Strategic management of uncertainty *



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This paper presents a strategic view of environmental uncertainty for profit-oriented organizations. It argues that managers make decisions that sometimes result in the aggressive creation of environmental uncertainty. A proposed model suggests that although strategy, structure, and performance constitute environmental enactment processes, the environment also directly influences organization performance. Further, the performance of others influences the environment through individual and collective actions.

Environmental uncertainty has long been recognized as an important variable in the explanation of organizational equilibrium and performance (e.g., March & Simon, 1958). A significant amount of theoretical and empirical work has been done to conceptualize and measure uncertainty (see Table 1). Most treatments, however, have begun with the implicit assumption that uncertainty is dysfunctional to maintaining equilibrium and to satisfactory performance, and have focused on identifying and prescribing ways managers can either reduce or absorb these negative consequences of uncertainty. Further, such prescriptions seem to be based on a more basic assumption that organizations cannot influence the environment and, therefore, must simply adapt to environmental uncertainty through internal structural change. These assumptions may not be true. If they were, why is there such a pervasive perception of escalating uncertainty? Why does uncertainty increase if the majority of systems are opting for uncertainty reduction?

This paper suggests that managers, and the performance of their organizations, influence the environment.

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The "excess profits" of oil firms in the late 1970s significantly affected competitors, customers, suppliers, and governments. It is further suggested that managers may actively seek to create environmental uncertainty, rather than adapt to it. For example, pharmaceutical firms patent their mistakes to create uncertainty about the direction of their product development in the minds of competitors ("Business Sharpens," 1978). Through its influence on the environment, an organization can create greater uncertainty for competitors, thereby enhancing its own competitive position. Such actions, while potentially increasing uncertainty for itself as well, can be seen as attempts to improve performance, even at the cost of a reduction in equilibrium for the organization.

Hence, as opposed to the typical assumption that uncertainty leads to structural adaptation which in turn leads to equilibrium, a more complex model of the relationship between environment, organizational actions, and desired outcomes is called for. While the shift of this approach reduces parsimony of existing models, such an elaboration should lead to a more realistic explanation of complex patterns of managerial decisions.

Contrasting Past Models of Environmental Uncertainty

Table 1 compares the views of selected analysts of environmental uncertainty over the last 25 years (see Herbert & Deresky, 1983) in terms of the focus of the definition of uncertainty, suggested focus for uncertainty re-



duction, focus of outcomes, and assumed environmental influence. Admittedly, this is a simplification of each author's work. But it is believed the table captures the essence of approaches toward environmental uncertainty, and changes in them over time.

March and Simon (1958) were among the first to recognize the importance of uncertainty in an organization. But they defined uncertainty as a lack of internal control (although recognizing the objective environment had some impact); they proposed internal structural techniques to reduce the impact of uncertainty on system equilibrium. In contrast, Cyert and March (1963, p. 120) suggested that "firms will devise and negotiate an environment so as to eliminate uncertainty... and make the environment controllable." Quite different foci of attention were assumed in order to reduce uncertainty: March and Simon focused on internal action; Cyert and March proposed actively influencing the environment to control uncertainty. The March and Simon approach may have gained the greatest attention among academicians and practitioners because it is easier to measure internal factors and posit ways to control them.

For the most part, the definitions of uncertainty that gained intellectual favor in the early 1960s depicted uncertainty as emanating from some set of objective (but largely unmeasured) environmental characteristics. Other analysts (Burns & Stalker, 1961; Chandler, 1962; Emery & Trist, 1965) emphasized that change and unpredictability in the objective environment required structural adaptation to achieve desired outcomes. These "classical views" (as described in Table 1) recognized the existence of some environmental adaptation imperative, but the decisional prescription was primarily internal change. The major criterion of interest for successful adaptation, however, tended to be "system equilibrium" (i.e., stability) as opposed to organization performance.

The "transition views" (as labeled in Table 1) began to appear in the late 1960s and early 1970s. Sources of uncertainty were thought to be both internal and external (Galbraith, 1973; Perrow, 1970; Terreberry, 1968; Thompson, 1967). Child (1972) refuted an uncertainty response as "imperative," proposing that decision makers could choose different types of reaction to uncertainty. Although these writers focused on overall performance rather system equilibrium, they typically prescribed internal structural actions as the means to mitigate uncertainty.

