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Three Types of Perceived Uncertainty About the Environment: State, Effect, and Response Uncertainty

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The research literature on environmental uncertainty is briefly reviewed to illustrate problems and inconsistencies in conceptualizing and measuring the construct. Three types of perceived uncertainty about the environment are described and their implications for the behavior of an organization's administrators are discussed. The failure to differentiate between these types may explain some of the confusion about environmental uncertainty.

Uncertainty has been a central concept in the organization theory literature, particularly in theories which seek to explain the nature of the relationship between organizations and their environments (Dill, 1958; Duncan, 1972; Lawrence & Lorsch, 1967; Thompson, 1967). In his classic book, *Organizations in Action*, Thompson, in fact, asserted that uncertainty is the fundamental problem with which top-level organizational administrators must cope (1967, p. 159). Organization theorists have focused particular attention on a variable which has come to be known as "environmental uncertainty" or "perceived environmental uncertainty." (Quotation marks have been placed around these terms because one of the primary purposes of this paper is to question the meaning of these constructs.) The concept of "environmental uncertainty" is a central variable in discussions of the organization-environment interface, particularly in theories of organizational design (Burns & Stalker, 1961; Galbraith, 1977; Lawrence & Lorsch, 1967; Thompson, 1967) and in models of strategic planning systems (Liedtka, 1985; Lindsay & Rue, 1980).

Despite the fact that the field has attributed great theoretical significance to the construct of environmental uncertainty, research generally has yielded inconsistent and often difficult-to-interpret results (see, for example, Duncan, 1972; Downey, Hellriegel, & Slocum, 1975). Problems range from findings of poor reliability and validity evidence for measurement instruments (Downey et al., 1975; Tosi, Aldag, & Storey, 1973) to a failure to find clear evidence of a relationship between "objective" characteristics of the organizational environment and perceptions of environmental uncertainty (Downey et al., 1975; Duncan, 1972; Pennings, 1975; Pfeffer, 1978; Tosi et al., 1973).

The theoretical importance of the environmental uncertainty construct coupled with the somewhat confusing state of the empirical literature suggest a need to reexamine the nature of this important construct. This paper reexamines "perceived environmental uncertainty." It is hypothesized that three types of "environmental uncertainty" can be experienced by an organization's administrators as they try to understand, make sense out of, and respond to conditions in the external environment. A failure to differentiate among these three types may partially explain some of the confusing results of past research.

Reexamining "Environmental Uncertainty"

Downey and Slocum (1975), in their review of the environmental uncertainty literature, noted that the word "uncertainty" is so commonly used that "it is all too easy to *assume* that one knows what he or she is talking about" when using the term (p. 562, emphasis added). Such an assumption may cause researchers to pay insufficient attention to the conceptualization and operationalization of a construct. Furthermore, researchers who assume agreement may interpret the literature as though there was agreement when, in fact, there is tremendous inconsistency and confusion about how a construct is defined and used.

One source of confusion in the environmental uncertainty literature is that the term "environmental uncertainty" has been used both as a descriptor of the state of organizational environments and as a descriptor of the state of a person who perceives himself/herself to be lacking critical information about the environment. The former implies that it is possible to characterize environments in terms of how objectively uncertain they are; the latter implies that environmental uncertainty is inherently "in the eye of the beholder" and thus ought to be studied as a perceptual phenomenon (Aldag & Storey, 1979; Huber, O'Connell, & Cummings, 1975; Starbuck, 1976). These two perspectives have yielded different definitions and operationalizations of the term "environmental uncertainty."

The most commonly cited definitions define "environmental uncertainty" as though it was a perceptual phenomenon but diverge when it comes to specifying the nature of the uncertainty which is experienced. The three most common definitions cited by organization theorists are:

1. An inability to assign probabilities as to the likelihood of future events (Duncan, 1972; Pennings, 1981; Pennings & Tripathi, 1978; Pfeffer & Salancik, 1978);
2. A lack of information about cause-effect relationships (Duncan, 1972; Lawrence & Lorsch, 1967); and/or
3. An inability to predict accurately what the outcomes of a decision might be (Downey & Slocum, 1975; Duncan, 1972; Hickson, Hinings, Lee, Schneck, & Pennings, 1971; Schmidt & Cummings, 1976).

