

## Analyzing the historical development of the environmental uncertainty construct

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### Abstract

The concept of environmental uncertainty is recognized as a fundamental element of the strategic management and organizational theory literature. Unfortunately, the development of inconsistent conceptualizations and operationalizations of uncertainty have muddled the true meanings of the construct. In an effort to reverse this disturbing trend, this paper systematically analyzes the historical development of the uncertainty construct. Seminal management literature is used to trace the construct's evolution over the last 60 years and to speak to the original meanings of its key elements. The rise of the information uncertainty and resource dependence schools is explored, as is the evolution of the construct's operationalization from simple to complex measures. Insights provided by this analysis form the basis of a categorization scheme for conceptualizations and operationalizations of uncertainty. This categorization and the discussion that accompanies it are intended to provide future researchers with greater precision and consistency in the use of the environmental uncertainty construct.

From the genesis of management studies it has been recognized that organizations do not operate in a vacuum. In the seminal work, *The Functions of the Executive*, Chester Barnard (1938) theorized that an organization's survival was dependent on its ability to sustain a balance with its external environment by readjusting its internal processes to match the various elements in the environment (Barnard, 1938, p. 6). In recognition of Barnard's observation that firms must maintain equilibrium in an ever-changing environment, a considerable body of literature has developed that is devoted to conceptualizing and comprehending the external environment and its role in management theory.

Numerous conceptualizations of environmental uncertainty have been explored in the literature (e.g. Barnard, 1938; Thompson, 1967; Lawrence and Lorsch, 1967; Duncan, 1972; Pfeffer and Salancik, 1978; Milliken, 1987; Tan and Litschert, 1994). The majority of these have rested on one of two dominant perspectives: information uncertainty or resource dependence theory (Tan and Litschert, 1994). The information uncertainty perspective is derived directly from Barnard (1938) and is built on the assumption that uncertainty arises from a lack of perfect information about the environment. Researchers adopting this perspective in their theory building include Lawrence and Lorsch (1967), Thompson (1967), Duncan (1972), Milliken (1987), and Dickson and Weaver (1997).

Barnard's conceptualization of environmental uncertainty dominated discourse in this area of management theory until the early 1970s, when another school of thought began to develop with Child (1972). Child attributed environmental uncertainty primarily to organizational dependence on resources and argued that uncertainty arises

as firms attempt to manage critical resource flows from partners who have varying degrees of power (Pfeffer and Salancik, 1978). Researchers whose work has primarily focused on this aspect of environmental uncertainty include Child (1972), Pfeffer and Salancik (1978), Dess and Beard (1984), and Finkelstein (1997).

Throughout the last three decades both schools of thought have made significant contributions to the field of management studies. However, scholars employing either theoretical lens have encountered a significant challenge in the operationalization of the environmental uncertainty construct (Milliken, 1987; Gerloff *et al.*, 1991). Early efforts to capture environmental uncertainty tended to employ relatively simple, unidimensional measures. Over time, measures of environmental uncertainty have tended to become increasingly complex with numerous contemporary researchers (e.g. Steensma *et al.*, 2000) utilizing multidimensional tools. Unfortunately, as the various conceptualizations and operationalizations of uncertainty have evolved, the true meaning of the construct has become muddled (Milliken, 1987; Koberg and Ungson, 1987; Tan and Litschert, 1994). The fundamental concern raised by these developments is that the environmental uncertainty construct may soon be stretched beyond usefulness, as it becomes so broad as to be fundamentally meaningless.

The first step in rectifying this disturbing trend is to return to the nascent stages of environmental uncertainty research and to examine the historical evolution of this concept and its operationalizations. Analyzing the historical development of environmental uncertainty is an essential undertaking, as the "study of evolving management thought can provide the origins of ideas and approaches, trace their development ... and thus provide a conceptual framework which will enhance



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the process of integration. A study of the past contributes to a more logical, coherent picture of the present" (Wren, 1979, p. 4).