A substantial portion of the more recent studies of uncertainty (see the "process views" in Table 1) had their genesis in the seminal work of Lawrence and Lorsch (1967). Explaining that the objective measurement of the environment was fraught with difficulties, their study ultimately relied on perceptions of the environment. Work by Downey, Hellriegel, and Slocum (1975, 1977) began to emphasize the roles of perception, psychological states, and cognitive processes of decision makers as influential factors in both the decision maker's assessment of uncertainty and his/her reaction to it. This work and others (Duncan, 1972, 1973; Tung, 1979; Van de Ven, Delbecq, & Koenig, 1976), however, tended to ignore the objective properties of the environment. With few exceptions, the perception of the decision maker was assumed to mediate the link between environmental uncertainty, decisions, and outcomes.

Research on the relationship between "objective" and "perceptual" uncertainty has been conflicting. Tosi, Aldag, and Storey (1973) found no significant correlations between their measures of objective volatility and the Lawrence and Lorsch (1969) subjective uncertainty subscales. But Snyder and Glueck (1982) used industry analysts' evaluations and established positive correlations between perceptual uncertainty and the Tosi et al. measures of technological, market, and industry volatility for six industries. Hence, it is not clear from this work how perceptual uncertainty and objective uncertainty are related.

As shown in Table 1, work on uncertainty has shifted away from objective impacts of the environment on performance outcomes of the organization. Some theorists have tried to explain how managers decide which internal structural adaptations are necessary to absorb or to reduce the impact of perceived environmental uncertainty. Structural alterations are prescribed to reduce or to absorb uncertainty (Keller, Slocum, & Susman, 1974; Lorenzi, Sims, & Slocum, 1981) in an attempt to achieve system equilibrium. The equilibrium outcome seems to have become the primary criterion of interest, as opposed to performance. The assumption is that uncertainty is bad for the organization, and that system equilibrium is good. Other recent work has found that uncertainty may be neither reduced nor absorbed by some managers, but rather ignored (March, 1981; March & Feldman, 1981); attributed to factors outside of their control (Bobbit & Ford, 1980; Ford & Hegarty, 1984); or assumed away (Nutt, 1984). Practitioners seem to have forgotten, or have chosen to ignore, the impact of the objective environment on performance. Yet, there is other evidence that some theorists find that practitioners seek to influence the environment.



Table 1

Comparisons of Selected Analysts of Environmental Uncertainty

Assumed Influence of Environment: Authors	Focus of Uncertainty Definition		ocus of Uncertainty Reduction Decisions		Focus of Outcomes		
	Internal	External	Internal	External	System Equili- brium	Perfor- mance	
March & Simon (1958)	Lack of control	Secondary influence	*				 A. Classical Views External environment is a source of uncertainty. Reality of the objective environ- ment influences decisions, structure and performance.
Burns & Stalker (1961)		Unpredictable	•		•		
Chandler (1962)		Change and diversity	•			•	
Cyert & March (1968) Emery & Trist (1965)		Unpredictable Turbulence		*	*	•	
Thompson (1967)	Interdepen- dence	Lack of knowledge	•		*		B. Transition Views Source of uncertainty is both ex- ternal and internal. Some sug- gest decision makers have choi- ces and influence, rather than an uncertainty imperative.
Terreberry (1968)	Information processing	Turbulence an complexity	nd *	*		•	
Perrow (1970)	Life cycle	Change	•			*	
Child (1972)	Choice	Choice	•			÷	
Galbraith (1973)	Information processing	Complexity			٠		
Lawrence & Lorsch (1967)		Lack of knowledge	•			*	C. Process Views Tend to ignore objective proper- ties of the environment. Decisions makers perceptions (influenced by internal factors) mediate the link between uncer- tainty and system characteristics.
Duncan (1972, 1973)		Lack of knowledge	٠		•		
Downey & Slocum (1975)	Perception and psychological states.		*		•		
Van de Ven et al. (1976)	Interdep en- dence		Ŧ		•		
Downey et al. (1977)	Cognitive processes		*		•		
Tung (1979)	Perceived rate of change		٠		•		

"This characteristics best describes the author's focus.



