (1978) quantitative method was deemed the most comprehensive and suitable approach to addressing the problem.

Chapter Three presented the research question:

Can a theory of scenario planning be developed?

and provided a detailed description of the methodology used for this research. That description included an overview of Lynham's (2002a) General Method of Applied Theory Building Research and Dubin's (1978) eight-step method. Also included was a description of how the selected methodology was appropriate in answering the research question.

Chapter Four presented the theoretical model of scenario planning in terms of its units, laws of interaction among the units, boundaries of the theoretical model, its system states and strategic propositions. The significance of this chapter is its conceptual representation of a theory of scenario planning, a description of how it operates and the contextual requirements for its operation. Additional literature review was presented where appropriate to justify the selection of the units, and their prevalence in scenario planning literature.

Chapter Five operationalized and confirmed a *Theory of Scenario Planning* and its readiness for application. At this point, the theoretical model became a theory (Dubin, 1978). Empirical indicators, and several testable hypotheses were identified for the theory as well as descriptions of the process and outcomes of that phase of theory building. Further, chapter five outlined a detailed research agenda for testing a *Theory of Scenario Planning* (TSP) and beginning research to validate scenario planning practices.

This chapter provides a clear and concise answer to the research question and further discusses the implications and potential importance of the *Theory of Scenario Planning* (TSP) for scenario planning and human resource development practice, research, and theory.

Answering the Research Question

At this point it seems logical to provide a concise answer to the question that began as the focus of this study. The research question undertaken for this study was:

Can a theory of scenario planning be developed?

By all accounts it seems appropriate to answer this question with affirmation. Chapter Two presented several approaches to constructing a theory of scenario planning; any of which would have been appropriate and useful in examining scenario planning except for meta-analysis. Justification for the chosen method has been provided although it may be appropriate to reiterate these points. Dubin's (1978) method of theory building was selected based on the following strengths: (1) it is the most comprehensive method of those reviewed, (2) it requires that the researcher/theorist construct a theoretical model based on conceptual and logically connected ideas, (3) it requires the translation of that theoretical model into testable hypothesis about how the theory works in practice, (4) it requires that the theoretical model be tested in order to claim that a theory exists and finally, and (5) through the identification of hypothesis it provides a demand for empirical research.

Thus, this research has resulted in a *Theory of Scenario Planning* (TSP), clearly confirming that:

A theory of scenario planning can be and has been developed.

The remainder of this chapter discusses the implications of a *Theory of Scenario Planning* (TSP) for scenario planning practice, research and theory and human resource development practice, research and theory. Each is described in detail.

Part One: Implications for Scenario Planning Practice, Research and Theory

This research provides a theory of scenario planning that is intended to be useful in the practice, research and theory domains of scenario planning. While the theory has not been tested yet, certainly, the opportunities and appropriate steps to do so have been identified. This section describes the implications of a *Theory of Scenario Planning* (TSP) for scenario planning practice, research and theory.

Implications for Scenario Planning Practice

The core problem statement underscoring this research was stated as follows:

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

This research provides a *Theory of Scenario Planning* (TSP) aimed at aiding practitioners and scholars in their understanding and validation of scenario planning. Therefore, the implications for scenario planning practice are twofold: (1) scenario planning practitioners now have a theory that attempts to explain what happens in scenario planning and (2) as the *Theory of Scenario Planning* (TSP) is confirmed through extensive research, scenario planning practices will become validated. Scenario planning practitioners may be additionally encouraged to develop alternate theories or refine the theory proposed as a result of this research.

Ultimately, the *Theory of Scenario Planning* (TSP) may provide a basis for practice guided by sound theory and potentially an end to random consulting activity that sells scenario planning as a solution to any organizational problem. Specifically, practitioners may find it useful to consider that planning consists of much more than simply creating scenarios about the future. Planning requires using those scenarios to challenge the ways in which decision-makers perceive their environment. With such an understanding, it seems that practitioners may be more thoughtful in their approach to building scenarios having considered how and on what time scale they will be used.

The *Theory of Scenario Planning* (TSP) may also encourage scenario planning practitioners to integrate existing approaches to scenario planning and strategy formulation. For example, practitioners may use any one of the scenario planning methods described in chapter two, and combine it with one of the strategy approaches also discussed in chapter two to form a planning system. Then, following the progression of the theory, those scenarios are used for learning, altering and shaping mental models, and improving decision-making with an ultimate aim of improving organizational performance. At a minimum, the *Theory of Scenario Planning* (TSP) provides a modular approach to using scenarios in strategic settings.

Implications for Scenario Planning Research

At the conclusion of this research, scenario planning professionals are provided with a rigorous agenda for establishing the validity of scenario planning itself. With the shortage of research outlined in chapter two, researchers interested in the topic have their work cut out. This research has set the groundwork for simple correlational, multiple regression, and basic ANCOVA studies. This groundwork is intended to be a foundational and encouraging set of suggestions that may be built upon by the imagination and energy of scenario planning practitioners interested in proving the worth of their trade.