Management history also plays an important role in determining the true meanings of key management concepts (McMahon and Carr, 1999; Rutgers, 1999). Koontz (1996) claimed that imprecise terminology is one of the most significant problems currently inhibiting organizational research. He argued "as is so often true when intelligent men argue about basic problems, some of the trouble lies in the meaning of key words. The semantics problem is particularly severe in the field of management" (Koontz, 1996, p. 27). This semantics problem poses a significant threat to research on the environmental uncertainty construct. If the study of environmental uncertainty is to continue making a significant contribution to the field of management studies, then it is imperative that researchers be made aware of the fundamental elements of the uncertainty construct present in these various conceptualizations.

This paper presents a systematic analysis of the historical development of the uncertainty construct and evaluates its current state. Utilizing the early environmental literature, the authors trace the development of environmental uncertainty over the last 60 years. The rise of the information uncertainty and resource dependence schools are explored, as is the evolution of the construct's operationalizations from simple to complex measures. The insights provided by this analysis form the basis of a categorization scheme for conceptualizations and operationalizations of the uncertainty construct. This categorization scheme provides insight into the fundamental elements of the environmental uncertainty construct and enables future researchers with a tool to ensure greater precision and consistency in the use of this construct.

### **Early conceptualizations of environmental uncertainty**

In the management literature, the external environment can be broadly defined as "the totality of physical and social factors that are taken directly into consideration in the decision-making behavior of individuals in organizations" (Duncan, 1972, p. 314). Organizational researchers have long theorized that the overall environment consists primarily of several independent components (e.g. Duncan, 1972; Miles and Snow, 1978; Hambrick, 1982). Among the most

significant elements that were theorized to exist in the external environment were customers, competitors, government regulations and labor unions. While the individual components that made up each researcher's conception of the environment were not always the same, each conception agreed that the various environmental elements acted to create uncertainty for firms.

Chester Barnard (1938) was one of the first management scholars to explore the relationship between firms and their external environment. In his work, *The Functions of the Executive*, Barnard examined the impact that environmental uncertainty had on organizational strategies. Barnard believed that the physical environment was inherently unstable and that this instability created strategic uncertainty for firms. He argued that the primary reason for this uncertainty was the inability of managers to comprehend all the information present in a given environmental situation. Barnard felt that "under most ordinary conditions, even with simple purposes, not many men can see what each is doing or the whole situation" (Barnard, 1938, p. 106). This lack of perfect information about the environment posed significant problems for both firms and managers as it created ambiguity during the strategic decision making process.

Barnard believed that organizations should survey the opportunities and threats present in the external environment before deciding whether to operate in that environment. He argued that interacting or not interacting "with a particular environment centers on the identification of the key strategic factor and the ability of the organization to provide the missing factor, or to be able to effectively match the current capacities of the organization with the key strategic factor in such a way as to create an advantageous opportunity for the organization" (McMahon and Carr, 1999, p. 233).

Simon (1957), March and Simon (1958), and Cyert and March (1963) expanded on the work of Barnard contending that managers were forced to make decisions under conditions of "bounded rationality." Bounded rationality concerns itself with organizational processes related to the "choice of courses of action in an environment which does not fully disclose the alternatives available or the consequences of those alternatives" (Thompson, 1967, p. 9). A logical result of bounded rationality is that managers and firms are not able to fully understand complex environments, and are forced to

make decisions while possessing incomplete information about their strategic options.

## **Two dominant perspectives: information uncertainty and resource dependence theory**

### **Information uncertainty perspective**

In the 1960s, authors further elaborated on the information uncertainty perspective developed by Barnard. Lawrence and Lorsch (1967) and Duncan (1972) both argued that imperfect knowledge about the environment created uncertainty for firms. It was also posited that managers would perceive the environment in ways that were consistent with their training and personal characteristics. As such, managerial perceptions played a significant role in determining the amount of uncertainty managers perceived in the environment.

Within the information uncertainty school of thought, Lawrence and Lorsch (1967) defined three components of environmental uncertainty. The first component, based on the work of Barnard, was the lack of clear information available about the external environment. The second component was the long time span required for feedback after strategic action. Even after a firm had formulated and implemented a strategy, it still might not be sure if it had achieved a fit with its external environment. The final component was the general uncertainty inherent in causal relationships. It was very difficult for firms to accurately predict the effects that specific strategic actions would have on the external environment, and also what effect environmental changes would have on the firm.