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Other views of the environment

Some literature is critical of the assumptions and approaches which ignore the crucial role of the objective environment on performance and the role of managers in influencing their environment through strategic decisions. While still based on perceived uncertainty, the work of Miles, Snow, Meyer, and Coleman (1978) and Miles, Snow, and Pfeffer (1974) suggested that performance can be influenced by different managerial philosophies in relation to uncertainty. In particular, they defined "prospectors" as those top managers who actively search for change and uncertainty. The firms with "prospectors" are viewed as more successful, emphasizing the Cyert and March (1963) notion of proactive managing of uncertainty, or of positioning the firm to influence its environment. Anderson and Paine (1975) also suggested that managers choose their environments (e.g., product/market niches) and attempt manipulate them (e.g., pricing tactics). In strategic terms, firms may create their own "opportunities" and do not necessarily shrink from risk uncertainty by seeking organizational equilibrium (stability). Weick (1977, p. 271) provided examples of organizations which "were proactive toward their environments rather than reactive to them." Khandwalla (1976), Miles and Snow (1978), and Paine and Anderson (1977) found that strategic managers in more uncertain environments tend to be more proactive and innovative, and tend to assume more risk. In a similar vein, Sormunen, Daft, and Parks (1985) found CEOs to increase scanning frequency in sectors of the environment thought to be more important and more uncertain.

Some other work on strategic decision making leads one to believe that environmental forces combined with internal conditions have some impact on performance. Prescott (in press) developed a strategic model to examine join efforts of environment and strategy on performance. Christensen and Montgomery (1981) and Rumelt (1982) showed that diversification combined with market conditions to influence performance. Lenz (1980) found that different environment, strategy, and structural combinations had an impact on performance for savings and loan associations. In addition, empirical tests of the Boston Consulting Group (BCG) portfolio model (Hambrick, 1983a; Hambrick, MacMillan, & Day, 1982) provide preliminary support for the notion that both environmental conditions and strategy have a direct impact on performance. Compelling findings by Hambrick (1983b) indicated that environmental factors had main effects on three performance measures (return on investment, cash market share); strategy had main effects on



two of three performance measures; and environmentstrategy combinations had differential impacts on all three measures of performance.

Another dilemma for those emphasizing perceived uncertainty is posed by Mintzberg (1978), who categorized strategies into three types: (a) deliberate-intended strategies which are realized (achieved goals); (b) unrealized-intended strategies, which are not realized (goal failure); (c) emergent-unintended strategies which are realized (unexpected outcomes). What accounts for these differences? In the first case, decisions based on perceptions were matched with actual conditions obtained. But in the second and third cases, perceptions were apparently inaccurate; yet either positive or negative outcomes of some kind still resulted. In other words, "conditions in the specific environment of the system probably have a direct impact on organizational outcomes whether they are perceived by managers or not" (Osborn, Hunt, & Jauch, 1980).

These conclusions, at first glance, appear to be at odds with the position taken in a recent paper by Smircich and Stubbard (1985). Their approach to strategic management processes posits that the environment is "a specific set of events and relationships noticed and made meaningful by a specific set of strategists" (p. 727). This argument is based on Weick's (1977, 1979) notion of enactment. These perceptual and cognitive processes of "understanding and sensemaking" (Weick, 1977, p. 272) do affect strategic decisions and, hence, performance. But that part of the environment which is not perceived or enacted may also influence performance. For example, the introduction of digital watches was a strategic surprise to Swiss watchmakers whose performance was severely affected by these new products. Indeed, the collective action of others is the social "ecological context" (Smircich & Stubbard, 1985, p. 727) which constitutes an influence on the objective environment and that "counterpressures from reality" (Weick, 1977, p. 286) impose on an organization. In other terms, these theorists ground their interpretive paradigm on the assumption that "what passes as social reality does not exist in any concrete sense, but is the product of the subjective and intersubjective experience of individuals" (Morgan, 1980, p. 608). But there is more to the environment than this. Even acts of nature, such as tornadoes or volcanic eruptions, can seriously disrupt business firms' performance and their strategic decisions.

Dill (1958) introduced the terms task and general environment, and more recently Bourgeois (1980, 1984) proposed the terms domain navigation and domain definition that strategists may use to deal with relatively controllable aspects of their environment. The present authors contend that "less functional" strategies (a phrase

that implicity assumes a distinct external environment that resists the actions of strategists) do not mysteriously "disappear" (Weick, 1977, p. 286). Strategists choose reactive or proactive strategies to replace them. For example, a strategist may choose a proactive strategy to replace a "less functional" one when the organization has achieved superior power over some aspect of its environment. Moreover, the "ecological changes and discontinuities" (Smircich & Stubbard, 1985, p. 730) create the environmental uncertainty which contributes to the doubt managers experience about whether a particular strategy will become more or less functional.

