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thesis entitled

CHARACTERISTICS OF PERCEIVED ENVIRON -
MENTAL UNCERTAINTY, TASK INTERDEPENDENCE
AND THEIR RELATIONSHIP TO SUBUNIT POWER
IN COMPLEX ORGANIZATIONS

presented by

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has been accepted towards fulfillment
of the requirements for

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ABSTRACT

CHARACTERISTICS OF PERCEIVED ENVIRONMENTAL
UNCERTAINTY, TASK INTERDEPENDENCE
AND THEIR RELATIONSHIP TO SUBUNIT
POWER IN COMPLEX ORGANIZATIONS

By

Thomas Harry Dulz

This study has two main focuses. The first is on the conceptualization and identification of organization environments and dimensions of the environment. The second is on the relationships between task and environmental variables and subunit power.

The sample consists of three subunits of sales, manufacturing and engineering in each of twelve manufacturing firms operating in similar macro environments and having similar technologies. A twenty-item questionnaire was administered to the chief executive officer and the respective heads of sales, manufacturing and engineering in each firm for a total of forty-eight respondents. As the units of analysis are organizations and subunits, responses are pooled to reflect the shared perceptions of the executive group in each organization.

Environmental components are specified in terms of systemic inputs. Based on a conceptualization of an organization as an open system, six systemic inputs are identified which are common to all classes of organizations. These six inputs are the avenues or "linkages" between the organization and its environment and are: 1) labor supply; 2) material supply; 3) capital supply; 4) product technology; 5) process technology;

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and 6) markets. The environment is conceptualized in terms of six components corresponding to each of these six linkages.

An environmental dimension which has gained much attention in the literature is that of uncertainty. However, to this point, it has not been well identified nor operationalized. This study builds on previous work in this area and empirically demonstrates the relationship of perceptions of change and complexity to perceived uncertainty. The more dynamic and complex the environment is seen, the greater the degree of uncertainty associated with that environment. The strongest relationship is between the dimension of change and uncertainty. If an environment is seen as dynamic, it is also seen as complex.

The dimensions of performance and immediacy have a mediating effect on perceptions of uncertainty. There is a strong relationship among the firms in this sample between past organizational profitability and perceptions of uncertainty in the market component of the environment. The more profitable a firm has been in the past, the less uncertainty there is associated with the market component.

There is a significant difference in perceptions of uncertainty in the various environmental components. Labor, material and markets are seen as the most uncertain components of the environment followed by process technology, product technology and then capital which is seen as the least uncertain. The environmental components which have the greatest sense of immediacy for the organization in terms of effects - labor, material and markets - are seen as highly uncertain regardless of the degree of change or complexity associated with them. These results indicate that perceptions of uncertainty are a result of the interaction of change, complexity and immediacy, tempered by past performance.

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Perceived subunit power is highly correlated with perceived environmental complexity and perceived task interdependence, which suggests that, to a large degree, power arises out of the dependencies created by environmental and task demands. The more a subunit is seen as affecting others by virtue of its task activities, the more power it is seen as having in systemic decision areas. In relatively placid, stable environments, subunits whose environmental domains are identified as more complex and turbulent are in a position to be more easily identified as controlling organization dependencies rooted in the environment and can draw power from this position. However, when the total environment is identified as complex and turbulent, no one domain stands out, and consequently, no one subunit can lay claim to control of environmental dependencies. In this situation, no single unit is clearly differentiated from the rest in terms of dependency control and so, the focus turns to task dependencies as a base for subunit power.

No significant relationships are found between perceptions of task uncertainty, task difficulty, environmental uncertainty, or an imbalance in task interdependence and the variable of subunit power. However, the subunit seen as most critical is also seen as the most powerful.

More reported differences are found when organizations are compared on the basis of environment type than on the basis of performance. Organizations experiencing relatively high levels of environmental uncertainty and turbulence also report higher degrees of task interdependence, irrespective of economic performance levels. Consistent with other reports is the finding that there is more self-reported power in more profitable firms.

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UNCERTAINTY, TASK INTERDEPENDENCE
AND THEIR RELATIONSHIP TO SUBUNIT
POWER IN COMPLEX ORGANIZATIONS

By

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INTRODUCTION

The original intent of this dissertation was to investigate the bases of subunit power in complex organizations. A review of the literature generated the following conclusions. 1) Power is a very complex phenomenon and there is little agreement on its characteristics. 2) In most research, power is treated at the individual and interpersonal level as an independent variable. Only two studies are found where subunit power is the dependent variable. 3) The "newer tradition" in organization theory places a heavy emphasis on technologies and environments. There has been little agreement on the conceptualization of an organization's environment or the elements comprising it. 4) Theorists suggest that power is related to coping with uncertainties stemming from technologies and environments.

These conclusions governed the design of this study. The first task was to design a model of organization environment, which would not be organization-specific and could be used across other classes of organizations in future research. The second task was to operationalize the concept of environmental uncertainty. Chapter One deals with these problems. Chapter Two deals with the issue of power, and specifically subunit power. Various dimensions of power are discussed and operationalized, drawing on the most recent work in this area, and relationships to technological and environmental variables are suggested.

The sample chosen for this study consists of twelve manufacturing

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firms selected according to the following criteria. 1) They were to be as similar as possible in structure, technology and environments to allow comparisons between them. 2) They were to be simple in nature.

Because the study is exploratory, with the relationships between variables yet to be established, it was felt that large scale organizations would introduce an element of complexity which would make the analysis more difficult. Consequently, the sample consists of small systems comprised of three main subunits - manufacturing, sales and engineering.

Chapter Three presents twelve hypotheses derived from the discussion in Chapters One and Two. It was not expected from the outset that all of these hypotheses would be supported by the data. They were chosen because they represent directions suggested by the literature. Chapter Three also contains a list of variables used in the study and explains how each is operationalized.

Chapter Four discusses the development of the instrument and the methodology used. The results of the study are presented in Chapter Five, and the concluding chapter, Chapter Six, reviews this data analysis, summarizes the study as a whole, and places the findings in a broader organizational context.

CHAPTER ONE

THE ENVIRONMENT

In recent years, organization theorists have been asserting that the environment is a critical factor in understanding and explaining much of what goes on inside organizations. One of the earliest proponents of this theme was Dill (1958) who traced differences between the two Norwegian firms he studied to differences in their respective environments. Dill's contribution was not simply an acknowledgement of environmental effects, other researchers had reported organizational-environmental interactions (e.g., Selznik, 1949), but rather, he was one of the first to offer a theoretical conceptualization of the environment. He differentiated between the "general" environment in which all firms operate, and the "task" environment which is unique to each firm. He identified the task environment as being composed of four sectors: customers; suppliers; competitors; and regulatory groups, each of which are characterized as being relatively homogeneous or heterogeneous.

Interdependencies were the focus of an article by Emery and Trist (1965). They differentiated between "internal interdependencies" -- processes within the organization; "transactional interdependencies" -- exchanges between the organization and its environment, in either direction; and "causal texture" -- those interdependencies within the environment itself. This conceptualization is similar in many respects to Parson's (1960) "levels" of organizational responsibility and control.

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Parson's "technical", "managerial", and "institutional" levels correspond roughly to Emery and Trist's "internal interdependencies", "transactional interdependencies", and "causal texture". Emery and Trist distinguished four types of environments according to the degree to which environmental components exhibited "system connectedness". Their interest was centered on the most complex of the four, which they called "turbulent field". In this type of environment, changes "arise from the field itself" not just from interactions of the components. A "turbulent field" is characterized by "autochthonous processes". Emery and Trist argued that the firm they studied, a vegetable canner, did not recognize the fact that it was operating in a "turbulent field" environment and was unprepared for environmental changes which resulted in a decreasing market for its product. In an often-cited article, Terreberry (1968) building on the work of Emery and Trist and others, argues for the increasing importance of the environment as an organizational variable. She argued that a "turbulent field" environment best described the situation for contemporary organizations and that environments were becoming increasingly "turbulent". She further maintained that the environment was the most important factor in explaining organizational behavior and hypothesized that "organizational change is largely externally induced". Katz and Kahn (1966) in their discussion of organizations as "open systems" echoed this theme of the importance of the environment, arguing that a necessary system component is the "adaptive function" which has as its aim "environmental constancy". Survival of the system, in their view, is dependent upon the success of the adaptive function.

J. D. Thompson (1967), in his book Organizations In Action, which

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he calls a "conceptual inventory", bases his analysis of organizations on the concept of uncertainty stemming from technologies and environments. He sees environmental influences as ultimately being the most powerful in shaping organizational characteristics. Stinchcombe (1965) takes the position that, not only are existing organizations influenced by environmental forces, but that environmental conditions dictate both the founding of organizations and the forms they will take during their existence.

While the importance of the environment has been well publicized by theoretical writers, a review of the empirical literature discloses that environmental influences are virtually ignored in most studies. Hirsch, in his critique of industrial sociology says: "In short, while we speak of organizations as interacting with their environment (in theory), most empirical studies, by virtue of their design, continue to ignore the process by which this interaction occurs". (1976:5) Not only is the inclusion of the environment as a variable important in inter-organization and organizational analysis, but it is also an important factor in intra-organizational analysis. It is possible that much of the disparity in research findings could be explained if the nature of the environment were identified. For example, Hinings, et al., (1974) in their study of the bases of organizational subunit power, found, in their sample, that production was the most powerful subunit in contradiction to Perrow (1970b) who found sales to be the most powerful subunit in the firms he studied. Neither researcher identified the nature of the environment of their sample firms. It is possible that much of the variation in these findings could stem from environmental differences.

In fact, the value of any study done in an organizational setting

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would be enhanced if there were some identification of the environment. Gouldner (1954) and Guest (1962) both examined the consequences following the succession of a new manager in an organization. Gouldner found increased stress and tension following the arrival of the new manager while Guest found the opposite to be the case. Gouldner (1962) in a later comment pointed out that the environmental circumstances of the organizations were very different, hence, any direct comparisons should be avoided.

One of the difficulties researchers, such as Guest and Gouldner, face, is that although they may recognize that there are environmental differences which may have a bearing on their findings, there is no common agreement or precedent on which to make environmental comparisons. At this stage, all we know is that circumstances surrounding each study are "different". We are not yet able to agree on the relevant dimensions of these differences. The identification of the environment has not been clearly specified in the literature. Accordingly, the following discussion will delineate some of the major issues of environmental conceptualization and suggest a methodology for environmental identification.

Conceptualization of the Environment

The generalized term "environment" encompasses an infinite number of elements, some of which, but not all, will be relevant for any given organizational analysis. The first issue to be considered is the question of what is the environment. A separate, but related issue is, once the environment has been identified, what is the nature of it. On the surface, this seems like a very elemental distinction, too trivial to

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discuss. However, a review of the literature shows that this distinction has not always been observed. For example, Emery and Trist (1965), J. D. Thompson (1967), and Terreberry (1968) all discuss the nature of environments, (in terms of "turbulent field", homogeneity, etc.) based on some a priori identification which they do not make clear. A more recent case is the article by Jurkovich (1974) who offers a "core typology consisting of 64 types", all of which are descriptive and assume a prior identification. While it may be argued that these theorists did not intend to deal with the issue of identification, choosing instead to introduce criteria for evaluation and describing, still, this is an issue that must be dealt with if a theory of organizational-environment relations is to be developed.