Duncan (1972) argued "uncertainty and the degree of complexity and dynamics of the environment should not be considered as constant features in any organization. Rather, they are dependent on the perceptions of organization members and thus can vary in their incidence to the extent that individuals differ in their perceptions" (Duncan, 1972, p. 325). He believed that the overall amount of uncertainty present in the environment was determined by managerial perceptions of that environment.

Managerial perceptions of environmental uncertainty can also be influenced by the importance managers assign to certain environmental variables. As Hitt *et al.* (1982) explained, "the recognizable pattern of organizational responses to environmental conditions is determined not so much by the objective characteristics of the organization-environment interactions as by managerial

perceptions of the strategic importance of the critical areas contained within different organizational functions" (Hitt *et al.*, 1982, p. 270). Thus, organizations will respond to environmental factors that they judge as having a high degree of importance to firm survival.

The common theme unifying the works of Barnard (1938), Lawrence and Lorsch (1967), and Duncan (1972) was the belief that it was impossible for a firm to acquire perfect knowledge about its environment and this lack of information created uncertainty for the firm. The threats and opportunities that managers perceived to exist in the external environment ultimately determined a firm's choice of strategic actions and influenced a firm's evaluation of its strategic options. As perceptions can directly influence the firm's actions, researchers in the information uncertainty school were not especially concerned with the objective environment (Sharfman and Dean, 1991).

Consistent with their argument that managerial perceptions ultimately shape strategy formation, researchers in the information uncertainty school have typically employed perceptual measures of uncertainty (Duncan, 1972; Miles and Snow, 1978; Tung, 1979; Hrebiniak and Snow, 1980; Milliken, 1987; Daft *et al.*, 1988; Sawyerr, 1993; Buchko, 1994; Dickson and Weaver, 1997). These researchers "objected to the use of objective measures of environmental uncertainty. They argue[d] that firms respond to the environment perceived and interpreted by the decision makers and that the environmental conditions that are not noticed do not affect management's decisions nor actions" (Sawyerr, 1993, p. 290).

### **Resource dependence theory**

In the early 1970s researchers began to question whether managers were able to accurately perceive the threats and opportunities actually present in the external environment. Scholars soon began to search for a more objective method of operationalizing the environmental uncertainty construct. Attempting to solve this dilemma, researchers in the 1970s began to explore resource dependency as a more objective measure of the uncertainty that organizations faced when dealing with their environment.

Pfeffer and Salancik (1978) utilized the previous environmental literature to develop resource dependence theory. Resource dependence theory is based on the notion that environments are the source of scarce resources and organizations are dependent on these finite resources for survival. A lack



of control over these resources thus acts to create uncertainty for firms operating in that environment. Organizations must develop ways to exploit these resources, which are also being sought by other firms, in order to ensure their own survival.

According to Pfeffer and Salancik (1978):  
... the elemental structural characteristics of environments are concentration, the extent to which power and authority in the environment are widely dispersed; munificence, or the availability or scarcity of critical resources; and interconnectedness, the number and pattern of linkages, or connections, among organizations. These structural characteristics, in turn, determine the relationships among social actors – specifically, the degree of conflict and interdependence present in the social system. Conflict and interdependence, in turn, determine the uncertainty the organization confronts (Pfeffer and Salancik, 1978, p. 68).

Pfeffer and Salancik determined three factors that influenced the level of dependence organizations had on particular resources. First, the overall importance of the resource to the firm was critical in determining the resource dependence of the firm. Second, the scarcity of the resource was also a factor. The more scarce a resource was, the more dependent the firm became. Finally, another factor influencing resource dependence was the competition between organizations for control of that resource. Together, all three of these factors acted to influence the level of dependence that an organization had for a particular resource.

Resource dependence theory also inferred that a firm's strategic options were determined to a great extent by the environment. Since firms were dependent on the environment for resources, they needed to enact strategies that would allow them to acquire these resources. Therefore, the external environment had already been determined for these firms, and they experienced little strategic choice. However, those who supported the notion of managerial choice argued that some organizations were more effective than others in the same environments, thus proving that strategic choice did exist.