If the dependent variable of concern is performance, then the objective environment plays a significant role (Pfeffer & Salancik, 1978). Moreover, through proactive attempts to influence the environment, the "objective" environment can be changed.

Values and influencing the environment

Tosi and Slocum (1984) suggested that profitability is a primary criterion for measuring effectiveness in business organizations. However, it is our contention that the methods for measuring profitability may sometimes disguise another capitalistic value-the relative rate of accumulation of valued resources, whether they be financial, material, human, or informational, which serve as the source of power. Filley, House, and Kerr (1976, p. 299) also argued "organizations seek to control environments by increasing their power" over selected segments of the environment, but added that organizations also "seek to adapt to environments by monitoring environmental demands and by designing structures and practices to permit effective response to such demands." While Weick (1977) questioned how the organization gets to know its environment and how it determines what is controllable and what is not, Sims and Eden (1984, p. 51) wrote that "the planning process has always involved making judgments about how the future is likely to unfold." Through the planning process managers discover (or think they discover) the uncertainty which exists or which is likely to exist. Through decisions and actions some managers seek to create some of the uncertainty which can come to exist for others.

Efforts directed toward the accumulation of resources, if successful, create disequilibrium and uncertainty. For example, oil company profits in the 1970s created disequilibrium and uncertainty regarding future government and competitor actions. Whether the resource controllers (owners or managers) create uncertainty consciously or unconsciously, intentionally or unintentionally, they do so in fulfilling their capitalistic purpose-it is a matter of survival of the fittest. Seeking equilibrium, in contrast, may not serve capitalistic values.

This is not to say that no other values are important in capitalistic societies. If equilibrium is sought by so many, the effort must be for the purpose of satisficing or serving some other value. Some may value equilibrium and stability for their own sake. Equilibrium and stability also are sought to reduce human anxiety: threat of loss (e.g., in power), fear of failure, threat of reaching cognitive limits (e.g., in learning on information processing), or threat of disrupted social set.

Clearly, other values exist within a capitalistic society which compete with capitalistic values with different degrees of success over time, as has been shown by interest in social responsability issues. Moreover, other cultures such as socialistic societies may have dominant values other than those associated with capitalism (Tannenbaum, Kavcic, Rosner, Vianello, & Weiser, 1974). While the study of culture and values in organizations is not new (see, e.g., Abegglen, 1958), the impact of culture and values on the strategic management process has been largely ignored. Only recently, Tosi and Slocum (1984) introduced culture and values into a model of strategic management, but the model does not deal with the manner in which cultural values can influence strategic choices. This issue deserves much more attention. Some strategists pursue specific strategies to increase uncertainty because their values contradict uncertainty absorption; they are risk seekers.

Uncertainty strategies

As noted earlier, the dominant theme in organization theory and research has been internal uncertainty reduction strategies. Other strategic options seem to be underrepresented in the literature. Internal uncertainty reduction is but one of four important strategic options for managing uncertainty. Others include: external uncertainty reduction, internal uncertainty stimulation, and external uncertainty stimulation.

None of these uncertainty management strategies is entirely new. For example, Ansoff and Stewart (1967) urged proactive moves by technology-based firms which create uncertainty. However, the discussions of external strategies and stimulation strategies have not been systematically explicated as strategic options.

The benefit in using any of these strategies in a capitalistic system is the achievement of organizational effectiveness (not equilibrium) through the accumulation of resources. Furthermore, uncertainty is the lack of confidence about one's knowledge. As such, internal uncertainty reduction strategies may be viewed as a means of



acquiring knowledge (a major resource) about the operation of the organization. External uncertainty reduction strategies are a means of acquiring knowledge about the environment. Market research through sales personnel reports is one means by which strategic managers gather information about their own organization and the performance of competitors. This is an attempt to reduce both internal and external uncertainty. Both types of strategies contribute directly to the achievement of capitalistic values, but are of greater benefit if they allow an organization to gain a superior competitive advantage (power) for future use in accumulating resources (e.g., profitability).