Most of these definitions are adaptations of definitions of uncertainty offered by theorists in the fields of psychology and economics (Garner, 1962; Luce & Raiffa, 1957; MacCrimmon, 1966). A question that deserves some attention, though, is whether each of the above definitions is essentially a restatement of one point of view or whether each refers to a qualitatively different type of uncertainty that administrators can experience as they scan and attempt to respond to environmental conditions.

Measuring Environmental Uncertainty

Some researchers have argued, quite strongly, that we should measure environmental uncertainty as a perceptual phenomenon rather than as a property of organizational environments (Child, 1972; Downey & Slocum, 1975; Starbuck, 1976). Others think differently. Tinker (1976), for example, warned that studying perceptions alone would reduce the study of organizations to a "problem of psychoanalysis of actors." Some writers have suggested that it is necessary to measure environmental uncertainty "objectively" as a means of attempting to validate our perceptual measures (Aldag & Storey, 1975; Starbuck, 1976).

Hence, many researchers (i.e., Downey et al., 1975; Downey, Hellriegel, & Slocum, 1977; Tosi et al., 1973; Tung, 1979) sought to measure both "objective" and perceived environmental uncertainty and to examine the relationship between these "objective" and perceptual measures. Several studies have, for example, operationalized "objective" uncertainty with various measures of environmental volatility (e.g., Downey et al., 1975; Tosi et al., 1973) and then used these measures as criteria for evaluating the validity of perceptual measures of uncertainty. The problem is not the idea but the execution of the idea.

Measures of environmental volatility, as several researchers (Lawrence & Lorsch, 1973; Miles,

Snow, & Pfeffer, 1974; Pfeffer & Salancik, 1978) pointed out, are not adequate operationalizations of environmental uncertainty. It is not change per se, or even a fast rate of change, that creates uncertainty about the environment; rather, it is unpredictable change that will be associated with this type of uncertainty. Thus, a lack of correlation between measures of environmental volatility and perceived environmental uncertainty is not, in and of itself, reasonable grounds for claiming that the perceptual measures are invalid.

Further problems stem from the heavy reliance on the use of two scales for measuring perceived environmental uncertainty (Duncan, 1972; Lawrence & Lorsch, 1967), both of which have a number of problems (Downey et al., 1975; Tosi et al., 1973). Downey et al. (1975), for example, found that there were no significant correlations between the subscales of the Lawrence and Lorsch measure and only one significant correlation among the subscales of the Duncan measure. Further, there was no significant correlation between the Duncan measure and the Lawrence and Lorsch measure.

Downey et al. (1975) concluded that the failure to find a significant relationship between these two measures of uncertainty suggested that there is a lack of communality between the two uncertainty scales even though they were "presumably designed to measure a similar, if not the same, concept" (p. 626). The lack of convergence between these two scales, however, is not surprising given the construction of these instruments. The Lawrence and Lorsch measure (as reorganized by Downey et al., 1975) measures time span necessary for feedback on job performance, clarity of job requirements, and degree of difficulty involved in job performance. Duncan's scale, on the other hand, measures lack of information about future environmental events, inability to assign probabilities as to the likelihood of future events influencing the success or failure of a decision unit, and lack of knowledge of the organizational consequences of a decision if the decision is incorrect.

Environmental Uncertainty: Past and Future

Research on environmental uncertainty reached a peak of popularity in the 1970s and since has fallen off dramatically. Perhaps one reason for this decline in interest is that the results of the research were not easily interpretable. However, the concept continues to be a key one in many organization theories. Given this importance, we are obliged to try to understand why the research has been confusing and often has failed to support our theories.

There is a need to be much more precise in defining, using, and measuring the construct of environmental uncertainty. In particular, there is a critical need to reexamine our conceptualizations and measurement of the construct of "perceived environmental uncertainty." Past research suggests that there are problems with the existing measures of "perceived environmental uncertainty" (Downey & Slocum, 1975; Tosi et al., 1973). Given the lack of relationship between the subscales of these measures, it seems quite possible that each measure may be measuring several different types of uncertainty. The lack of correlation between the two scales further suggests that the scales themselves may differ in the types of uncertainty being measured.