Hrebiniak and Joyce (1985) argued that strategic choice and environmental determinism did not have to be mutually exclusive. They reasoned, "control over scarce resources is central to the relationship between choice and determinism" (Hrebiniak and Joyce, 1985, p. 343). Lawless and Finch (1989) found limited support for the model developed by Hrebiniak and Joyce, stating that "parts of the model were not supported by our analysis, and that further questions ...

are actually raised" (Lawless and Finch, 1989, p. 361). Bedeian (1990) argued that neither argument is completely accurate, as "organizational adaptation is an ongoing, multi-directional relationship in which organizations neither mechanistically react to environmental forces nor exercise unrestricted free will (strategic choice)" (Bedeian, 1990, p. 571).

Within the resource dependence school, the environment was seen as the source of scarce resources that were critical to a firm's survival. It was the lack of control over these critical resources, rather than a lack of information, that gave rise to environmental uncertainty. Environments that contained high levels of resources were perceived as less hostile to the stability of organizations, whereas those with low levels of resources acted to increase the intensity of competition among firms. Accordingly, resource dependence theorists argued that in order to reduce the impact of this environmental uncertainty on organizational performance, it was necessary for organizations to develop and sustain effective relationships with their external environment.

### **Perceptual versus archival measures of uncertainty**

In operationalizing the environmental uncertainty construct, researchers in the resource dependence school have utilized both perceptual and archival measures of environmental uncertainty. However, archival measures have been most commonly employed to yield an objective measure of resource hostility (Dess and Beard, 1984; Yasai-Ardekani, 1989; Boyd, 1990; Wiersema and Bantel, 1993; Goll and Rasheed, 1997; Simerly and Li, 2000). These authors believed that the scarcity of resources in an environment was an objective reality, and thus needed to be measured objectively. Yasai-Ardekani (1989, p. 133) stated that "environmental munificence and scarcity refer to the objective condition of an environment and were thus measured with objective industry-demand data".

A limited number of researchers have instead used perceptual scales in order to measure the level of environmental resource dependence (Koberg, 1987; Koberg and Ungson, 1987; Tan and Litschert, 1994; Tan, 1996). In a study of the joint effects of environmental uncertainty and resource dependence, Koberg and Ungson (1987) claimed that "consistent with the argument that perceptions of organizational contingencies and not objective properties determine decision-making behavior, two perceptual measures of environment were

employed. One was a measure of environmental uncertainty ... the other was a measure of environmental resource dependence" (Koberg and Ungson, 1987, p. 729).

### **Simple and complex measures of environmental uncertainty**

As conceptualizations of environmental uncertainty have continued to evolve in the management literature, so too have operationalizations of uncertainty. Since the seminal works in the information uncertainty and resource dependence schools both posited that only one primary source of uncertainty existed in the external environment, researchers utilized simple measures to operationalize the uncertainty construct. As research in this area matured, scholars increasingly argued that several factors acted together to determine the total amount of uncertainty a firm faced in the environment. To reflect this belief and to form a more comprehensive view of uncertainty that had been lacking in the early literature, multidimensional operationalizations of uncertainty were developed (Milliken, 1987; Tan and Litschert, 1994).

Thompson (1967), in *Organizations in Action*, argued "uncertainty appears as the fundamental problem for complex organizations and coping with uncertainty, as the essence of the administrative process" (Thompson, 1967, p. 159). He conceptualized a firm's external environment in terms of two main dimensions: heterogeneity/homogeneity and stability/dynamism. A heterogeneous environment consisted of many elements that were different in nature; a homogeneous environment contained very similar elements. The stability/dynamism dimension referred to the rate of change present in the environment. A dynamic environment changed at a very rapid pace and thus created a great deal of uncertainty for firms; a stable environment typically remained unchanged and was therefore more predictable.

Duncan (1972), employing the works of Emery and Trist (1965) and Thompson (1967), also argued that there were two main dimensions along which the environment could be measured. Duncan called these the simple-complex dimension and the static-dynamic dimension. The simple-complex dimension measured the number of factors that were present in the environment. A simple environment consisted of a small number of key factors; a complex environment contained many different

defining factors. The static-dynamic dimension of the environment was concerned primarily with the amount of change in these factors. A static environment experienced little or no change, while a dynamic environment was in a constant state of change.