At first glance, it may appear that uncertainty stimulation whether internal or external, does not contribute to capitalistic values. Obviously, uncertainty simulation does not contribute directly to the accumulation of information resources. However, it may contribute directly to the acquisition and accumulation of other resources and indirectly to superior information resources. For example, Janis (1972) hinted at the value in stimulating uncertainty by creating a "norm of criticism" to overcome "groupthink," and Robbins (1974) incorporated the notion of stimulating conflict as a means of overcoming structural deficiencies such as goal incompatability. Similarly, Mason and Mitroff (1981) suggested that internal mechanisms that stimulate uncertainty are useful for challenging assumptions about strategic plans. These and other means of internal uncertainty stimulation may be seen, then, as contributing directly to superior structural resources (particularly when viewed as information networks). Organic structures are believed to be more effective than mechanistic structures in uncertain environments (Burns & Stalker, 1961) largely because of their information processing capabilities, but at the cost of reducing the rules and procedures which are intended to make organization behavior more predictable. Internal uncertainty stimulation strategies seem to create organic structures more able to absorb external uncertainty.

Few business organizations intentionally would reduce their own knowledge of the environment. However, an organization may choose strategies which produce a superior information advantage by creating more uncertainty for others than for itself, or, given an already superior internal structure for processing uncertainty, by creating an equal amount of uncertainty for itself and others. Prospector organizations, according to Miles and Snow (1978, p. 29), are "organizations which almost continually search for market opportunities... the creators of change and uncertainty" (emphasis added). The uncertainty created by prospectors may be a conscious attempt. to gain information superiority, or it may be inadvertent. Prospectors, by developing new markets, or by creating new products or processes through research and develop----- more directly fulfilling capitalistic values. Pros-



pectors secure current and potential future financial resources (the standard medium) which, in turn, may be used for the acquisition and retention of other resources. The term "market" in the Miles and Snow description of prospectors should be broadened to include other sectors of the external environment because opportunities (and threats) may be found in any of the environmental sectors, whether socioeconomic (e.g., terrorism), technological (e.g., gene splicing), governmental (e.g., regulation), or geographical (e.g., natural disasters).

Opportunities in a capitalistic system might be defined as circumstances in the objective environment (e.g., advances in stock values) potentially favorable for the accumulation of valued resources. Note that a failure to accumulate valued resources is a failure to take advantage of opportunities or to mitigate threats-regardless of the reason. But firms do not just react to threats or opportunities; they attempt to create them, resulting in external uncertainty in the hope of creating opportunity for themselves and threats for others.

Time becomes an important element in the evaluation of effectiveness since changing circumstances may contribute to failure-the reason forecasting is an important tool. Time also is implied in the meaning of accumulation-continuous or repeated growth.

It is clear that perceptions of environmental uncertainty play an important role in describing or predicting the behavior of strategists (Anderson & Paine, 1975; Yasai-Ardekani, 1986). In fact, Downey and Slocum (1975) argued that it is important to restrict the concept of uncertainty to a perceptual one. However, their unit or analysis was the organization structure, not boundaryspanning decisions which lead to organizational performance. Another factor of some importance in the decision process is perceived internal need for change (Paine & Anderson, 1977). If the organization believes it can tolerate or influence environmental uncertainty, then perceptions of environmental uncertainty become less important in explaining decisions. But outcomes can still be influenced by objective environmental realities. The performance of IBM clearly affects the relative performance of others in the various segments of the computer industry. For example, IBM's recent new product development of a local area network system is expected to have both positive and negative impacts on other competitors (Lewis, Harris, & Brandt, 1985). As a new entrant in computer workstations, IBM is expected to become fourth in market share, thereby affecting the strategies of firms in this segment (Bock, Wilson, Beam, & Harris, 1986). To argue that "objective" reality has no impact is as foolish as to argue that perception of the environment has no influence. Failure to take advantage of or to create opportunities, whether resulting from changing circumstances or perceptual distortions, is still a failure.

Ritti and Funkhouser (1977) hinted that opportunities often are overlooked when organizations measure their own performance. Nonetheless, the success of an organization can be determined in part by its relative superiority in measuring and forecasting events in the objective environment. We cannot, as researchers, afford to ignore the objective environment or to avoid attempting the measurement of objective environmental uncertainty.