The Elements of a Methodology

The first question to be dealt with in environmental identification is the method one would use in identification. The following discussion proposes a method of identification based on the notion of an organization as an open system. It begins with the question: "If an organization is an open system, where, and in what ways is it open?" The initial focus is on possible environment/organization linkages, which then provide direction for searches out into the environment for relevant factors and also back within the organization for environmentally sensitive elements.

It is assumed that the organization is an "open system" subject to the influence of environmental complexities and as such exhibits the following systemic characteristics: 1) energetic input; 2) transformation of energies within the system (throughput); and 3) energetic output

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(Katz and Kahn, 1966:19-20; J. D. Thompson, 1967:23-24). There are, of course, other characteristics which are descriptive of systems, but the three just mentioned are the most relevant in terms of environment/organization linkages. These three provide a guide for the following discussion.

Energetic Input

Organizations import two basic categories of energy from the environment. The first of these is labor -- those individuals who possess the necessary skills and abilities to carry out the functions of the organization but this category includes all forms of labor: consultants; volunteers; owners; slaves; etc. The second category of energetic input is materials, both those needed for system maintenance, such as buildings and supplies; but also those needed for transformation into the finished product, such as,

...a living being, human or otherwise, a symbol or an inanimate object. People are raw materials in people-changing or people-processing organizations; symbols are materials in banks, advertising agencies and some research organizations... (Perrow, 1967:195).

A distinction is made between humans whose contributions to the organization is in the form of skills, such as teachers, social workers, or guards (labor); and humans whose contribution is their presence, such as students, clients, or prisoners (material).

In order to insure system maintenance and survival, an organization must have an ability to procure these two categories of inputs. The means of procurement can be in the form of purchase, barter, seizure, or third party intervention. Control over the means of procurement can be seen as a form of stored or potential energy which affords an

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organization a degree of flexibility. In a money economy this flexibility is enhanced by the possession of capital which can be stored and later exchanged for necessary labor and materials. While strictly speaking, capital is a secondary input, in that it is at some point exchanged for other inputs, it is included in the model because of its ubiquity in this culture. An organization will be linked to its environment through the three categories of inputs just described: 1) labor; 2) material; and 3) capital.

Throughput

Organizations engage in a "pattern directed effort to alter the condition of basic materials in a predetermined manner" (Perrow, 1965:913). This activity corresponds to Katz and Kahn's "throughput" (1966:20), and J. D. Thompson's "technological activities" (1967:19). Throughput includes two elements: the nature of the material; and the nature of the process used to convert the material into an altered state.

The manner in which the nature of the basic material to be processed is defined will have important organizational consequences. The effect of this is seen clearer when we compare organizations which share the same basic material input but define the initial state differently. For example, Perrow (1965) has compared mental hospitals which he classified into two types: "custodial"; and "therapeutic", based upon their respective initial definition of the basic material to be processed -- people, and found them to differ significantly along a number of dimensions. Perrow (1967) and Rushing (1968) both discuss, at some length, organizational consequences stemming from the manner in which the material to be processed is defined. This definition, or

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product technology, is heavily influenced by belief systems, culture, generalized knowledge and other environmental factors.

The nature of the process used to convert the basic material into an altered state also has environmental roots. This process will be identified as process technology which Perrow defines as the "complex of techniques employed to alter material (human or non-human, mental or physical) in an anticipated manner" (1965:915), which also corresponds to J. D. Thompson's conceptualization of "core technology" (1967:19). There is ample evidence in the literature to support the assumption that process technology has an important effect on organizational characteristics (e.g., Blauner, 1964; Woodward, 1965; Perrow, 1970a). As with product technology, process technology has its roots in the environment. Some examples of technological developments that have impacted on organizations in recent years would be: computers and systems analysis; PERT; organization development; credit cards; profit centers; plastics; and so on. Not only are existing organizations influenced by environmentally rooted technologies, but as Stinchcombe (1965) has argued, the influence affects the founding of new organizations. In addition to the inputs of 1) labor, 2) material, and 3) capital, an organization will also be linked to the environment through 4) product technology, and 5) process technology.

Energic Outputs

Outputs are the "products of the system". They can be intended results of the process technology - automobiles rolling off the assembly line - or they can be unintended results - air pollution. They can be tangible, as in the case of salaries, or intangible, such as psychic

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For our purposes, the systemic outputs which have relevance will be those which, in some manner, affect either the energetic input, the through-put, or both. A difficulty here is that given the wide range of outputs, those factors which will affect the organization are often impossible to identify at any given time because of the tenuous and complex relationships between cause and effect. This is especially true when the outputs are mediated by other factors in the "causal texture" (Emery and Trist, 1965), or "institutional level" (Parsons, 1960) of the environment. For example, one of the "outputs" originally associated with the introduction of the automobile was the reduction in pollution as the auto replaced the horse. Much later, the "discovery" of the effects of air pollution stemming from the auto has led to government establishment of standards which have affected both the product and process technologies of the automobile companies.

The effects of outputs on the organization will be felt through one or more of the five inputs previously discussed: labor; materials; capital; product technology; and process technology. Hence, a model of environment/organization linkages could stop with these five components. For organizations where one or more of the end products is converted by sale into money, then product disposition, or the market component of the environment becomes a generalized predictor of future effects on inputs. Consequently, in those cases where the conversion of output into money can be identified, then the market component should be included in analysis. For many organizations, especially those in the "non-profit

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sector" of the economy there is no clear cut market as in many cases the users of the organization's outputs do not supply input resources. Downs (1967) does an excellent job of showing how governmental agencies must tailor their outputs in terms of their efficacy in obtaining system inputs.

An alternate conceptualization is that used by Hinings, et al., where product disposition is seen as a "demand" and hence an input into the system, rather than an output (1974:28). Whichever conceptualization is used, market as an input or output to the system, there is no change in the manner in which this concept would be operationalized.

In the preceding discussion, six environment/organization linkages have been identified based on an open systems model of organizations. These are: those having to do with inputs: labor; material; and capital; those having to do with throughputs: product technology; and process technology; and finally markets which have to do with one form of output - product disposition. All classes of organizations will be open to environmental influences through one or more of these six.

The advantage of this linkage model is that the effects of virtually any environmental factor can be traced through one or more of these six linkages and gives a more precise delineation of organization-environment interactions. As an example, consider one of the most ubiquitous factors in a firm's environment today - the government. Equal employment and minimum wage legislation affects the labor component of organizations. In the sample of firms in this study, one of the often mentioned environmental factors was the OSHA regulations which affected the process technology of these firms. Another governmental intervention which affected the process technology of these companies was the

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introduction of clean air standards and regulations of the state Department of Environmental Protection. Consumer safety standards have affected the product technology of many companies, one of the most publicized cases is that of the automobile industry, resulting in product changes such as lower-emission engines, restraining harnesses, impact-resisting bumpers and so on. In this instance, both product and process technology is affected. Government intervention in these areas also affects the market component, in the case of the automobile industry, one of the results has been the switch in advertising emphasis from performance to gasoline economy. When these changes in product and process technology require capital investments, the capital supply component is affected.

One of the things which must be considered in organization-environment analysis is the fact that not all organizations respond in the same manner to changes in the environment. It is difficult a priori, to forecast how environmental changes will be identified, and consequently what strategies of accommodation will be pursued. For example, a government increase in the tax on inventories may be identified by one firm as requiring a change in process technology - the introduction of a manufacturing process which results in a lower inventory level, or the introduction of a management science technique of inventory control with the same result. Another firm might respond to the same change in the environment by a change in the marketing area - a change in the product mix, dropping those products with high or costly inventories, or increasing the price on the products.

The point is, changes in an organization's environment become relevant in terms of the responses made by the organization in question.

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Not all organizations will respond in the same manner to the same environmental change. Consequently a model of organization-environmental interaction which facilitates the analysis of organizational responses will contribute to a better understanding of organizational behavior. Not only does this linkage model allow the identification of the effects of environmental factors, but also provides a frame of reference from which to determine the relevant environment for any given organization or class of organizations and allows a measure of comparability between organizations. This model will be used in the following discussion of environmental identification.

Identification of the Environment

There are a number of approaches one might take when studying organizational environments, the choice of which must be determined by the aims of the researcher. Osborn and Hunt (1974) propose a typology of three categories of environments: macro, aggregation and task.

The macro environment "is the general cultural context of a specified geographical area and contains those forces recognized to have important influences on organizational characteristics and outputs" (1974:231). The most noted work in this area is that of Stinchcombe's (1965), who examined macro environmental variables such as literacy, urbanization, schooling, political characteristics and organizational density and traced their relationship to the formation and maintenance of general organization types. The value of Stinchcombe's work lies in the demonstration of the effects of macro variables on organizations in general, and is suggestive of some directions empirical research might take.

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The second of Osborn and Hunt's categories is the aggregation environment which they define as "the associations, interest groups, and constituencies operating within a given macro environment." (1974:231-2). This category is similar in many respects to Parson's "institutional level" (1960) and Emery and Trist's "causal texture" (1965). Finally, the task environment "is defined as that portion of the total setting which is relevant for goal setting and goal attainment". (1974:232). This parallels the definitions adopted by Dill (1958), J. D. Thompson (1967), Lawrence and Lorsch (1969), Aldrich (1972) and others.

The preceding categories can be viewed as a pool of potential variables which a researcher will choose to investigate based on his interests. Whichever variables are selected, their choice must be made in terms of a focal organization and that organization's relationships with environmental elements through the six linkage points previously discussed. Kimberly (1975), for example, reports a relationship between the macro variable of increasing "social responsibility" and the increase in income from grants of those rehabilitation workshops which reflected the changed societal values. This is an example of a study identifying an element in the "macro" environment by means of its effects on one of the organizations inputs, in this case, that of capital. Emery and Trist's (1965) conceptualization of the "causal texture" was based on their note of changes in the market linkage of the firm they studied.

The model of environment/organization linkages can not only be used for the identification of the "relevant" environment but can also be used in intra-organizational analysis such as that to be discussed later. In intra-organizational analysis, the focus is not on environmental

elements, but rather on the adaptations and responses the organization makes to the environmental elements. To facilitate this analysis and allow inter-organizational comparisons, what is required is a conceptualization of the environment which is applicable to all organizations being compared. Conceptualization of the environment in terms of the six components discussed above satisfied this requirement. For the purposes of this study, the term "environment" will be taken to mean those factors, outside the boundaries of the organizations studied, which are identified by the respondents as critically affecting the organization in the areas of labor, material, capital, product technology, process technology and markets.

Dimensions of the Environment

Organization analysis requires not only the components comprising the organization's environment be identified, but also the nature, or dimensions of that environment. The following discussion reviews the environmental literature and catalogs the themes common to this literature.

Complexity and Change

Most descriptive treatments of the environment in the literature center around the dimensions of complexity and change. Change is the major theme of Terreberry's (1968) discussion of the increasing importance of the environment as an organizationally relevant variable. Tosi, et al., focus on "range of fluctuations" (1973:30). Osborn and Hunt choose complexity as "an important, if not the most important variable in the environment" (1973:233). Emery and Trist (1965), Lawrence

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and Lorsch (1967), J. D. Thompson (1967), Duncan (1972), and Jurkovich (1974) are just a few of the theorists who have identified change and complexity as major dimensions of the environment. Duncan, in an earlier article, (1972) has suggested the labels "simple-complex" and "static-dynamic" to represent the dimensions of complexity and change respectively. Rather than create a new terminology, his identification of simple-complex and static-dynamic will be adopted for the purposes of this study.