Child (1972) utilized three dimensions to conceptualize the external environment. His first two dimensions were similar to those theorized by Thompson (1967) and Duncan (1972), measuring both rate of change and complexity. However, he also drew upon the resource dependence literature to develop a third dimension called "illiberality." Illiberality referred to the overall availability of resources in the external environment.

### **Dynamism, complexity and munificence**

Integrating the work of previous authors, Dess and Beard (1984) employed three environmental dimensions in their measure of uncertainty. These three dimensions, which were very similar to those developed earlier by Child, were "dynamism," "complexity," and "munificence." The first dimension, "dynamism," referred to the "rate of change and innovation in an industry as well as the uncertainty or predictability of the actions of competitors and customers" (Miller and Friesen, 1983, p. 222). Dynamism in Dess and Beard's measure was similar to the stability/dynamism dimension of Thompson's measure, the static-dynamic element of Duncan's, and the variability component of Child's.

The second dimension of Dess and Beard's measure was "complexity." Complexity referred to "the level of complex knowledge that understanding the environment requires" (Sharfman and Dean, 1991, p. 683). This dimension was concerned with the overall number of factors that a firm needed to analyze in its external environment. Thompson's heterogeneity/homogeneity dimension and Duncan's simple-complex component were both very similar to complexity. As the number of environmental factors that must be considered by a firm increased, so did the level of uncertainty present in the environment.

The final component of Dess and Beard's (1984) operationalization was "munificence," also known as hostility. This dimension was not part of the earlier constructs developed by Thompson and Duncan, and was referred to as "illiberality" by Child. Munificence described "the level of resources available to firms from various sources of the environment" (Tan, 1996, p. 33). Covin and Slevin (1989) argued, "hostile environments are characterized by precarious industry

settings, intense competition, harsh, overwhelming business climates, and the relative lack of exploitable opportunities” (Covin and Slevin, 1989, p. 75).

According to these authors, the concepts of dynamism, hostility, and complexity could be utilized in order to measure the level of uncertainty present in a given environment (Table I). High levels of dynamism, hostility, and complexity all acted to create high levels of uncertainty. Low levels acted to reduce the overall amount of environmental uncertainty. By analyzing the levels of dynamism, hostility, and complexity present in an environment, firms were able to formulate and implement strategies to match these environments.

### State, effect and response uncertainty

Extending the multidimensional conceptualization of environmental uncertainty, Milliken (1987) built on the work of Lawrence and Lorsch (1967) to develop a measure that distinguished between three types of uncertainty that existed in a firm’s external environment. Milliken’s typology included “state uncertainty,” “effect uncertainty,” and “response uncertainty.” “State uncertainty” referred to the general unpredictability of the environment and its various components. “Effect uncertainty” was the inability of firms to predict the effect of future environmental changes on their business operations. “Response uncertainty” captured the difficulty firms had in predicting the response of their competitors to a particular strategy that the firm implemented. According to Milliken, these three concepts acted together to determine the overall level of uncertainty present in a firm’s external environment.

### Analyzing key elements of the uncertainty construct: a new categorization scheme

An examination of the evolution of the conceptualization and operationalization of the environmental uncertainty construct reveals that the seminal works on

uncertainty can be categorized according to two predominant factors:

- 1 the primary source of uncertainty theorized by the author (i.e. information uncertainty or resource dependence); and
- 2 the complexity of the measure employed to operationalize this uncertainty (i.e. simple versus complex).

Figure 1 summarizes the major works on environmental uncertainty according to these two factors.

It is important to note that while operationalizations of environmental uncertainty have become more complex with time, simple measures can still significantly contribute to organizational research. Indeed, depending on the research questions under consideration the operationalizations of environmental uncertainty in each sector of this figure have the potential to address critical issues. Issues that delineate the appropriateness of each measure include whether uncertainty is a primary or secondary variable of interest and the characteristics of the population under consideration, including firm and industry level factors.