A model of environmental uncertainty

Because managers pursue both uncertainty reduction and creation strategies, and because performance and objective environment have been neglected by theorists, an expanded model of environmental uncertainty seems needed. The proposed model of environmental uncertainty is shown in Figure 1. The model can be best understood by viewing it as representing the decision sequence of a strategist. However, the model also is useful in studying multiple iterations of decisions. The existing models of the role of perceptions and sensemaking are recognized in terms of their impact on strategy and structure decisions. But those decisions, in turn, have an impact on the objective environment and the uncertainty within it. This link between the strategy and structure decisions and the objective environment incorporates Weick's (1977) notion of "enacting" the environment. The model goes beyond this notion, however. It recognizes that performance outcomes are influenced by these strategy and structure decisions, and that performance is influenced by the objective environment. Further, the model shows that performance outcomes have an impact on the objective environment and its uncertainty. While the collective actions of others influence the environment for a particular organization, they do not constitute the totality of the objective environment which includes both social and physical phenomena. However, the model recognizes that the collective actions of others temper the degree to which both strategy and structure decisions, and performance outcomes influence the objective environment and its uncertainty.

The electronic mail industry provides an illustration of how collective actions influence organizations. MCI and others pursued proactive strategies in creating the new electronic mail industry "Sluggish acceptance" from potential customers contributed to steep losses in MCI's profits. Failure of MCI's strategy to achieve the sales potential that experts had forecasted produced uncertainty regarding the long-term sales potential of the industry. Additional uncertainty was created by the anticipated entry of AT&T (Wilke & Maremont, 1985). The model predicts that this type of entry would cause changes in the objective environment and MCI's perception of uncertainty, and hence a change in the strategy and/or structure of MCI. Moreover, the performance of MCI is likely to be affected by both the reality of AT&T's entry and by AT&T's decisions leading up to the entry. Ironically, while MCI's market share is likely to deteriorate, experts anticipate that the collective actions of MCI and its competitors (e.g., Western Union, AT&T) may create greater customer awareness leading to greater market demand and potentially greater profits for MCI.

The findings of Burke (1982) help to clarify our model. Managers of strategic business units pursuing highgrowth strategies had significantly higher uncertainty scores than managers of strategic business units pursuing stability strategies. The growth strategies were used to build slack as an internal defense against uncertainty; however, at the same time, additional market share could create additional uncertainty for competitors. In terms of our revisionist model, deliberate, conscious decisions to create uncertainty in the objective environment are being made-external uncertainty stimulation. This appears contradictory to the assumptions of other models which imply uncertainty reduction and avoidance.

In some cases, what makes a market attractive very well may be the risk. Interestingly, in Burke's study, when industry attractiveness was high but competitive position was weak, uncertainty had no impact on the decision to grow or to remain stable. One might speculate about why uncertainty was irrelevant in this circumstance. If the industry is attractive because the total market is growing, then the type of competitive weakness becomes the dominant decision factor. If the weakness is a critical one which in reality precludes growth, then a stability strategy is a "deliberate" and rational one. Seeking opportunities in uncertain environments may be the only hope of longrun survival for some firms. In these cases, sales growth strategies or market share expansion strategies may also be "deliberate" and rational. These last two growth strategies describe those of many successful entrepreneurs who seek and sometimes create environmental uncertainty by introducing new products or services. The major point is that several of these strategies involve seeking or creating uncertain environments.

In summary, the model proposes a shift in the assumptions about the desirability of uncertainty, a recognition of the importance of the objective environment, a realization that interactions of strategic and structural decisions with the environment influence performance, and the inclusion of performance rather than system equilibrium as a dependent variable. This model emphasizes a proactive rather than a reactive perspective of the uncertainty- strategy-structure-performance relationship.



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Figure 1. A revisionist model of environmental uncertainty.



Suggestions for future work

The literature has focused on perceived uncertainty because the measurement in more complex models is more difficult. Although perceived uncertainty has been addressed by researchers (Duncan, 1972; Tung, 1979), measurement of objective uncertainty should be included in future research. Tosi et al. (1973) made a start, but their approach was unidimensional. Osborn et al. (1980) argued that uncertainty has several dimensions-disparity (heterogeneity), and volatility, which is composed of rate of change (velocity), degree of change (force), and predictability of change (directional deviation)-which can be measured objectively. As an example, technological uncertainty can be objectively measured on these dimensions by exploring the activity of firms applying for patents. The rate at which different firms patent their mistakes and successes, and the degree to which new patents diverge from previous activities and those of other firms, indicates a measure of disparity and volatility in this area. As the number and type of patents increase, the greater disparity makes it more difficult to predict the pattern of developments occurring in a given research area. These measures could disconfirm conclusions about uncertainty based on perceptions alone.