In addition, it is recognized that the theory construction presented here is according to a single methodology of many that are appropriate. For example, social constructionist (Turnbull, 2002), case study (Dooley, 2002), and grounded research (Egan, 2002) have been identified as other alternate theory building methodologies that could provide important insight to scenario planning theory. This research invites scholars to test their practices -- whether that is according to this theory or another is not necessarily the point; rather the validation of scenario planning practices is the ultimate goal of the research conducted here. How that is achieved is important, but in no way does this research suggest that it is the only way to do so.

Implications for Scenario Planning Theory

A theory of scenario planning now exists. Prior to this research, this was not the case -- at least not in a fashion that has been explicit. While it is likely that many high profile practitioners have their own theories, none have expressed them in a manner consistent with a true methodology. Linked to the implications for scenario planning research, this research calls for theory that informs scenario planning. Other rival theories will only make the dialogue more provocative. That is, good debate and deeper questions about the nature, understanding and explanation for what happens in scenario planning will only come about by engaging in multiple alternative views regarding what makes scenario planning work.

Part Two: Implications for Human Resource Development Practice, Research, and Theory

The theory of scenario planning presented in this research has implications for HRD professionals as well. HRD professionals can provide much in the development and facilitation of scenario planning because of their expertise in learning, performance, research, theory building and evaluative techniques (Provo, Ruona, Lynham & Miller, 1998). Considering these potential contributions, it has been advocated that HRD is poised to lead the scenario planning process, the construction of its theory, the implementation around its research, and the development of its evaluation. Further, traditional HRD work has included employee training and development and organization development (Swanson, 1995). Many authors (Cummings & Worley, 2000; Senge, 1990) have classified scenario planning as an organization development intervention. Such a classification implies that scenario planning is within the domain of HRD.

Implications for HRD Practice

Torraco and Swanson (1995) stated that there are two ways for HRD to demonstrate its strategic capability. They are (1) through educating organizational leaders about strategic thinking and (2) through direct participation in organizational planning. A mastery and leadership of the scenario planning process might enable HRD to effectively increase its contribution in both of these domains, providing the potential for HRD itself to be recognized as being of more strategic value to other business units.

The theory proposed in this research provides a framework for HRD professionals to engage in strategic partnership with other business functions. Through such partnerships and experience with scenario planning as a strategic tool, HRD professionals can prove their worth in a strategic context.

A *Theory of Scenario Planning* (TSP) implemented by HRD professionals may allow HRD to demonstrate its capability through education about and direct participation in the planning system in organizations. By mastering scenario planning, HRD professionals have something of great potential value to contribute to organizations that they have not had in the past. However, HRD's mastery of scenario planning will require the testing of the theory and the implementation of extensive research validating the effectiveness of the theory. Additionally, the *Theory of Scenario Planning* (TSP) must be revised and adjusted if it is found inadequate in its representation of reality.

Implications for HRD Research

A research agenda has been identified that would lead to the validation or invalidation of scenario planning practices. While HRD professionals have other domains in which to demonstrate their expertise, the benefits of demonstrating strategic expertise have been suggested. The classic HRD intervention has been employee training and development. As training has been an important function for HRD to perform, its utility would be far less than it is if it were not for the extensive research that supports training as a value-added activity. Applying research to other HRD domains such as organization development -- particularly strategic interventions concerning scenario planning -- is yet another domain that does not currently entail the kind of research to support itself that training does. Therefore, if they desire, HRD professionals have an opportunity to determine their strategic value to other business units by conducting the necessary research to document their strategic contributions.

Implications for HRD Theory

Swanson (1995) has advocated for economic, systems, and psychology theories as the theoretical foundations of HRD. A *Theory of Scenario Planning* (TSP) as constructed in this research is at a micro level compared to Swanson's (1995) foundations. Accordingly, a *Theory of Scenario Planning* (TSP) is not advocated as a theoretical foundation of HRD, rather, a specific theory of a strategic system that HRD professionals may draw upon to inform their work. Further, scenario planning has been advocated as a domain in which there has been little academic activity and thus it is there for those with the energy and commitment to verify.

The significance of this theory in the HRD domain has already been discussed. For example if HRD professionals were to conduct the necessary research and find that scenario planning is, indeed a performance enhancing activity, with a mastery of conducting the process, HRD professionals may increase their stock with executives in organizations. While perhaps this is not an explicit goal for many HRD professionals, it significance is difficult to deny.

The theoretical foundations of HRD can be thought of as inclusive of the proposed *Theory of Scenario Planning* (TSP). In fact, Swanson & Holton (2001) advocated for the use of scenario planning to fulfill part of the system theory domain. Further, the authors advocated for the use of scenario planning as one method for advancing the HRD profession both through mastery of the system, and also through using scenario planning to explore its own future. Finally, Provo et al. (1998) suggested that the theory domain of scenario planning was lacking and could benefit from the HRD perspective. This has been one effort to fill the theory void in scenario planning and it has done so from an HRD perspective.

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