Simple measures are useful when uncertainty is a secondary variable of interest and only broad analyses are necessary. These measures of uncertainty tend to be less precise than complex measures, but are generally easier to calculate. Multidimensional operationalizations are useful when uncertainty is the primary variable of interest. These measurements tend to be more comprehensive than those attained through simpler methods and provide a more complete set of information for the researcher.

Characteristics of the population under consideration provide a useful indication of whether a researcher should employ measures from the information uncertainty or resource dependence schools. Information uncertainty measures are useful in studying firms that are dependent on information for their economic prosperity, such as those in technology-based industries (i.e. Internet firms, the electronics industry, etc.). These firms tend to be agile and flexible, and usually operate in highly competitive industries. Resource dependence theory provides an effective tool for measuring the uncertainty faced by firms in resource-intensive industries (i.e. mining, manufacturing, etc.). These firms tend to have larger, more traditional organizational structures and are less dependent on technology for their survival.

**Table I**  
Components of multidimensional constructs

Author	Rate of change	Level of complexity	Availability of resources
Thompson (1967)	Stability/dynamism	Heterogeneity/homogeneity	
Duncan (1972)	Static/dynamic	Simple/complex	
Child (1972)	Variability	Complexity	Illiberality
Dess and Beard (1984)	Dynamism	Complexity	Munificence



**Figure 1**  
Categorization of seminal environmental works

		Complexity of Measure	
		SIMPLE MEASURE	COMPLEX MEASURE
S o u r c e  o f  U n c e r t a i n t y	INFORMATION UNCERTAINTY	<i>BARNARD (1938)</i>  <i>LAWRENCE &amp; LORSCH (1967)</i>	<i>THOMPSON (1967)</i>  <i>DUNCAN (1972)</i>  <i>MILLIKEN (1987)</i>
	RESOURCE DEPENDENCE	<i>PFEFFER &amp; SALANCIK (1978)</i>	<i>CHILD (1972)</i>  <i>DESS &amp; BEARD (1984)</i>

Figure 2 summarizes the primary research situations in which measures from the four different quadrants should be utilized. It also lists examples of recent articles that have productively employed each particular operationalization.

The first quadrant (information uncertainty/simple measure) of this matrix contains measures useful when studying firms competing in information-based industries, where only a general measure of uncertainty is needed. For example, Bergh

**Figure 2**  
Primary research situations by category

		Complexity of Measure	
		SIMPLE MEASURE	COMPLEX MEASURE
S o u r c e  o f  U n c e r t a i n t y	INFORMATION UNCERTAINTY	<ul style="list-style-type: none"> <li>• Secondary variable of interest</li> <li>• Agile, flexible firms</li> <li>• Technology-based industries</li> <li>• <i>Bergh and Lawless (1998)</i></li> </ul>	<ul style="list-style-type: none"> <li>• Primary variable of interest</li> <li>• Agile, flexible firms</li> <li>• Technology-based industries</li> <li>• <i>Boyd and Fulk (1996)</i></li> </ul>
	RESOURCE DEPENDENCE	<ul style="list-style-type: none"> <li>• Secondary variable of interest</li> <li>• Large, traditional firms</li> <li>• Resource-intensive industries</li> <li>• <i>Finkelstein (1997)</i></li> </ul>	<ul style="list-style-type: none"> <li>• Primary variable of interest</li> <li>• Large, traditional firms</li> <li>• Resource-intensive industries</li> <li>• <i>Lawless and Finch (1989)</i></li> </ul>

and Lawless (1998) employed a very simple measure of uncertainty in an article related to firm diversification. The authors calculated uncertainty as the change in net sales over a given period of time. Although this did not provide a very precise measure of environmental uncertainty, it was sufficient to support their findings that uncertainty affects the relationship between diversification strategy and portfolio restructuring (Bergh and Lawless, 1998, p. 98).

The measures in the second quadrant (information uncertainty/complex measure) allow for a much more precise measurement of uncertainty. Boyd and Fulk (1996) employed a very sophisticated measurement of information uncertainty in their study. They developed four perceptual measures to gauge the amount of uncertainty present in the environment: the adequacy of information available about the environment, and the overall analyzability, predictability, and variability of the environment. Given their particular research situation, their findings supported modeling uncertainty "with multiple indicators" (Boyd and Fulk, 1996, p. 14).