Other parts of the task environment also can be measured objectively using these dimensions. For instance, the disparity and volatility of advertising or research and development expenditures, or income of competitors can be tracked as a measure of competitive uncertainty. Similarly, disparity and volatility of new product/service introductions by members of an industry could indicate the degree of competitive uncertainty. Purchases can be measured on these dimensions to reflect sales uncertainty. Information about material resource availability and prices (rate, degree, and predictability of change in these factors) can provide measures of the uncertainty of suppliers. The rate at which laws affecting the industry are introduced or passed provides indications of political uncertainty. These types of measures supplement perceptual measures such as the complexity of particular laws.

The collective actions of competitors within an industry also may create uncertainty and can be measured by the rate of exit, entry, and restructuring. For example, the recent rash of brandname mergers (Brown, Schiller, Dugas, & Scredon, 1985) has caused restructuring, and considerable uncertainty, in a variety of consumer products industries. Numerous ways of measuring these concepts have been developed in the tradition of industrialorganizational economics (e.g., Harrigan, 1985). More recently, research has incorporated such industry-structure variables as: long-term growth, served market growth, concentration, major competitors' share, share instability, order of market entry, and major competitor entry (Zeithaml & Fry, 1984).

The four dimensions of uncertainty also could be applied to the measurement of factors in the general environment such as changes in the money supply, disposable income, or birthrates. These dimensions can be and are applied to natural phenomena which can create disruptions to firms' strategy and performance (Glueck & Jauch, 1984). For example, the "low-snow" winter of 1978 led some snowblower manufacturers to diversify into lawn mower production. Several businesses in seasonally influenced industries employ meteorologists to forecast environmental irregularities. Managers in these firms are making proactive decisions in the face of objective environmental uncertainty. As such, objective measures of environmental uncertainty can be used for each sector of the environment.

There is a need to return to the basic reason for investigating environmental uncertainty. Somehow, as rescarchers, we have lost sight of the reasons why strategic and structural decisions are made-to attain desired performance outcomes. Authors have noted the underutilization of performance measures as dependent variables (Ginsberg & Venkatraman, 1985; Otley, 1980; Thomas & Tymon, 1982). Although numerous possibilities exist, many researchers focus on a limited set of performance criteria, if any, such as return on investment, return on sales, and return on assets, which are essentially based on an assumption that profitability is the penultimate valued outcome. As suggested earlier, the values within a capitalistic system put a premium on the sustained accumulation of resources. Hence, performance could be measured by longterm growth rates in such things as the accumulation of human and financial resources.

Organization performance is dependent upon both internal and external factors. Performance is not merely an outcome of a singular construct called perceived environmental uncertainty. Regardless of how sophisticated we become in explaining that concept, we will do little to make an impact on decision makers unless we go beyond these relationships and include the combination of factors which influence performance. That is, the four strategic choices of internal and external uncertainty reduction and stimulation can be investigated as options managers can use to deal with uncertainty in attempts to improve performance.

Within limits, uncertainty is useful. Some riskseeking strategies may be designed to position the organization directly within an uncertain environment to take advantage of assumed internal strengths and to benefit from the uncertainty. Our models must be expanded to encompass this richer explanation, although it is more difficult



to deal with. Moreover, research needed to answer a variety of questions: How frequently are uncertainty creation/positioning/defense strategies used? What types of strategies are/can be used to create uncertainty? How do such strategies affect initiating (or competing) firms' performance? To answer these questions, researchers need to find creative operational definitions to tap the variables that have been identified here.

Many other questions need to be answered before these complex strategic relationships can be fully understood. Clearly, the task environment is a primary focus of most boundary-spanning managers' perceptions and decision making. But how do these decisions interact with the objective environment? Can a self-fulfilling prophecy result from perceptions of uncertainty, and under what conditions? If we make structural decisions such as increasing flexibility of the technical core, does that mean we will increase technical rationality, or in fact does that alter the degree of predictability in the system? What happens to managerial styles when objective uncertainty increases? Do consultative patterns of decision making lead to greater flexibility and less bureaucracy as lateral contacts and relevant information holders gain more power? Is this a negative consequence of uncertainty? Examining the strategic management of uncertainty as proposed here should contribute to a better understanding of organizations.

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