Uncertainty

The concept of uncertainty is a major foundation underlying the work of the theorists in the "newer tradition". Crozier (1964) was one of the earliest to use this concept in accounting for the power of maintenance engineers in the French factory he studied. He equates uncertainty with lack of predictability (1964:109). J. D. Thompson suggests a situation of uncertainty exists when there are "more variables than we can comprehend at one time, or that some of the variables are subject to influences we cannot control or predict" (1967:6). Weick, in dealing with the same issue, substitutes the term "equivocality" which he identifies as the range of "possibilities or sets of outcomes that might occur" (1969:40).

Quantitative decision theorists differentiate between conditions of risk, where the probability of outcomes can be calculated from past events, and conditions of uncertainty where the probabilities must be estimated. While risk is a single category, uncertainty is a continuum ranging "from near accurate estimates based on objective experience to an extreme case in which no knowledge exists" (Archer, 1967:455).

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Lawrence and Lorsch's conceptualization of uncertainty consists of three elements: "clarity of information: uncertainty of cause and effect relationships; and the time span of definitive feedback" (1969:28). Respondent scores on each of these measures was combined to get a "total uncertainty score". Tosi, et al., attempting to validate Lawrence and Lorsch's instrument operationalized uncertainty as the "range of fluctuations of revenues or expenditures" for the firms studied (1973:30). Hinings, et al., assumed that uncertainty is related to unpatterned variability previously experienced, defined as "the degree of constancy or variability in three elements, trend, range, and regularity" (1974:28). They base this conceptualization on their assumption that "uncertainty is a lack of information about future events, so that alternatives and their outcomes are unpredictable It is assumed that the greater the variability previously experienced, the greater the inherent uncertainty" (1974:27).

One of the more ambitious investigations was that of Duncan, who identified uncertainty as: "1) the lack of information regarding the environmental factors associated with a given decision-making situation; 2) not knowing the outcome of a specific decision in terms of how much the organization would lose if the decision were incorrect; and 3) inability to assign probabilities with any degree of confidence with regard to how environmental factors are going to affect the success or failure of the decision unit in performing its function" (1972:318). This concept was measured by a 12-item Likert-type scale from which Duncan constructed a "total uncertainty score".

The common theme running through all of the conceptualizations discussed above is that of uncertainty as unpredictableness. The more

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uncertain the situation, the less one is able to predict consequences. Of the twelve items in Duncan's uncertainty measure, six had to do with respondent's perceptions of predictability. The Spearman-Brown reliability for this scale was .91 (Duncan, 1971). Based on this evidence, it seems safe to assume a major component in the conceptualization of uncertainty is predictability, consequently, for the purposes of this study, the dimension of uncertainty will be defined as the degree to which it is felt an outcome can be successfully predicted.

Environmental Characteristics and Uncertainty

Duncan found that "individuals in decision units experiencing dynamic-complex environments experience the greatest amount of uncertainty in decision making" (1972:325). Duncan's basic argument is that the dimensions of simple-complex and static-dynamic are components of uncertainty. "By considering the interaction of these two dimensions, different states of the decision unit's environment can be identified. Once these are identified, predictions can then be made as to the degree of perceived environments" (1972:320).

Duncan has constructed a typology of environments based on these assumptions which is reproduced in Table 1.

Duncan's data supports these assumptions. In his sample of twenty-two subunits, he found that those units which perceived a small number of components in their environment which were basically unchanging (Cell I) perceived the lowest amount of uncertainty in those subunits in his sample. Subunits identifying the largest number of components and perceiving the greatest amount of change (Cell IV) perceived the greatest amount of uncertainty. He further found that the greatest amount of

TABLE 1

Environmental State Dimensions and Predicted Perceived
Uncertainty to be Experienced by Individuals in Systems
Operating in These Types of Environments

TABLE 1
Environmental State Dimensions and Predicted Perceived
Uncertainty to be Experienced by Individuals in Systems
Operating in These Types of Environments

	Simple	Complex
Static	<u>Cell 1: Low Perceived Uncertainty</u> 1) Small number of factors and components in the environment 2) Factors and components are somewhat similar to one another 3) Factors and components remain basically the same and are not changing	<u>Cell 2: Moderately Low Perceived Uncertainty</u> 1) Large number of factors and components in the environment 2) Factors and components are not similar to one another 3) Factors and components remain basically the same
	<u>Cell 3: Moderately High Perceived Uncertainty</u> 1) Small number of factors and components in the environment 2) Factors and components are somewhat similar to one another 3) Factors and components of the environment are in continual process of change	<u>Cell 4: High Perceived Uncertainty</u> 1) Large number of factors and components in the environment 2) Factors and components are not similar to one another 3) Factors and components of environment are in a continual process of change
Dynamic		

perceived uncertainty was experienced by those subunits experiencing the greatest amount of change (Cells III and IV). "The difference in perceived uncertainty between static and dynamic environments is always significant regardless of whether the environment is simple or complex" (1972:325).

This discussion generates the following questions which provide a base for the hypotheses offered in Chapter Three. 1) Duncan found a relationship between perceptions of complexity and change and those of uncertainty. However his sample was one of related subunits. He compared twenty-two subunits of three manufacturing organizations (ten subunits). All but one of his manufacturing subunits experienced simple environments (Cells I and III), while all but two of the research and development subunits experienced complex environments (Cells II and IV). Would these same results occur when independent organizations are tested?

2) A factor which has received attention in the work of decision theorists but has received little or no attention by organization theorists is the relationship of past experience to perceptions of uncertainty. Is there a relationship between past organizational performance and perceived uncertainty?

These questions provide the foundation for the first four hypotheses of this study and will be tested across a sample of twelve independent manufacturing firms.

Summary

A review of the literature shows that, although the environment is a critical factor in the theorist's treatment of organizational behavior, the concept of organizational environment has not yet been clearly

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specified or identified. Most of the attempts to date have been organizationally specific (e.g., Duncan, 1972), or too vague to be operationalized (e.g., Thompson, 1967; Lawrence and Lorsch, 1969). A model and strategy for identifying relevant components of an organization's environment which is not organization-specific is offered. Environmental components which are common to all organizations are identified, and, based on prior theoretical and empirical work, the dimensions of change, complexity and uncertainty are identified and discussed.

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CHAPTER TWO

INTRA-ORGANIZATIONAL POWER

From the time of Plato and Aristotle, through Machiavelli's era, and up to the present, power has been a recurring central interest of mankind. Most discourses of the past have been highly normative: how to get power, or how to use it. Until the 30's power was more the concern of students of political and military processes. Since then, the study of power has become an increasing concern of the social scientist, mainly within the province of social psychology. Most of the attention has been at the individual and interpersonal level, e.g., great man theories, (Bales, et al., 1954); trait leadership, (Ghiselli, 1963); group leadership, (Lewin, Lippit and White, 1939); and/or the vertical or hierarchical dimensions of power, e.g., Tannenbaum's work with control graphs (1968), although sociologists turned their attention to studies of community power in the 50's, (e.g., Dahrendorf, 1959). Most often, power is treated as an independent variable, whose characteristics affect the variable under study. Swanson (1967) used power as the key independent variable to explain the acceptance of various forms of Protestantism in Reformation Europe. Weber's (1947) analysis of power led to his famous discussion of bureaucracy. The Human Relations school uses power to explain differences in morale, self-actualization, initiative and productivity of workers (e.g., Likert, 1961). The more popular strategies of organization development focus on power equalization and

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improvements in organizational effectiveness are traced to changes in power relationships (e.g., Bennis, 1969).

It has not been until recently, with the advent of the "newer tradition" and its conceptualization of organizations as decision making power systems, that power has been considered in terms of it being a situational characteristic of an organization. Identification of a variable such as power as a "situational" characteristic stems from the work of J. D. Thompson and assumptions he articulated in his book Organizations In Action. His basic assumptions are that "human action emerges from the interaction of: 1) the individual who brings aspirations, standards, and knowledge or beliefs about causation; and 2) the situation, which presents opportunities and constraints. Interaction of the individual and the situation is mediated by his perceptions or cognitions" (1967:101-102).

A study may concentrate on one or more of the above: the individual, the situation, the interaction of both or some combination of the three. The understanding of human behavior will be developed through a synthesis of these three areas, arrived at through the contributions of studies which delineate and clarify the characteristics of each. Power will be treated here in terms of Thompson's second category - as a situational characteristic. More specifically, it will be considered as a property of organizations and organizational subunits, rather than individuals or interpersonal relationships. Consequently the unit of analysis will be organizations and subunits.

It is common to speak of the "power of General Motors" or the "power of the marketing department", but neither General Motors nor the marketing department is capable of exercising power. These terms are a

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reflection of situational characteristics which are defined over time by the behaviors of individuals in those situations identified with General Motors or the marketing department and which serve to shape the framework within which present behavior is expressed. A member of a "powerful" unit will have alternatives available which are different from those available to a member of a "weaker" unit. The terms "powerful" and "weaker" are properties of the respective units, and not the members. This point was stressed by Stagner (1969) in his study of 217 executives in 109 companies. He found no evidence that a "strong personality" would "win out" in opposition to a subunit with a "strong power base".

Baldrige (1971), and Pfeffer and Salancik (1974) have argued that a coalition model of organizations as outlined by Cyert and March (1963) is a better description of "reality" than other popular models such as bureaucratic or collegial. In the coalition model it is assumed that participants have divergent goals and values, and that power is an important factor in determining outcomes. Baldrige, in his study of New York University, argues that power, rather than rationality or consultation, best explains the decision making behavior he studied. Pfeffer and Salancik, studying decision making at the University of Illinois, show that budget allocations are more strongly related to departmental power than to measures of departmental work load, national rank and number of faculty. They emphasize the significance of subunit power in understanding organizational decision making.

While there is an acknowledgement of the importance of subunit power in the literature, the bases of subunit power has received relatively little attention as evidenced by the small number of studies in

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this area. A review of the literature discloses only two studies that have directly dealt with the bases of subunit power - the work of Hinings, et al., and Salancik and Pfeffer.

The most ambitious work is that of an English group who have been developing what they term "a 'strategic contingencies' theory of intra-organizational power". The basis for their approach was discussed by Hickson, et al., (1971) and empirical results based on this discussion were later reported by Hickson, et al., (1972) and Hinings, et al., (1974). They conceptualize organizations "as inter-departmental systems in which a major task element is coping with uncertainty. The task is divided and allotted to the subsystems, the division of labor creating an interdependency among them. Imbalance of this reciprocal interdependence (Thompson, 1967) among the parts gives rise to power relations" (Hickson, et al., 1971:217). In a study of seven manufacturing firms, they tested the relationships between power and the variables of coping with uncertainty, immediacy of work flow, pervasiveness of work flow, and substitutability of subunit activities and found no single variable highly related to power by itself, however, taken together, all variables were related to power in differing degrees with "coping first, then nonsubstitutability, and last pervasiveness" (Hinings, et al., 1974:40).

Salancik and Pfeffer (1974) explored the bases of departmental power at the University of Illinois and found departmental power to "be most highly correlated with the department's ability to obtain outside grants and contracts, with national prestige and the relative size of the graduate program following closely in importance" (1974:453). Their conclusion is "subunit power accrues to those departments that are most

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instrumental in bringing in or providing resources which are highly valued by the total organization" (1974:470).