The third quadrant (resource dependence/simple measure) contains operationalizations that can be effectively utilized while performing research on traditional firms in resource-intensive industries. Finkelstein (1997) examined resource dependence theory by utilizing a basic construct developed by Pfeffer (1972). Similar to Pfeffer's seminal work, Finkelstein measured inter-industry mergers in the context of resource dependence theory. Although their findings were not identical, Finkelstein concluded, "the basic resource dependence hypothesis on the relationship between interindustry transactions and mergers was supported" (Finkelstein, 1997, p. 808).

The fourth quadrant (resource dependence/complex measure) contains measures that should be employed when uncertainty is the primary variable of interest and resource availability is a major factor being considered. Lawless and Finch (1989) utilized a very complex construct in order to measure resource dependence theory. The authors used the values calculated by Dess and Beard (1984) to determine the validity of Hrebiniak and Joyce's (1985) model of organization-environment relations. They measured munificence, complexity, and dynamism for all four environmental types proposed in the model. Their findings suggest, "relationships between returns and particular strategy

types vary by environment" (Lawless and Finch, 1989, p. 360).

Although this is by no means an exhaustive list of the articles that have recently employed measures of environmental uncertainty, it is clear that each quadrant in this classification scheme has value in answering specific research questions. Simple measures are effective when uncertainty is a secondary variable of interest, while complex measures allow for precise measurements when uncertainty is the primary variable being studied. Operationalizations from the information uncertainty and resource dependence schools can also be effectively utilized when performing organizational research, depending primarily on the characteristics of the firm and industry being studied.

### **A decision tree for studying the environmental uncertainty construct**

The categorization scheme developed in this paper provides a decision tree that can be utilized when studying the environmental uncertainty construct. First, the researcher must determine whether environmental uncertainty is the primary or secondary variable being studied. If uncertainty is the primary variable of interest, then the researcher should employ a complex measure in order to ensure more precision and comprehensiveness while measuring the construct. If uncertainty is only a secondary variable of interest, then researchers need only employ simple measures that are easier to calculate and provide more generalized information regarding the amount of uncertainty present in the external environment.

Second, the attributes of the firms and industry in the study must be closely examined. The primary focus of the researcher during this stage should be in determining whether a information uncertainty or resource dependence perspective more closely aligns with their specific research questions and sample characteristics. If the industry being studied tends to experience rapid change and the firms in this industry are dependent on information from the environment, then measures based on the information uncertainty perspective should be employed. If the change rate in the industry is slow and firms tend to be more dependent on acquiring environmental resources than information,



then researchers should utilize measures developed from resource dependence theory.