It is also important to recognize that there is no reason to expect a one-to-one correspondence between an objective indicator of uncertainty, no matter how sophisticated, and a perceptual indicator, because perceptions vary as a function of contextual factors (Pfeffer, 1983) and as a function of individual attributes (Downey et al., 1975; McCaskey, 1976). Further, perceptions of reality are likely to differ from "objective" reality because of limitations in our cognitive reasoning abilities (MacCrimmon, 1966; March & Simon, 1958).

This paper suggests that there are at least three differentiable types of uncertainty about the environment which can be experienced by organizational administrators. All of these have been subsumed previously under the umbrella of the term "perceived environmental uncertainty" but each may, in fact, be a differentiable type of

uncertainty with its own particular antecedents and implications for the behavior of organizations.

General Definition of Uncertainty

For the purposes of this paper, uncertainty will be defined as an individual's perceived inability to predict something accurately. An individual experiences uncertainty because he/she perceives himself/herself to be lacking sufficient information to predict accurately or because he/she feels unable to discriminate between relevant data and irrelevant data (Gifford, Bobbitt, & Slocum, 1979).

The label "environmental," when attached to the term uncertainty, suggests that the source of the uncertainty is the organization's external environment. Thus, the "something" which is unpredictable is specified as being the organizational environment. Some researchers (Duncan, 1972; Miles & Snow, 1978; Tosi & Slocum, 1984), however, suggested that such a broad conceptualization of environmental uncertainty may not be a particularly useful one. They suggested that uncertainty should be studied in relation to specific components of the environment (e.g., suppliers, competitors, government, distributors, consumers, etc.).

This paper suggests that not only is it important to understand what the particular source of "environmental uncertainty" is but also it may be important to understand the type of "environmental uncertainty" experienced by the decision maker. While specifying the source of uncertainty identifies the domain of the environment which the decision maker is uncertain about (e.g., competitors or suppliers), specifying the type of uncertainty focuses on delineating the nature of the uncertainty being experienced.

Three Types of Perceived Uncertainty About the Environment

State Uncertainty (or Perceived Environmental Uncertainty)

One type of uncertainty which organizational administrators can experience is uncertainty about the state of the environment. Administrators experience "state" uncertainty when they perceive the organizational environment, or a particular component of that environment, to be unpredictable. Top-level managers might be uncertain about what actions relevant organizations or key organizational constituencies (i.e., suppliers, competitors, consumers, the government, shareholders, etc.) might take, or they might be uncertain about the probability or nature of general changes in state in the relevant environment (i.e., sociocultural trends, demographic shifts, major new developments in technology).

Uncertainty about the state of the environment means that one does not understand how components of the environment might be changing. An inability to predict the future behavior of a key competitor is a manifestation of state uncertainty as is an inability to predict whether Congress will deregulate one's industry as well as uncertainty about whether a key labor union will call for a nationwide strike. Also, the state uncertainty may involve an incomplete understanding of the interrelationships between elements in the environment. For example, one might be uncertain both about the likelihood of deregulation as well as the likely behavior of competitors if deregulation occurs. Thus, in this case one knows neither the probability of deregulation nor the probability of a price war if deregulation occurs.

Of the three types of uncertainty about the environment discussed here, it is this type of uncertainty which is conceptually closest to using the term "environmental uncertainty" to describe the state of organizational environments. It differs only in that it is being used here to describe a perceptual experience of uncertainty, not an objective state of the world.

Theorists who define "environmental uncertainty" as the inability to assign probabilities to the likelihood of future events (Duncan, 1972; Pennings, 1981; Pfeffer & Salancik, 1978) seem to use the term to describe an experience of state uncertainty. This use of the term is different than definitions that suggest "environmental uncer-

tainty" is an inability to understand or predict the future consequences of decisions (Conrath, 1967; Taylor, 1984). The difference is that the experience of state uncertainty is not tied directly to assessing the probable consequences of a decision.

The experience of uncertainty about the state of the environment is likely to be partially a function of characteristics of the environment in which the organization is operating. To the extent that volatility, complexity, and heterogeneity make environments less predictable, it is likely that administrators who function in environments with these characteristics will perceive more uncertainty about the nature of their environment than administrators who operate in simpler, more stable environments.