This study builds and expands upon the work of these researchers. Following Hickson, et al., (1971) the organization is conceptualized as a task inter-related system where "subunits control contingencies for one another's activities and draw power from the dependencies thereby created" (1971:222). However, as Hinings, et al., (1974) point out, their study dealt with only one dimension of interdependence: pervasiveness. They did not deal with the effect one unit would have on another. Based on Hickson, et al., and Emerson's (1962) work this study will explore one of the possible relationships between subunits power and task interdependence. Salancik and Pfeffer's (1974) conclusion that subunit power is related to the unit's ability to bring in needed resources for the organization can be seen as a form of coping. Uncertainties can spring from both external conditions in the environment, but also from the nature of the task itself. Coping, in order to be translated into power, must be recognized. One measure of the amount of task uncertainty might be the perception of the degree of difficulty in task accomplishment. A subunit's recognized ability to master a difficult task can also be seen as a form of coping.

Power

Power has been conceptualized as "potential acts" rather than as transactions actually occurring (Katz and Kahn, 1966:220; also: French and Raven, 1960:609; Parsons, 1967:308). Power is seen as a resource which can be used in a number of ways, one of which is to barter or exchange between two parties in a relationship (e.g., Emerson, 1962;

Blau, 1967). This view of power as a capacity or ability to influence future events is one of the most common found in the literature (e.g. March, 1966; Olsen, 1970; Harsanyi, 1962; Lehman, 1969; Bierstedt, 1950; Blau, 1967).

Power is generally related to individuals although some theorists include norms (Mechanic, 1967) roles, and groups, (French and Raven, 1960) and these individuals are usually located in some relationship with other individuals. Dahrendorf, however, focuses more on the individual. He sees power "essentially tied to the personality of individuals" (1959:166) and Mechanic prefers "force rather than relationship" (1967:197).

Dominance or control is the central issue of power for many theorists. Dahl, for example, says: "A has power over B to the extent that he can get B to do something B would not otherwise do" (1957:202). This theme of power over someone can be found, for example, in Blau: "control through negative sanctions", (1967:116); Skinner: "control over aversive stimuli" (1971:42), or Alderson: "Control over expectations" (1967: 574). Others in this vein are: March (1955), Wrong (1968), Tannenbaum (1968), Hickson, et al., (1971), Bennis, et al., (1958), Emerson (1962), and Harsanyi (1962). In these analyses, the "relevant frame of reference" as Martin (1971:246) suggests, is that of the subordinate, for it is the limitations on his activity "which symbolize the existence of a power relation".

Not all theorists focus on the subordinate. Weber's classic definition is in terms of the power holder: "power is the probability that one actor within a social relationship will be in a position to carry out his own will despite resistance" (1947:152). Power, as defined

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here, could include dominance, but it allows consideration of another dimension - that of power as a degree of autonomy in an ongoing relationship. In this view, power consists of the "range of alternatives" available while maintaining the system of relationships (Dubin, 1963:19; Kornhauser, 1966:215). This "freedom" from constraints while maintaining relationships may be what many organizational members have in mind when they use the term "power" (e.g., Jay, 1967; Perrow, 1970b).

The problems of defining power are much too thorny to be discussed here. Every theorist mentioned above has a somewhat different perspective and each is open to criticism. The discussion above is just a sampling of the power literature, and does not do justice to the complexity and depth of the subject. For an excellent in-depth analysis of some of the major themes, see Martin (1971). The advice of Dahl seems pertinent here: "The particular definition one chooses will evidently have to be made from considerations of the substance and objectives of a specific piece of research and not from general theoretical considerations" (1957:207).

The framework chosen for the analysis of power in this study is that the exercise of power is done by individuals in a relationship of dependency. The exercise is mediated by the situation which provides opportunities and constraints for the individuals. This model will be used as a guide in the following discussion of the power literature.

Exchange theorists see power as arising out of unbalanced social exchanges (e.g., Blau, 1967). Power, in this view, results from the dependence of one party on another in order for the first party to obtain resources or services controlled by the second party. To Emerson (1962) power is the obverse of dependency. A has power over B to the degree

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Theorists have conceptualized power relationships in terms of the resources controlled by A - the "bases" of power. One of the most often cited is the typology of French and Raven (1960): reward, coercive, legitimate, referent and expert. A has power over B to the extent that: 1) B desires what A controls (reward), 2) A is able to punish B (coercive), 3) B endows A with the right to exercise power (legitimate), 4) B desires to identify with A (referent) and 5) A has some special knowledge required by B (expert). In each of these cases, the dependency of B is assumed. This analysis, however, is incomplete because it neglects the strategies available to B to avoid dependencies. Emerson (1962) has suggested four options open to B: 1) he can forego the resource controlled by A; 2) he can utilize alternate sources; 3) he can use his own resources; or, 4) he can coerce A into providing the resource. Any power relationship can be analyzed in terms of these power bases and counter strategies.

However useful these typologies might be, they are not sufficient material with which to build a theory of power in social systems. What is left unanswered (or unasked) is the question of how it is that A came into control of resources desired by B, and further, what is it that prompts B to enter into a dependency with A. What is important is not A or B's responses to unique sets of stimuli, but rather the object is to discover patterns of responses that are stable over time. A theory of social systems must be built upon the identification of situations that will be predictive of the responses of a number of A's and B's. As Martin (1971) suggests, ongoing power structures may be "conceived as the result of a number of 'bargains' between the differentially

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dependent" which over time may "be used to provide a normative basis, to sanctify, future imbalanced exchanges" (1971:254). Power relationships in the past determine to a large degree the relative differential in dependence and differential access to avoidance strategies, which shape present power relationships. Situations, then, which are in part historically determined, provide a matrix within which are contained both opportunities and constraints for individual exercise of power in the present. A distinction must therefore be made between relationships which are indicative of the exercise of power, and situations which define the constraints shaping the potential character of relationships.

Much of the confusion in the literature of social power which led March (1966:70) to wonder if power was simply a term used to mask our ignorance may be attributed to the preoccupation with characteristics of relationships without due consideration of the situation which defines the potential nature of the relationship. For example, theorists have identified "intercursive" and "integral" power, (Wrong, 1968); "independent" and "incentive" power, (Harsanyi, 1962); "conjugal" power, (Centers, et al., 1971); "veto" power, (Kornhauser, 1966); "intermember" and "systemic" power (Lehman, 1969); all of which are descriptive of relationships and not situations.

The aim of this study is not to investigate power relationships, but rather to attempt to begin an identification of relevant situational characteristics that provide the constraints and opportunities for the exercise of power in organizations. As mentioned earlier, power has historical antecedents. Past activities and relationships provide a precedent which is the root of, and a constraint on, present alternatives. A "reputation" represents a distillation of past history which

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communicates expectations about the present. A reputation for knowledgeability in a specific area communicates the expectations that the reputation holder will be knowledgeable when a new problem in that area arises. Likewise, a reputation for power in a particular setting, not only reflects past exercises of power, but predisposes and shapes power relationships in the present. The reputation serves to define the ranges over which the reputation holder has the potential to exercise power, and while providing a range of opportunities, it also constrains and restricts the utilization of power. As French and Raven have noted "any attempt to utilize power outside the range of power will tend to reduce the power" (1960:621).

When the setting is an organization, one of the characteristics of the system relevant in understanding the exercise of power will be the variance in reputation for power between subunits in the organization. While a reputation for power provides opportunity for expression of power, it also serves as a constraint on behavior. As Landsberger (1961) and Stagner (1969) have shown, organizational characteristics provide a limitation on the range of effective behaviors any individual may pursue.

It is in the light of the above that criticisms of the "reputational approach" to studies of power must be considered. In the community power literature, one of the major aims has been to identify relevant actors in power arenas - to learn "who got things done ...". (Spinrad, 1966:218). The results have not been consistent. Mills, for example, found a "power elite" in American society (1956:244) while Riesman, attempting to investigate the same issue, found "veto groups" (1953:257). Kornhauser (1966) traces this disparity to the flaws

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inherent in the "reputational approach". As discussed previously, a reputation is a distillation of past history, it merely is one component of the present situation, it does not address the dynamics of the present exercise of power which was the aim of Mills and Riesman investigations. Also, there is more fluidity in community power relationships than in organizations. Organizational subunits do not have a choice whether or not to interact with each other; they must maintain permanent relationships if there is to be an organization. An actor in a community power arena often not only has a choice of relationships, but also many times may choose whether or not to enter into them.

Spinrad (1966) identifies two methodological approaches used in the study of power: reputation and event analysis. In the reputation approach, respondents are asked: "who is powerful around here?" From these responses, a large sociogram of the community is constructed. In event analysis, the question asked is: "who was influential in this specific instance of decision making?" Different results are found when these different approaches are used. For example, there is a debate in the book Power and Democracy in America (D'Antonio and Ehrlich, 1961) between Delbert Miller and Robert Dahl over the disparity in their findings. Miller, using the reputation approach, found a pyramidal power structure; Dahl, on the other hand, found a more pluralistic structure using event analysis.

Differing results have also been found in organizations by researchers using these approaches. Perrow, (1970b) in a study of twelve manufacturing firms asked his respondents to "rank the power" of subunits in their organizations and found sales ranked the most powerful. Hinings, et al., however, using event analysis in seventeen decision

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areas found production to have the most power in their sample of seven companies (1974:31). J. D. Thompson, in his critique of Perrow's study points out that Perrow's approach results in a "tendency to conceive of power in several ways, which may or may not be consistent" (1970:90).

Much of the confusion surrounding the "reputational" approaches discussed above has to do with the questions of what is meant by the term power, and who has power. Past studies may be criticized on the grounds that power was conceptualized in global terms. In most cases it has not been made clear whether the exercise of power, relationships, or situational characteristics were being discussed.

Influence in Decision Making

One of the major difficulties associated with the concept of power is that while it may be theoretically conceptualized as the ability to win one's will over others, an operational identification must be based on the uses of power. Perrow (1970b) in his study of twelve firms asked organization members to "rank the power" of four organizational subunits. Upper management ranked sales the highest, while middle management gave this ranking to finance. Thompson (1970), in his critique of Perrow's article, suggests this might be attributed to differences in the respondents' perceptions of the uses of power. Middle management seems to define power in terms of the ability to affect the state of the system. This is not so surprising in view of the central interests of the different levels of management. If it is assumed that upper management is most concerned with the system as a whole, then it seems reasonable that it should identify what Lehman calls the "systemic" dimension of power - the ability to "set, pursue, and implement goals for the system as a

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whole" (1969:455). If goal setting is a major concern for upper management, middle management is concerned with the means to attain the ends specified by upper management (Simon, 1957). Consequently, middle management identifies power in terms of the effect on its implementation efforts. Resource allocation is a significant factor affecting implementation ability. Finance's exercise of power is felt through resource allocation. Therefore, it follows that the power of finance should be emphasized by middle management. The point to be made here is that perceptions of power will vary according to positions in the organization.

Autonomy

Most theorists, in discussing power have focused on relationships of asymmetrical dependency, and consequently, most of their attention has been on the conceptualization of power as influence over. However, when power is considered in an organizational setting of interdependent relationships, another dimension gains attention. Dubin (1963) and Kornhauser (1966) have equated power with the "range of alternatives" available to the power holder within the limits of maintaining the system. Crozier (1964) links power to "discretion". Downs (1967) sees power expressed in a bureaucracy in terms of subunit's attempts to maintain and increase autonomy. To Jay (1967), power is freedom from constraints. This is the ability of a party (subunit) in an ongoing relationship (organization) to choose a variety of alternatives while still maintaining the relationship. In an organizational setting, this can be the degree to which a subunit can change its activities on its own. One of the difficulties with this as a measure of power is that it could be a function of interdependence. A subunit that was only peripherically

involved in the organization could have a large measure of autonomy but very little influence. However, under conditions of "reciprocal interdependence" (Thompson, 1967:54) where each subunit involved poses contingencies for the other units, then a measure of autonomy could be an indicator of power.