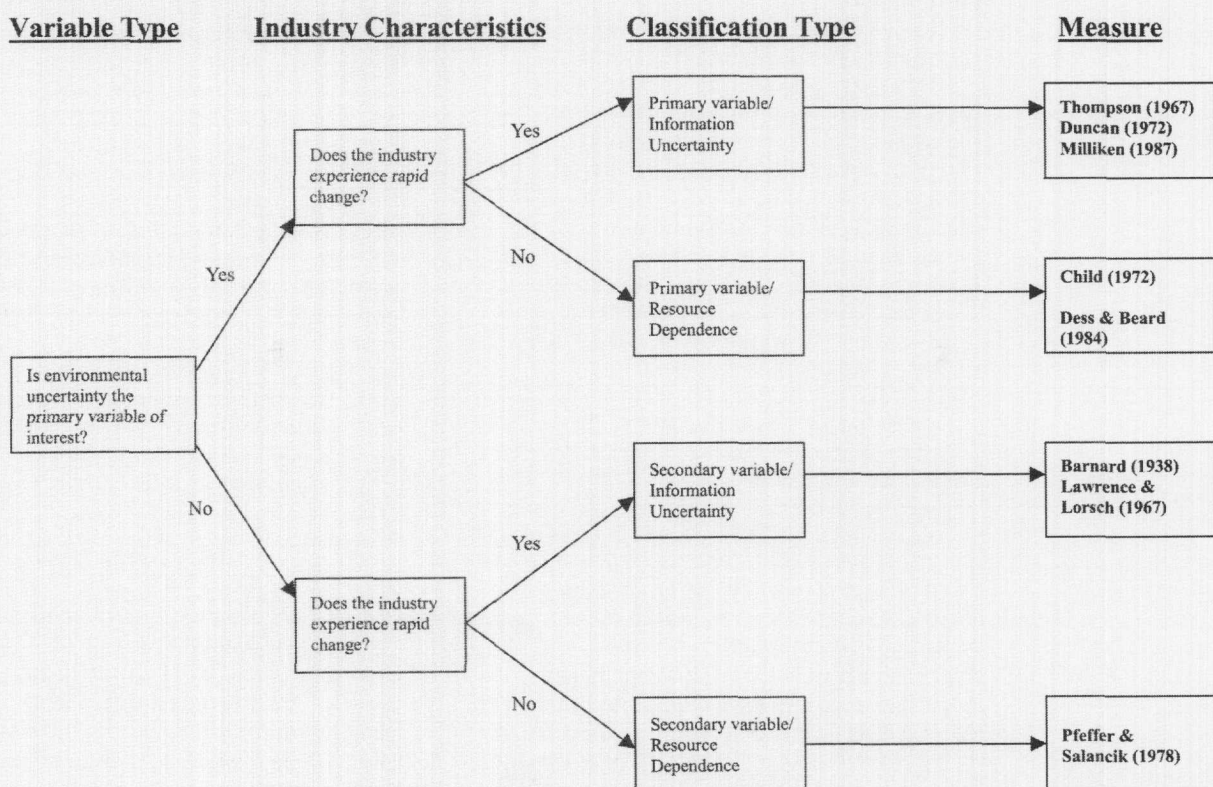
After performing these two analyses, the organizational researcher can determine the measure of uncertainty that would be most appropriate in their study. Figure 3 provides a decision tree that can aid researchers in determining which of the four types of environmental uncertainty measures delineated in this article would be most appropriate for their purposes. For example, a researcher who is studying uncertainty as a primary variable of interest (thus needing a precise measure of uncertainty) and whose sample consists of firms in a rapidly changing, information-dependent industry (such as e-commerce), could choose from the measures of environmental uncertainty developed by Thompson (1967), Duncan (1972), or Milliken (1987). Thus, through the two-step process of determining whether uncertainty is a primary or secondary variable of interest, and analyzing the characteristics of the firms and industry being studied, organizational researchers can utilize the decision tree presented in Figure 3 to choose and employ measures of uncertainty that provide the richest information in their particular research situation.

### Summary observations

Multiple operationalizations have developed over the last 60 years to measure the amount of uncertainty present in the external environment. Each of these measures can be effectively utilized in performing organizational research depending upon the specific research questions being addressed. This article has presented a systematic method for determining which measure should be utilized in a given research situation. While none of the four categories of measures discussed in this paper is perfect in every research situation, each can be effectively employed in specific situations to perform research on the topic of environmental uncertainty.

The most significant problem raised by this analysis is the threat of concept stretching in regard to the environmental uncertainty construct. As conceptualizations of uncertainty have continued to evolve and diverge from one another over the last 60 years, integrating research streams and ensuring the generalizability of results on this topic has become increasingly difficult. The categorization scheme and decision tree developed in this paper provide a starting point to reverse this unsettling trend.

**Figure 3**  
A decision tree for measuring environmental uncertainty



Research on environmental uncertainty has several practical implications. In order to sustain organizational growth and survival, firms must be able to successfully interact with their external environment. One of the key factors in so doing is a firm's ability to effectively handle the problems created by environmental uncertainty. By studying the topic of uncertainty, researchers are better able to understand the relationship that exists between an organization and its external environment. The categorization scheme presented in this paper provides a valuable tool for future investigation of the uncertainty construct. By determining the theoretical foundation of the question under consideration and the role of environmental uncertainty in the research model, investigators can employ this categorization scheme to choose the appropriate measure of environmental uncertainty.

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