Labeling this type of uncertainty as "state uncertainty" has been done for two reasons. First, this is the only one of the three types of uncertainty that relates directly to unpredictability of the state of the world. Second, it was so named to minimize confusion since this type as well as the others have been previously subsumed under the label "perceived environmental uncertainty." In a sense, though, this type of uncertainty is the only one that should be labeled "perceived environmental uncertainty."

Effect Uncertainty

A second and quite different type of uncertainty about the environment relates to an individual's ability to predict what the impact of environmental events or changes will be on his/her organization. Effect uncertainty, thus, is defined as an inability to predict what the nature of the impact of a future state of the environment or environmental change will be on the organization. Knowing, for example, that a hurricane is headed in the general direction of your house does not mean you know how it will *affect* your particular house (e.g., will your house be left standing?).

The experience of effect uncertainty may involve uncertainty about whether an event or change in the environment will have an impact on the focal organization at all as well as uncertainty about the nature, severity, and timing of the impact. While this type of uncertainty is obviously related to the conditions of the organization's external environment, it does not necessarily mean that there is uncertainty about the nature of these conditions. One may, for example, be quite sure that there will be a decline in the number of 18-24 year-olds in this country in the next ten years but feel unable to predict what the effect of this environmental change will be on sales of your organization's product. In fact, uncertainty about the *effect* of a possible future event, or set of events, may become more salient when there is a fairly high degree of certainty about what the potential future state of the environment is likely to be.

Effect uncertainty involves a lack of understanding of cause-effect relationships (Duncan, 1972; Lawrence & Lorsch, 1967). Rather than being confident that "given X, then Y," an individual is unable to derive a causal statement about which he/she is confident. If state uncertainty involves uncertainty about the future state of the world, then effect uncertainty involves uncertainty about the implications of a given state of events in terms of its likely impact on the organization's ability to function in that future state.

Response Uncertainty

A third type of uncertainty is associated with attempts to understand what response options are available to the organization and what the value or utility of each might be. Response uncertainty is defined as a lack of knowledge of response options and/or an inability to predict the likely consequences of a response choice (Conrath, 1967; Duncan, 1972; Taylor, 1984). Response uncertainty is likely to be salient when there is a perceived need to act (Jackson, Schuler, & Vredenburgh, in press) because a pending event or change is perceived to pose a threat or to provide some unique opportunity to the organization.

This type of uncertainty is closest conceptually to definitions of uncertainty offered by decision

theorists (i.e., Conrath, 1967; Taylor, 1984). Conrath (1967), for example, conceptualized uncertainty as a lack of knowledge about:

1. The alternatives or response options available;
2. The states of nature or outcomes likely to be connected with each; and
3. The value or utility associated with each alternative-state-of-nature pair.

This type of uncertainty is experienced in the context of a need to make an immediate decision. Thus, an organization's top-level administrators would be most likely to experience response uncertainty either in the course of choosing from a number of possible strategies or in the course of formulating a response to an immediate threat in the environment.

Differentiating Between Types of Uncertainty

While the experience of each of these types of uncertainty is likely to be involved in attempts to understand the organization-environment interface, each may be a quite different type of uncertainty about the environment. What differentiates these three types of uncertainty from one another is the type of information that an organization's administrators perceive to be lacking. In the case of state uncertainty, administrators lack information about the nature of the environment. The experience of effect uncertainty, on the other hand, does not necessarily involve a lack of information about environmental conditions (in fact, the administrator may have all he/she can handle); rather, the shortage of critical information is in knowledge of how environmental events, changes, or sets of changes will *affect* the particular organization, if at all. Finally, in the case of response uncertainty, there is a perceived lack of information about what the organization's response options are and/or about the value or utility of each course of action in terms of achieving desired organizational outcomes.

While these three types of uncertainty seem quite different conceptually, they have not been differentiated from each other in previous work with the environmental uncertainty construct. Each of these types of uncertainty corresponds roughly to a type of information shortage that has been used either singly or in combination to define the concept of environmental uncertainty. Duncan's measure of perceived environmental uncertainty, for example, appears to measure all three of these types of uncertainty.