Interdependence

One of the more common themes in the literature of power is that power is related to dependency. In any given relationship, A-B, it is assumed that A has power over B to the extent that B is dependent on A. Emerson (1962), as noted earlier, takes the position that power is the "obverse" of dependency. Most theoretical discussions (e.g., Bierstedt, 1950; Dahl, 1975; French and Raven, 1960; Emerson, 1962; Martin, 1971) focus on interpersonal relationships that are asymmetrical in nature. That is, the relationships discussed are ones of asymmetrical dependency, or vertical power relationships. This focus on vertical relationships is the one most generally followed in studies of power in organizational settings (e.g., Etzioni, 1961; Warren, 1968; Peabody, 1962; Julian, 1966; Tannenbaum, 1968).

There has been less attention given to horizontal power relationships under conditions of interdependence where the degree of asymmetry is not clearly identifiable. In an organization, one of the major types of interdependency has to do with the division of labor, or task interdependence.

J. D. Thompson notes that there are differing types of intraorganizational task interdependence. He suggests three categories: pooled; sequential; and reciprocal (1967:54). Pooled interdependence describes

the situation where the actions of each part of the organization do not directly affect the actions of the other parts. Each part contributes to the whole, and each is supported by the whole, but there is no direct interaction between parts. An example of pooled interdependence would be academic departments or branch sales offices.

Conditions of sequential interdependence exist when there is an order to the actions of the organization parts. The output of one part becomes the input of another part. For example, the output of a stamping plant becomes the input for an assembly plant. A major characteristic of this type of interdependence is the asymmetry in the relationship. Reciprocal interdependence characterizes those situations where the outputs of each part becomes inputs of others and their outputs and in turn inputs for the first parts. Under these conditions all units involved are penetrated by all other units. The subunits of sales, manufacturing and engineering chosen for this study are examples of organizational units in situations of reciprocal task interdependence.

Blau and Scott (1962:183) also note the distinction between types of task interdependence. They identify two categories: parallel; and interdependent specialization, which correspond to Thompson's categories of pooled and reciprocal interdependence, respectively. It is important to differentiate between types of task interdependence as each of the types discussed above provides a differing opportunity for the exercise of power, specifically along the dimensions of amount of interaction and degree of asymmetry. In situations of low interaction (pooled interdependence or parallel specialization), the opportunities for influence will be fewer than in conditions of reciprocal interdependence. While the question of this difference has not been empirically addressed, a

suggestion of this difference may be found by comparing two recent studies of intraorganizational power.

Salancik and Pfeffer (1974) in their study of university departmental power (pooled interdependence) found the question of resource allocation to be a major issue among the departments samples. Hinings, et al., (1974) in their sample of manufacturing firms (reciprocal interdependence) found relatively less attention given to resource allocation by the subunits and more to systemic or policy type decision areas. As discussed earlier, the identification of power must be based on its uses. Comparing these two studies suggests a difference in the uses of power which might be based in the differing types of interdependence in the organizations sampled. Consequently, it seems important in an investigation of intra-organizational power to clearly identify the nature of the interdependencies of the subunits.

There are two dimensions of interdependence that are relevant for a discussion of power. They are: the amount of interaction characteristic of the interdependence; and the degree of asymmetry, or imbalance of dependency. A review of the literature shows only one attempt to investigate a relationship between subunit power and interdependence. Hinings, et al., (1974) found a relationship between "pervasiveness" and subunit power. Pervasiveness was operationalized as the number of task interconnections of subunits, which is a measure of the amount of interaction. As they point out in their summary, they did not investigate the degree to which the activities of one subunit are affected by the activities of another subunit (1974:40). As Hickson, et al., (1971) pointed out in an earlier paper, an imbalance, or asymmetry, in the degree to which subunits affect each other in task accomplishment

results in a subunit's ability to "draw power" from this asymmetry.

Substitutability

A major component in exchange theorist's conceptualizations of power-dependence relations is that of substitutability. The nature of the dependency is mediated by the availability of alternatives. One of the strategies suggested by Emerson (1962) for avoiding dependence is that of utilizing alternate resources. Blau (1967) makes the same point when he discusses monopoly as a base of power. Others of this theme are Mechanic (1967), and Dubin (1963). Hickson, et al., identify substitutability as a major variable in their "strategic contingencies" theory of intraorganizational power, which they define "as the ability of an organization to obtain alternative performance for the activities of a sub-unit" (1971:221). Hinings, et al., in a later study based on this article, operationalized substitutability by determining "how easy or difficult it was to obtain personnel" as measured by: "level of formal education required for the job, length of experience and training required, difficulties of hiring in the current labor market, existence of legal restrictions, number of tasks contracted out" (1974:26). A positive relationship was found between this variable and subunit power.

The work of this English group is rich in providing suggestions for further research efforts. Their identification of substitutability as a base of subunit power is an important contribution. There are, however, alternate operationalizations that should be considered. If the idea is followed that "power is explained by variables that are elements of each subunit's task" (Hickson, et al., 1971:217), a corollary would be investigation of task substitutability. The English group

investigated one dimension of substitutability: that of personnel, they did not report any measures of task substitutability. Conceptually, these are two very separate dimensions of substitutability. It would be possible, for example, to replace all the personnel associated with accomplishing a given task and have the task remain basically unchanged. Conversely, one could change the task and leave the personnel unchanged. The following discussion will attempt to identify this second dimension - that of task substitutability.

The first issue is whether the notion of direct task substitutability is a viable concept. Thompson (1967), for example, argues that the "core technology" is the essence of an organization and an organization will go to great lengths to protect it from "environmental influences". Substitution of a component of the technical core would result in a radical alteration of the total organization, and the degree to which this substitution would be considered is questionable. If Thompson's assumptions are correct, it would seem that activities peripheral to the core technology, and boundary-spanning activities would be more likely candidates for substitution. Another factor would be the immediate availability of activities outside the organization. For example, if existing market research or advertising services were available, these activities would seem to be more readily considered for substitution.

In practice, the notion of substitutability is probably more subtle. Direct substitution, or the threat of substitution does not seem to be a "normal" occurrence in most organizations. It seems reasonable to inquire into the strategies available that would preclude such considerations. Mechanic (1967) and others suggest some directions. One

strategy for maintaining nonsubstitutability would be control over information regarding the subunit's activities. Activities that are not clearly understood will be harder to replace than those which are. Another possibility would be control over the appearance of difficulty in performing the task. Task activities which are seen as simple would seem to be more likely candidates for substitution than activities which are seen as more difficult. Two variables, then, that would contribute to substitutability would be the degree to which a subunit's activities are understood by others in the organization, and the degree of difficulty associated with the task.

Task understanding and difficulty may also contribute to another concept associated with power - that of coping with uncertainty. Lawrence and Lorsch, in their study have included these two variables as components of uncertainty (1969:249). Thompson (1967) makes the point that uncertainties arise from both environments and technologies, or task activities. The mechanisms of coping have not yet been identified in the literature. One of the possible indicators of technological uncertainty might be the degree of difficulty associated with a given task. One of the difficulties with the concept of coping centers around the problem of identifying "successful" coping. If a subunit succeeds in "absorbing", "reducing", or "coping" with uncertainty, how is this recognized and differentiated from a situation that is inherently low in uncertainty? It seems that if coping is to be used as a base for power, the coping must be recognized. The process by which this is done is not clear, but one requirement might be that there be a recognition of the difficulty associated with the task.

The Environment

Coping with uncertainties in the environment has been suggested by many theorists as a base of intraorganizational power (Crozier, 1964; Thompson, 1967; Goldner, 1970; Perrow, 1970b; Hickson, et al., 1971). However, neither the process of coping nor the concept of uncertainty has been clearly identified. In fact, as discussed in Chapter One, there is, as yet, no agreement on the identification of the environment in the literature. Before one can investigate the relationships between power and the environment, the nature of the variables must be identified and defined. An attempt to clarify this situation provides the underlying rationale for Chapter One. In that chapter, three dimensions of the environment were identified; complexity, change, and uncertainty. There is some disagreement in the literature as to the relationship between subunit power and environmental uncertainty. The only study found which contains data addressing this issue is that of Lawrence and Lorsch (1969). Hickson, et al., interpret this work as showing that "marketing had more influence than production in both container-manufacturing and food-processing firms, apparently because of its involvement in (uncertain) innovation and with customers" (1971:219). However, a review of the data shows that while marketing received a higher score on the measure of departmental influence (1969:111 and 127) in these firms, it did not receive a higher score than production on the measures of environmental uncertainty in both industries (1969:91). An unresolved question then, is whether there is a relationship between environmental uncertainty and subunit power.

Performance

Performance as an independent variable has received little attention in the literature of organizations. Social psychologists have noted the "Pygmalion Effect" (Rosenthal, 1973); one version is that knowledge of past performance leads to differential treatment of the performer. High performance in the past has been shown to lead to greater autonomy and influence. Farris (1975) reports the findings of a number of studies which show that perceptions of past performance affect present conditions. High performers were allowed more influence and autonomy by their supervisors than were low performers. Salancik and Pfeffer, in their study of departmental power in a university, found that "power derived from acquiring resources is used to obtain more resources, which in turn can be employed to produce more power - the rich get richer" (1974:470). They assert "subunit power will be based on environmental contingencies or important resources only to the extent that such feedback and constraints are perceived and recognized" (1974:471). The point here is that past performance influences present perceptions, and consequently, present power configurations. If coping activities must be recognized to be a base for power, then past performance can be seen as evidence of success in coping. A high performing unit would be displaying evidence of successful coping, and the power distribution would be expected to reflect this. If past performance is an important variable in explaining power relationships at a social psychological level, it may well be a salient factor in explaining subunit power.

The Critical Subunit

The discussion so far has centered about the identification of power and its relationship to organizational variables. There is another issue related to subunit power that is found in the literature.

Woodward has noted in her study of manufacturing firms that "there seemed to be one function that was central and critical in that it had the greatest effect on success and survival" (1965:126). Landsberger (1961) gives anecdotal evidence of the changing power positions of subunits stemming from changes in the critical issues facing the organization. In the firm he studied, during the depression years, financial control was seen as most critical and accounting was the most influential subunit. This changed after the war when material shortages were common and the purchasing department eclipsed accounting in influence. Later, material shortages eased and the critical issue for the firm was identified as sales, and consequently the marketing department increased its influence. Perrow takes "the view that the most critical function tends to have the most power" (1970b:66). These views seem to be based on impressionistic evidence. They have not been subjected to a test of empirical validity. A number of questions come to mind: is there, in fact, a relationship between the identification of a subunit as critical and the amount of power associated with that subunit? If so, what is the relation between criticalness and other bases of subunit power? Is the term "critical subunit" simply another term for power?

Summary

This chapter reviewed the literature on power and suggested that much of the confusion surrounding this concept is due to the fact that

in most cases, power is considered in global terms. It has not been clearly specified whether the exercise of power, relationships, or situational characteristics were being discussed. Subunit power, the topic of this study, is a situational characteristic, and can be operationalized by using event analysis.