Differentiating among these three types of uncertainty about the environment may help to clarify some of the seemingly confusing results reported in past research. For example, objective indices of environmental characteristics (e.g., those which seek to measure the amount of volatility in the environment) that have been used as criteria for evaluating the validity of the measures of perceived environmental uncertainty can be viewed as correlates or antecedents of a perception of environmental state uncertainty because volatility and complexity may make the environment less predictable. However, only one of Duncan's three subscales measures this type of uncertainty while none of the Lawrence and Lorsch subscales appears to measure this type of uncertainty. Not unexpectedly, Tosi et al. (1973) and Downey et al. (1975, 1977) found no significant relationships between the objective indicators of volatility they used and scores on the Lawrence and Lorsch uncertainty scale. On the other hand, Downey et al. (1975) and Tung (1979) reported significant correlations between objective indices of environmental volatility and the Duncan measure of perceived environmental uncertainty.

Also, recognizing the potential existence of several different types of perceived uncertainty about the environment may be useful in clarifying the nature of the expected relationship between environmental volatility and perceptions of "environmental uncertainty." Several writers (Lawrence & Lorsch, 1973; Miles, Snow, & Pfeffer, 1974; Pfeffer & Salancik, 1978), as previously noted, pointed out that volatility or variability in the environment is not necessarily unpredictable. According to the framework suggested here, if the environment is volatile but changing in pre-

dictable ways, one will not experience state uncertainty. However, it is quite possible that "effect" or "response" uncertainty will be experienced. The fact that environmental changes are predictable does not mean that their consequences are understood. In fact, the more predictable an event or change is perceived to be, the more likely it may be to increase the salience of the effect and response types of uncertainty. On the other hand, if volatility is making the environment unpredictable, one would expect administrators to have high levels of state uncertainty and, perhaps, lower levels of effect and response uncertainty because such a high level of state uncertainty might make it impossible to characterize the environmental changes well enough to ask the questions: What effect will these changes have on us, and what should we do about it?

Implications for Understanding the Strategic Behavior of Organizations

When the external environment is perceived to be unpredictable, as is the case when administrators experience a large amount of state uncertainty, an organization's strategic planning may be affected, both in terms of process and content. The strategic planning process may be affected in two ways. It is likely that organizational administrators who are uncertain about the state of their environment will spend a greater amount of time and resources on environmental scanning and forecasting than administrators who are more confident that they understand their environment. The scanning efforts will be directed toward clarifying the administrators' understanding of the probabilities of various events or changes in the environment. It should be noted that because the time and resources devoted to scanning are a function of how uncertain administrators perceive the environment to be, administrators who are quite certain that they understand the industry environment will scan less, regardless of the "objective" characteristics of that environment.

Also, it seems likely that modes of strategic thinking such as "muddling through" (Lindblom, 1959) and the so-called garbage can approach to decision making (Cohen, March, & Olsen, 1972) would be more prevalent when administrators have a great deal of state uncertainty. If administrators have a high degree of uncertainty about the nature of the organization's environment, it will be very difficult for them to go through the steps outlined in most linear models of the strategy formulation process (i.e., Hofer & Schendel, 1978). If one is uncertain about the nature of environmental changes, for example, it will be extremely difficult to identify threats and opportunities with any degree of confidence. Nevertheless, because of the value attached to the idea of strategic planning, administrators may proceed with their strategic planning endeavors, but the strategic planning is likely to resemble more closely a "muddling through" mode of strategic thinking than the linear mode recommended in strategy textbooks.

The substance of an organization's strategic choices also may be affected by the amount of uncertainty administrators have about the state of the organizational environment. Given the fact that the environmental context is not well understood and the capacity for rational evaluation of strategic alternatives limited, the perception of state uncertainty is probably linked to several generic strategies designed to protect key functions of the organization. Protective responses such as surrounding the technical core with an administrative component to buffer the production process from the effects of uncertainty (Thompson, 1967) and attempting to create slack resources (Cyert & March, 1963) may be common under this circumstance. Both of these strategies serve to insulate the organization from sudden, unexpected shifts in the environment, but do not commit the organization's resources to a particular strategic direction. Also, one might expect that diversification-type responses are likely in these circumstances as administrators seek to diminish the organization's vulnerability to a set of environmental conditions that are

poorly understood by the organization's direction setters.