Subunit power has been suggested to arise from interdependencies of task activities and uncertainties stemming from both the task and the external environment. These variables have been discussed and provide a ground for the remaining hypotheses to be offered in Chapter Three. Finally, the impressionistic evidence suggesting a relationship between perceptions of the criticalness of a subunit and the amount of power attributed to it has been noted and some questions raised about the nature of this relationship.

CHAPTER THREE

HYPOTHESES AND VARIABLES IN THE STUDY

Introduction

Chapter One discussed the concept of the environment and its place in organization theory. A model for environmental identification was offered and the environmental dimensions of change, complexity, and uncertainty were identified. The first three hypotheses discussed below will test the relationship between these three variables. A fourth variable - performance - has been suggested to be related to perceptions of uncertainty. This relationship will be tested by Hypothesis Four.

In Chapter Two, the concept of power, specifically subunit power, and its relationship to a number of organizational variables was discussed. These suggested relationships provide the base for the remaining hypotheses.

The final part of this chapter lists each variable in the study and discusses how each is operationalized.

The Environment

As discussed previously, the environment plays a central role in organization theory. One of the dimensions of the environment which has received much attention is that of uncertainty. J. D. Thompson, for example, argues that environmental uncertainty is a major factor in explaining organizational behavior. He states: "technologies and

environments are major sources of uncertainty for organizations, and that differences in those dimensions will result in differences in organizations," further, "the central problem for complex organizations is one of coping with uncertainty" (1967:13). However, it has been noted that, neither the components of the environment, nor the dimension of uncertainty has been clearly specified. The most advanced work in this area is that of Duncan (1972) who found a relationship between the environmental dimensions of change, complexity and uncertainty. Table 1 (Chapter One) represents his conceptualization of these relationships and provides a foundation for the first three hypotheses.

Hypothesis One

Units which are seen as operating in simple-static environments (Cell 1, Table 1) will experience the least perceived uncertainty.

Hypothesis Two

Units which are seen as operating in complex-dynamic environments (Cell 4, Table 1) will experience the greatest perceived environmental uncertainty.

The assumption here, based on the work of Thompson (1967) and Udy (1959), is that changing and heterogeneous environments are associated with increased uncertainty. Since it is assumed that a major component of uncertainty is unpredictableness, environments which are simple in nature and relatively unchanging lend themselves more to predictableness than those environments which are complex and rapidly changing.

Hypothesis Three

Units which are seen as operating in simple-dynamic environments (Cell 3, Table 1) will experience greater perceived environmental

uncertainty than units seen as operating in complex-static environments (Cell 2, Table 1).

The rationale is that the rate of change contributes more to uncertainty than does complexity. It is more difficult to predict and anticipate the consequences of a situation that is changing because past practices and procedures cannot be relied upon to be effective under the changed conditions. In a static environment, not as many unprecedented decisions have to be made and past procedures and practices will tend to serve as an effective precedent because of unchanging conditions.

Uncertainty is related to the ability to identify possible outcomes and estimate probabilities of their occurrence. These abilities are based on experience. As Archer (1967) points out, the degree of uncertainty encountered is experience-related: the less experience in previous situations of the nature being considered, the greater the uncertainty; the greater the experience base, the less the uncertainty.

If we assume the central problem for organizations is "coping with uncertainty" (Thompson, 1967:13), or "removing equivocality from the informational environment (Weick, 1969:40), then we must also assume that as this behavior has taken place over time an experience base has been developed on which present and future assessments of uncertainty are grounded. Estimates of future outcomes are "based on retrospective interpretations of actions already completed" (Weick, 1969:91). In other words, a "batting average" of successes and failures in prediction attempts is developed over time and is a major component in the confidence level of new predictions. Present estimates of predictability have their roots in past successes or failures in prediction.

Coping with uncertainty is a central element in the "newer tradition" of organization theory. However, at this time, the process by

which this takes place has neither been clearly conceptualized nor operationalized. It can be assumed, though, that if coping with uncertainty is a "central problem" for organizations, then one indicator of successful coping in the past would be some measure of organizational performance. An organization which has had a poor performance record could be expected to have a low confidence level in terms of predicting future events, and consequently, could be expected to identify its present environment as more uncertain than would an organization which has had a good performance record. In the sample of manufacturing firms in this study, one of the major measures of performance is economic. A firm that has experienced increasing sales and profits could be expected to assume that past coping has been successful, and consequently be more confident when assessing environmental uncertainty.

Hypothesis Four

Low performing organizations will experience greater perceived environmental uncertainty than will high performing organizations in similar environments.

The rationale for this hypothesis is that perceptions of uncertainty are grounded in experience. If performance has been effective in the past, the assumption will be made that competent predictions have been made in the past, contributing to a sense of confidence which will determine the confidence levels of present predictions, and consequently, perceptions of uncertainty.

For the purposes of this study, the term environment will be taken to mean those factors, outside the boundaries of the organizations studied, which are identified as critically affecting the organization in the areas of labor, material, capital, product technology, process

technology, and markets. The method of investigation used is to ask respondents to list factors in the environment they feel are critical to the organization in these six categories. For each of the factors identified, respondents are asked to identify the amount of change and the degree of predictableness associated with each factor. The amount of change is identified as the static-dynamic dimension and is operationalized by the variable of Environmental Change. The degree of predictableness is called the uncertainty dimension and is operationalized by the variable of Environmental Uncertainty. Environmental complexity (the simple-complex dimension) is based on the number of environmental factors identified. Organizational performance will be measured by the actual amount of sales and profit increase over the past five years.

Power

The choice of dimensions of power to be used in a study is somewhat arbitrary and must be made in light of the researcher's interest. The aim of this study is not to investigate the exercise of power, but rather to begin an identification of relevant situational characteristics having a bearing on the exercise of power in organizations. One of the dimensions of power chosen for this study is the degree of influence each subunit is seen as having in the specific decision areas of:

- 1) product innovation decisions; 2) marketing strategy decisions; and
- 3) capital budgeting decisions. The rationale for choosing influence in decision making as a dimension of power stems from the conceptualization of organizations as "decision making power systems" and the recognized effect subunit power has on decision making (e.g., Pfeffer and Salancik, 1974). These three decision areas were chosen because they represent

"systemic" (Lehman, 1969) issues. These are decision areas that Simon (1957) characterizes as "time-binding", that is, that class of decisions which set the "rules of the game" or serve to limit and constrain later decisions. To demonstrate this point, he uses an example of a decision made to construct a shoe factory (1957:66). Once this decision is made, all subsequent decisions regarding product choice are influenced. The decision to produce shoes (in Simon's example) represents a sunk cost which restricts any alternative of later producing automobiles or any product other than shoes. In manufacturing firms such as those investigated in this study, decisions of this type have to do with: the nature of the product (product innovation); the method of marketing (marketing strategies); and the way the processes are financed (capital budgeting). Decisions made in these areas are time-binding in nature and affect later decisions. For example, making a decision to produce a standardized product at a large volume will affect the choice of production processes and sales efforts which would later affect the ability to produce a specialized, low volume product calling for different sales strategies and production processes. If, as Hickson, et al., (1971) assert, power has a base in system task interdependencies, then decision areas affecting the nature of the task and its interdependencies will be important. For this sample of firms, the important areas will be those dealing with product definition, marketing and financing.

It is important to keep in mind that power should be considered in terms of specific issues, not general terms such as "most powerful." For example, Hinings, et al., (1974) report the production subunit to be most powerful in their sample of breweries and container manufacturers. While they do not report the raw power scores in their study for all of

the organizations in their sample, they do provide scores for one of the firms as an example of decision areas included in their power measure. Three of their issues are similar to those chosen for this study. They are: marketing strategies, introduction of new products, and overall capital budget. When the reported scores on these issues are examined, it is found that sales is the most powerful, followed by manufacturing and then engineering. The point is that power is, to a large degree, the function of issues selected, and any interpretation of power studies must be made with this in mind.

The second dimension of power chosen for this study will be a measure of subunit autonomy. In Chapter Two, it was shown that most discussions of power assume relationships of asymmetrical dependency with the resulting conceptualization of power as influence over another. Under conditions of reciprocal interdependency (Thompson, 1967), such as organizations where subunits are not free to leave the situation, a measure of power is the degree of autonomy a subunit possesses while still maintaining the organizational system. As the subunits chosen in this sample meet the conditions of reciprocal interdependence as identified by Thompson, autonomy, the degree to which a subunit can change activities on its own, is chosen as a measure of power.

In summary, two dimensions of power are chosen to be investigated in this study: influence in decision making in the areas of product innovation, marketing strategies, and capital budgeting; and autonomy measured as the degree to which a subunit can unilaterally change its own activities. When the generalized term power is used in this study it will be taken to be comprised of the two dimensions just described.

Power has often been related by theorists to dependencies. There

has been less attention given to situations of interdependence. In an organization, one of the major types of interdependency has to do with the division of labor, or task interdependence, which has been suggested by Hickson, et al., to be the "ultimate source of intra-organizational power" (1971:217). In a study reported by Hinings, et al., (1974), a relationship was found between the amount of task interconnections of subunits and subunit power. In their discussion they suggest some further directions that might be taken. The first of these is the degree to which the activities of one subunit are affected by the activities of another subunit. They suggest that the more a subunit affects others while accomplishing its own tasks, the more it poses contingencies for the other subunits, which provides a base for its power. A second suggestion is that the degree of imbalance, or asymmetry, in task interdependence contributes to subunit power differentials.

This study will investigate the dimensions of interdependence suggested by this English group. While they suggested a direction for investigation, they did not offer an operationalization of this variable. A step in this direction is suggested by the work of Lawrence and Lorsch and one of their measures of integration: the degree to which one subunit is influenced by the way other subunits perform their tasks (1969: 251). This measure will be used to construct the variables of task interdependence and asymmetry. Task interdependence is the degree to which a subunit affects other subunits while performing its own task, and asymmetry is the relative difference between the degree to which a subunit influences others while accomplishing its tasks and the degree to which it is influenced by other subunits. This provides the basis for the following two hypotheses.

Hypothesis Five

The greater the degree of task interdependence of a subunit, the greater the power of that subunit.

Hypothesis Six

The greater the degree of asymmetry in task interdependence of a subunit in relationship to other subunits in that organization, the greater the power of that subunit relative to other subunits.

Hypothesis Five addresses the question raised by Hickson, et al., (1971) in a simplified fashion. They propose that to the degree that one unit's activities affect a second unit's activities, the activities of the first unit pose "contingencies" for the second unit, and therefore become a potential base of power for the first unit.

Hypothesis Six approaches the question of dependency from the perspective of Emerson (1962) and others. Power differentials result from an imbalance, or asymmetry, in the relationship. A subunit that affects others more by its activities than it is affected, portrays a situation where the other units are more dependent on the first unit than it on them. If power is the obverse of dependency, then the first unit should be more powerful. Hypothesis Five investigates the general question: is there a relationship between power and the degree to which the activities of one unit affect other units? Hypothesis Six addresses the more particular question of asking if there is a relationship between imbalance and power.

Another direction suggested by the literature has to do with the task itself. There are a number of themes that have been discussed. One of these is that power is related to substitutability. Monopoly of a needed service in a relationship provides a basis of power for the one holding the monopoly. If the service can be obtained elsewhere by

substitution, the power of the one offering the service is reduced. Hinings, et al., found a relationship between substitutability of subunit personnel and subunit power. They did not, however, deal with the issue of task substitutability. One of the difficulties with the notion of task substitutability is that, in an organization where the subunits are operating under conditions of reciprocal interdependence and whose activities constitute the core technology (Thompson, 1967) it is highly problematic whether task substitution on any scale is a viable consideration.

In Blau's (1967) treatment of exchange theory, he discusses perception of task difficulty as a factor in social exchange at the interpersonal level. Appearing to master a difficult task can lead to increased esteem and power. However, to be seen as having difficulty with a task that is understood to be simple in nature, or easily accomplished has the opposite result. Blau's position is similar in many respects to those theorists who discuss the concept of "uncertainty absorption" (e.g., Crozier, 1964; March and Simon, 1958; Perrow, 1970b). "Absorbing", "reducing", or "coping" with uncertainty for a second party will provide a base of power for the first party. "Uncertainty itself does not give power: coping gives power" (Hickson, et al., 1971:219). It is not clear how either uncertainty, or coping is recognized. One possibility might be the degree of difficulty associated with the activity in question. This provides the rationale for Hypothesis Seven.

Crozier, in his discussion of the bases of power of maintenance workers in the French factory he studied, suggests two factors relating to their power position. The first of these has to do with the issue of predictability, or uncertainty. In the factory, machine stoppages are

"the only major happenings that cannot be predicted" (1964:109). The uncertainties associated with such stoppages serve to provide a base of power for those responsible for remedying these stoppages. He also discusses a second, "complementary" factor - the lack of understanding associated with the maintenance function. "No one can understand what they are doing" (1964:109). Because others in the organization are not able to understand the activities of the maintenance workers, Crozier argues that this also provides a base for their power position.

As discussed earlier in Chapter Two, substitutability has been suggested by some organization theorists (e.g., Hickson, et al., 1971) as being related to power. The level of understanding associated with a task could be a dimension of task substitutability. The less well understood the task activities of a subunit, the more difficult it will be to identify a capable replacement for those activities. Conversely, controlling information so that activities are not understood by others has been identified as a strategy for influencing power relationships (e.g., Mechanic, 1967).

If lack of task understanding provides a base for power as has been suggested, then subunits whose activities are less well understood should have greater power than those whose activities are relatively better understood. Hypothesis Eight is intended to test this assumption.

Hypothesis Seven

The greater the degree of difficulty associated with a task, the greater the power of the subunit associated with accomplishing that task.

Hypothesis Eight

The less well understood the activities of a subunit are by others in the organization, the greater the power of that subunit.

The preceding four hypotheses deal with the relationship between subunit power and "internal" organizational variables. We will turn now to a consideration of "external" or environmental variables. Uncertainties in the environment are an important factor in the theories of the "newer tradition". Many theorists have suggested a relationship between power and environmental uncertainty. The previous discussion on coping with uncertainty is equally applicable to environmental relationships. In Chapter One, three dimensions of the environment were identified: complexity, change and uncertainty. The relationship between these variables and power is yet to be determined, consequently, they provide the basis for the following three exploratory hypotheses.

Hypothesis Nine

The greater the complexity of an environmental component, the greater the power of that subunit which deals with that component.

Hypothesis Ten

The greater the rate of change associated with an environmental component, the greater the power of that subunit which deals with that component.

Hypothesis Eleven

The greater the degree of uncertainty associated with an environmental component, the greater the power of that subunit which deals with that component.

The preceding hypotheses have dealt with organizational variables. There is another issue having to do with subunit power which is referred to in the literature and is succinctly stated by Perrow: "the most

critical function tends to have the most power" (1970b:66). The assumption made here is that a subunit is powerful because it is critical. As Blau (1967) has pointed out, differentiation of power causes imbalances in social relationships which are a source of dissonance (Festinger, 1957). This dissonance may be reduced by labeling the power differential "just", "legitimate" or in the case of subunit power: "critical". Whichever the causal relationship, the basic assumption that there is a relationship between a subunit identified as "critical" and its power has not yet been empirically tested. Hypothesis Twelve is designed to test this assumption.

Hypothesis Twelve

The more a subunit's activities are seen as critical, the greater the power that will be attributed to that subunit.

This concludes the list of hypotheses in this study. The following section discusses the variables and the manner in which they have been operationalized. Table 2 provides a summary of these variables.

Table 2. Variables of the Study

1. The Environment
2. Simple-complex Environmental Dimension
3. Static-dynamic Environmental Dimension
4. Perceived Environmental Uncertainty
5. Subunit Power
6. Task Interdependence
7. Asymmetry
8. Task Difficulty
9. Task Understanding
10. Criticalness
11. Performance

The Environment

The definition of the term "environment" as used in this study is based on the linkage model of organizational/environmental interaction discussed in Chapter One and will mean those factors, outside the legal boundaries of the organizations studied, which respondents identify as critically affecting the organization in the area of labor, material, capital, product technology, process technology, and markets. Each of these six areas will be identified in this study as environmental components. For each of these environmental components respondents are asked to list the critical environmental factors of their own choosing which they feel affect their organization.

For example, respondents are asked: "What do you consider to be the critical environmental factors (those outside your firm) affecting your firm's ability to obtain an adequate supply of labor?" The respondent then lists the factors he feels are critical to labor supply. The question is then repeated for each of the other five remaining environmental components of material, capital, product technology, process technology, and markets (questions 12 through 17). The result is a list of environmental factors, arranged by components, which constitute the relevant task environment for that organization. For each organization sampled, the list of components will remain the same, however, the factors will vary according to the respondent's perceptions.

Simple-complex Environmental Dimension

The simple-complex environmental dimension for each organization is operationalized by the "Organization Measure of Environmental Complexity." For each of the six environmental components of labor, material,

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capital, product technology, process technology and markets, respondents choose a number of factors which they feel critically affect their organization as discussed in the previous section. The number of factors actually chosen for each component by each respondent ranged from a high of five factors in one component to a low of zero where that component was not considered relevant by that respondent.

An Organization Measure of Environmental Complexity is developed by multiplying the total number of factors (F) identified by respondents in that organization by the number of components (C)² identified. The result is a measure of both the number of factors and the degree of similarity or dis-similarity of their effect on the organization. The Index of Environmental Complexity is computed for each organization by (F) X (C)².

Squaring the number of components reflects the idea that variance in components affects an organization at more points than does variance in factors. For example, an organization with three factors in one component, and two in another would have an Environmental Complexity Index score of 20: $(3+2) \times (2)^2 = 20$. An organization with one factor in each of five components would have a score of 125: $(1+1+1+1+1) \times (5)^2 = 125$. A high score on the index indicates a higher degree of environmental complexity while a low score is indicative of less complexity.

Much of the analysis of this study is at two levels: the organization; and individual subunits. The Organization Measure of Environmental Complexity is a reflection of that dimension for each organization. A different procedure is used to measure this dimension for subunits. The three subunits in the study are: manufacturing; sales; and engineering. For each of these subunits, the relevant environmental

components are: process technology, market, and product technology, respectively. To compute a measure of environmental complexity for each of these subunits, the number of factors in that component related to the subunit in question as identified by all organization respondents is summed. The result is a measure of environmental complexity for that subunit. For example, if the respondents in an organization identified three factors in the environment which critically affected the technology used in producing the firm's products (process technology environmental component); two factors which affected the firm's ability to market its products (market environmental component); and no factors which critically affected the technology used in designing and developing the firm's products (product technology environmental component); the environmental complexity score for each subunit would be: manufacturing - 3, sales - 2, and engineering - 0.

Static-dynamic Environmental Dimension

The static-dynamic dimension is a measure of the degree to which environmental factors are seen as remaining stable, or changing over time, and is operationalized for each organization by the "Organization Measure of Environmental Change". For each of the environmental factors that respondents chose, they were asked to select from a five-point scale of: (1) never; (2) almost never; (3) sometimes; (4) frequently; and (5) very often; the "number that best indicates how often each of the above factors (that had just been named by the respondent) changes" (questions 12 through 17).

As the units of analysis are organizations and subunits, not individuals, the responses are pooled to reflect the situation experienced

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by the organization as a whole. For the Organization Measure of Environmental Change, this is done in three steps. First, a mean score for each respondent on each environmental component is computed. Second, an average of all respondent means for each environmental component is then computed, resulting in an organizational score for that environmental component. Finally, the total organization score is developed by summing the scores of each component. For a discussion of this pooling procedure, see Hage and Aiken (1967).

For subunits, the Measure of Environmental Change is simply the score for the relevant component as computed through step two described above. For both organizations and subunits, a high score on this measure indicates more change, while a lower score indicates more environmental stability.

Perceived Environmental Uncertainty

The measure of environmental uncertainty used in this study reflects the degree to which it is felt that an outcome can be successfully predicted. For each of the environmental factors chosen by respondents they were asked to indicate how often they were able to predict how changes in each of the factors they had chosen would affect their organization. The response categories varied along a five-point scale of: (1) never; (2) almost never; (3) sometimes; (4) frequently; and (5) very often, (questions 12 through 17). Organizational scores on perceived environmental uncertainty are computed in the same three-step fashion as described in the section on Static-dynamic Environmental Dimension. Subunit environmental scores are also computed in the manner described above. The raw scores are reversed so that a high value

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reflects more perceived environmental uncertainty and a low score indicates less.

Subunit Power

Subunit power is measured along four dimensions: (1) ability of a subunit to change its activities on its own; (2) influence on product innovation decisions; (3) influence on capital budgeting decisions; and (4) influence on marketing strategy decisions. A measure of the first dimension - ability of a subunit to change its activities on its own - is determined by asking the respondents to indicate the degree to which each of the subunits, including his own, is able to change its activities on its own (question 2). The response categories varied along a seven-point scale of: (1) not at all; (2) to a very slight extent; (3) to a slight extent; (4) to some extent; (5) to a great extent; (6) to a very great extent; and (7) completely. The power score for this dimension was computed for each subunit by averaging the pooled responses to this question of all the respondents. For example, the power score for unit A on this dimension is computed by averaging the pooled responses of units A, B, C, and the president of the organization to the question of unit A's ability to define its own objectives. The same procedure is repeated for unit B and C, resulting in a power score on this dimension for each subunit.

A subunit power score is computed in a similar fashion for each of the remaining dimensions of: influence on product innovation decisions (question 9); influence on capital budgeting decisions (question 10); and influence on marketing strategy decisions (question 11).

An "Index of Subunit Power" for each subunit is then computed by

pooling the power scores of the four dimensions for that unit and determining the mean response score. The result then, is the Index of Subunit Power which reflects the perceived reputational power score over four dimensions for each subunit, with a high numerical value representing more power and a low numerical value representing less power of that subunit in that organization.

Task Interdependence

The approach used to determine measures of task interdependence used in this study is based on the work of Lawrence and Lorsch (1969:251). Respondents are asked to indicate the degree to which each of the subunits, including his own, is influenced by how other subunits perform their own tasks. For example, respondents are asked to indicate the extent to which the manufacturing subunit is influenced by the way the sales subunit performs its own task. When the respondent indicates his response to this question, he is then asked to indicate the extent to which the manufacturing subunit is influenced by the way the engineering subunit performs its own task (question 3). This procedure is repeated for each of the remaining subunits of engineering (question 4), and sales (question 5). The response categories varied along a seven-point scale of: (1) not at all; (2) to a very slight extent; (3) to a slight extent; (4) to some extent; (5) to a great extent; (6) to a very great extent; and (7) completely.