Effect uncertainty is much more specific than state uncertainty because the experience of uncertainty involves an inability to understand the impact of events on the organization rather than an inability to predict the external environment or a component of that environment. It is likely that effect uncertainty will be salient during the "identification of environmental threats and opportunities" phase of the strategic planning process.

It is argued that just as an owner of a house is not likely to make any move to protect his/her house or self from a pending hurricane unless he/she is fairly certain that the hurricane might, in fact, inflict damage, an organization's decision makers may not respond to events or changes in the organizational environment unless they perceive these events/changes as likely to represent significant threats or opportunities. In other words, some level of certainty that an environmental change might have an effect on the organization may be necessary to motivate the search for an effective strategic response to counteract or, alternatively, to capitalize on the effect.

The implications for the strategy formulation process follow from the above hypothesis. First, it seems likely that if administrators are uncertain about the effect of an environmental change or changes, they may spend a lot of time (and use many resources) in the "environmental threat and opportunity analysis phase" of strategic planning. Identifying environmental threats and opportunities requires using judgment. It requires administrators to come to some conclusion about the likely significance of an environmental change regarding its potential for affecting organizational outcomes, if the organization makes no response. Uncertainty could paralyze the strategic planning process as administrators argue about whether and how significantly their organization is likely to be affected by various environmental changes. Also, one might expect that should the strategic planning process proceed in spite of lingering uncertainty about threats and opportunities, a good deal of emphasis would be placed on the formulation of contingency plans.

Response uncertainty is experienced by decision makers as they attempt to understand the range of strategic responses open to them and to evaluate the relative utility of possible options. Thus, the focus of response uncertainty is different from either of the aforementioned types. It is likely that a need to take action or to make an immediate decision is a critical precondition to making response uncertainty salient.

Managers may react to response uncertainty in a number of ways. The experience of a large amount of response uncertainty by an organization's top-level decision makers may lead the administrators to imitate or copy the strategic responses of others. The administrators may assume that their competitors have figured out what the appropriate response is and thus, may imitate their competitors' behavior (DiMaggio & Powell, 1983). Alternatively, if the stakes are high and an incorrect response is perceived to be costly, high levels of response uncertainty may have the effect of delaying strategy implementation as possible alternatives are generated and carefully evaluated.

It is likely that high levels of response uncertainty are associated with high levels of boundary spanning and information acquisition activities. These activities will be directed toward discovering how other organizations are responding or toward uncovering how organizations that faced similar circumstances in the past responded and what the consequences of those responses were. Also, one might expect administrators who are uncertain about how to respond to place a good deal of emphasis on forecasting techniques that would allow them to model the consequences of various responses under various circumstances.

Conclusions

Recognizing that there are several different types of uncertainty which administrators experience in the course of trying to interpret and

respond to organizational environments suggests some potentially useful new directions for research on "environmental uncertainty." First, the framework suggests the importance of conducting research which focuses on developing our understanding of the environmental scanning and interpretation process. Do administrators, in fact, experience different types of uncertainty as they attempt to understand and respond to the external environment? What are the consequences of experiencing uncertainty of these different types on the nature of the environmental sense-making process? Several hypotheses have been outlined for testing how these types of uncertainty might affect environmental analysis and strategy formulation.

Another useful direction for future research would be to investigate the process by which an organization's decision makers come to be certain that an environmental change poses a significant threat to their institution. Organizational administrators may fail to properly align their organizations to a changed environment for a number of reasons, one of which may be that they did not see an environmental change as likely to pose a significant threat to their organization. Focusing attention on determinants of effect uncertainty or its converse, effect certainty, could further our knowledge of organizational differences in strategic effectiveness.

It is important to recognize the possibility that administrators may experience several different types of uncertainty as they attempt to understand and respond to events or changes in the organizational environment. Further, it is likely that these different types of uncertainty will elicit different types of coping responses. By placing all these types of uncertainty under the umbrella of the term "perceived environmental uncertainty," we may have masked potentially important distinctions among types of uncertainty and inadvertently made interpretation of the literature on environmental uncertainty unnecessarily confusing.

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