The measure of task interdependence used in this study is a reflection of the degree to which a subunit influences others while performing its own tasks and is computed in the following manner. For each subunit, the mean responses to the degree to which it influences other

subunits are summed to give a Task Interdependence score for that subunit. This procedure is repeated for each of the other subunits in that organization. For example, if the mean response score to the extent to which Sales influences Manufacturing while performing its own task is 5.25, and the mean response score on this same issue in relation to Engineering is 3.75, the Task Interdependence score for the Sales subunit in that organization is computed by summing each of the individual subunit Task Interdependency scores in that organization. A high value on this measure represents a high degree of interdependence, while a low numerical value reflects a low degree of interdependence.

Asymmetry

As discussed earlier, many theorists have suggested that an imbalance in task interdependencies is a basis for power differentials. This imbalance will be operationalized as the net difference in the extent to which a subunit influences others while performing its own tasks, and the extent to which it is influenced by other subunits carrying out their own tasks. This difference, or imbalance, will be called "Asymmetry," and will be computed in the following fashion. First, a value is computed for each subunit in a manner similar to that described above to compute the measure of Task Interdependence, which reflects the extent to which the subunit is influenced by the way the other subunits perform their own tasks. The mean responses to the question of the extent to which that subunit is influenced are summed, and the result is subtracted from the Task Interdependence score for that subunit. The product of this computation will have either a positive numerical value signifying that that subunit influences others more by

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its task activities than it is influenced; a value of zero signifying the interdependence is balanced; or a negative numerical value which signifies that that subunit is influenced more by other subunits in performing their task activities than it influences others. For example, if the computed Task Dependency score for a subunit is 9.00, and the score for the amount that subunit is influenced by others in their task activities is 9.50, the Asymmetry score for that subunit will be $-.50$ ($9.00-9.50$), which is a representation that that subunit is seen as being influenced more by others than it influences other subunits in the area of task activities.

What is at issue in this part of the investigation is to test whether there is any relationship at all between task interdependency imbalances and power. Consequently, consideration is given to the relative differences in task interdependence scores, not the absolute values. It is possible that the relationship between imbalance and power differentials is dependent upon the degree of task interdependence in an organization. Task asymmetry might be more of a factor in explaining power differentials in organizations which are characterized by a relatively low overall degree of task interdependence than in organizations where there is a higher amount of task interdependence between subunits. Unfortunately, the small sample size of this study precludes a consideration of this issue.

Task Difficulty

The measure of task difficulty chosen for this study is similar to that used by Lawrence and Lorsch (1969:249). Respondents are asked to indicate the degree of difficulty they see associated with three major tasks in the organization, (question 6) which are the task activities

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associated with each of the subunits of engineering, manufacturing and sales. These tasks are: 1) developing a product which can be manufactured and sold profitably; 2) manufacturing economically a product which can be designed and sold; and 3) selling a product which can be developed and manufactured economically. Respondents are asked to choose a number on a seven-point scale ranging from a low of (1) no difficulty at all, to a high of (7) extremely difficult, which reflects the perception of difficulty associated with each task. For each of the task areas a score is computed by averaging the pooled responses to that question. The result is a numerical value with a higher number representing a greater degree of difficulty associated with that task.

The Task Difficulty score for each subunit is the value assigned to the activity associated with that subunit. For example, if the mean response value to the question of the degree of difficulty associated with developing a product is 2.25, this value is the Task Difficulty score for the engineering subunit. This procedure is repeated for the subunits of manufacturing and sales. The Organization Task Difficulty score is computed by summing the individual subunit scores on this dimension.

Task Understanding

Another variable related to task substitutability is the degree to which a subunit's activities are understood by others in the organization and is operationalized by a measure of Task Understanding which is determined by averaging the pooled responses to the following (question 7): respondents are asked to choose from a seven-point scale the extent to which the activities of each of the subunits are understood,

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with the response category at the low end of the scale being "completely understood by those outside the department" and that at the high end being "not at all understood by those outside the department." This is repeated for all of the subunits in that organization. For each of the subunits, a Task Understanding score is computed by averaging the pooled responses to this question. A Task Understanding score for each organization is computed by summing the individual subunit scores. A high score on this measure represents the perception of a low degree of understanding by those outside the unit in question, while a low value represents a high degree of understanding.

Criticalness

To determine the degree to which a subunit is seen as "critical" relative to the other subunits in the organization, a measure of Criticalness is determined in the following way for each subunit.

Respondents are asked to rank the subunits in their organizations "in terms of the importance of each in contributing to your company's ability to compete successfully in your industry," (question 8) with 1 being the most critical, 2 being the second most critical, and 3 being the third. The rankings of all the respondents are pooled for each subunit with the resulting numerical value representing the overall ranking of each subunit.

Performance

The measures of performance used are those developed by Lawrence and Lorsch (1969:261). The presidents of each company were asked to indicate "the percentage change on a year to year basis of three

performance indicators: sales, before tax profits; and return on investment before taxes" for the past five years. The result is a representation of the percentage change on each of these three measures for each of the last five years. In addition, each respondent was asked his subjective assessment of the entire organization as it relates to competitors in that industry.

Summary

This chapter has presented twelve hypotheses which will be tested in this study. Four of them deal with perceptual dimensions of the organization's environment, while the remaining nine suggest relationships between subunit power and organizational and environmental variables. Eleven main variables of the study are listed and their operationalization is discussed.

CHAPTER FOUR

METHODOLOGY AND DEVELOPMENT OF THE INSTRUMENT

Sample

The main thrust of the study is toward a conceptualization of organizational environments and an investigation of intra-organization power. As these areas have yet to be clearly defined in the literature, this study is of an exploratory nature, aimed at contributing to a more precise definition of these concepts. Consequently, the study is designed with an over-arching concern for simplicity, so that the relationships between variables could be examined with a minimum of contamination from other sources.

The following criteria guided the selection of organizations sampled in the study. 1) The organizations selected were to be the smallest, simplest, independent task systems that had distinct, identifiable subunits in reciprocal interdependence (Thompson, 1967). 2) The organizations were to be as similar in technologies, environments and size as possible. 3) There was to be a range of economic performance in the sample. 4) The functional divisions of labor were to be distinct and clearly the responsibility of identifiable subunits. 5) There was to be a relatively simple product line.

To meet the above criteria, small manufacturing firms in the private sector were chosen. Further, there were two more reasons for choosing this class of organizations. First, there seemed to be a

sufficient number of these organizations in the local area that could be reached within the constraints of time and budget available for the study. Secondly, the researcher has extensive experience in this type of organization which contributed to a degree of rapport with the respondents.

Firms were selected from the New England Manufacturers Directory on the basis of size and simplified product line. Sixty-three letters (see Appendix A) were sent out to the firms selected, followed two weeks later by a personal phone call to the firm's president from the researcher, asking for participation in the study. At this point, twenty-eight firms expressed tentative interest in supporting the study. An appointment was then made with the president of each for an introductory interview during which the nature and intent of the study was explained in some detail and information was gathered as to the suitability of the firm as a research site. Fourteen of these were subsequently eliminated either because they did not wish to participate fully, or they did not meet the criteria listed above. This left fourteen firms which actually participated in the study. Because a number of firms agreed to participate on the agreement that their anonymity would be assured, the firms are identified by code numbers - 101 through 114. Through the course of the study, two of the firms - 102 and 106 - because of changing conditions, decided they could not continue participation, and they were dropped from the final study. The final sample of twelve firms is listed in Table 3.

Each of the twelve companies is autonomous, either independent of outside control (9 firms) or an independent subsidiary of a major corporation (3 firms: 101, 105, and 113). The median size is 250 employees.

Table 3. Characteristics of Firms in the Study

Company Identification Number	Number of Employees	Technology ¹	Product
101	1200	B(VI)	Hardware
103	150	B(VI)	Electrical Controls
104	250	B(VI)	Electro-Mechanical Measuring Devices
105	450	A(II)	Ordinance
107	245	B(VI)	Piano Keyboards
108	230	B(VI)	Hand Tools
109	140	B(VI)	Hand Tools
110	300	A(II)	Blowers
111	200	A(IV)	Rare Metal Plating
112	360	B(VI)	Metal Fasteners
113	300	B(VI)	Hardware
114	250	B(VI)	Wire and Cable

¹Technology is based on Woodward's typology (1958:11) A = Small Batch and Unit Production; B = Large Batch and Mass Production. Roman numerals in parentheses correspond to Woodward's sub-categories: (II) = Production of technically complex units; (IV) = Production of small batches; (VI) = Production of large batches, assembly line type.

They have similar technologies, nine of the twelve have "large batch" (Woodward, 1958) production technologies; all are located within the State of Connecticut, having in common a similar political and economic "macro" environment (Osborn and Hunt, 1974).

Organizational Subunits

The subunits chosen for analysis in the study are those of manufacturing sales and engineering. One of the difficulties encountered in the selection of firms was the wide divergence of organizational structure. Of the fourteen firms who showed interest in the study, but who were subsequently not selected for analysis, most were rejected because the organizational structure did not meet the selection criteria, not because of a lack of interest in participating in the study. (A similar range of organizational diversity is reported by Perrow, 1970b). Examples found were: the manufacturing function carried out in different locales, sometimes under the responsibility of semi-autonomous subsidiaries; more than one sales unit, or the sales function assigned to independent manufacturer's representatives, or some combination of the two; the engineering function integrated with sales or manufacturing.

The firms finally selected for the study had one subunit each identifiable as manufacturing, sales, and engineering, although they did not share common labels. The distribution of functional responsibilities in the twelve firms is shown in Table 4.

Data Collection Methods

Data for this study were collected by means of a combined structured and open-ended interview with the president of each company and

TABLE 4

Functional Responsibilities of Subunits

<u>FUNCTIONAL RESPONSIBILITY</u>	<u>SUBUNIT</u>													
	(Company Code)	101	103	104	105	107	108	109	110	111	112	113	114	
1. Labor Procurement	Per	Ea Dpt	Per Dpt	Per Dpt	Ea Dpt	Per Dpt	Ea Dpt	Ea Dpt	Per	Per	Per	Ea Dpt	Ea Dpt	
2. Capital Procurement	Ch Exec	Fin Exec	Fin Exec	Fin Exec	Fin Exec	Ch Exec	Ch Exec	Ch Exec	Ch Exec	Ch Exec	Ch Exec	Ch Exec	Ch Exec	
3. Marketing	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales	Sales	
4. Production Technology	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	
5. Material Procurement	Mtl	Mfg	Mfg	Mfg	Mfg	Pur	Mfg	Pur	Pur	Pur	Mfg	Pur	Pur	
6. Product Characteristics	Eng	Eng	Eng	Eng	Eng	Eng	Eng	Eng	Eng	Eng	Eng	Eng	Eng	
7. Production	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	Mfg	

the respective heads of manufacturing, sales and engineering for a total of forty-eight respondents.

The following format was basically followed at each research site. The initial interview with the firm's president was unstructured. The time was spent in explaining the nature and reason for the study, describing the time required and the number of people who would be involved, and trying to gain the cooperation of the president.

If this phase was successful, information was then gathered on the nature of the firm's structure, manufacturing processes, general market and environmental conditions, and the firm's performance. If the firm seemed to meet the criteria described previously, the next step was to set up an interview schedule for each of the respondents. Each interview was conducted in the respondent's office, and lasted from one to three hours.

As the study was of an exploratory nature, the interviews were conducted in a conversational fashion allowing ample discussion time with each respondent to check the surface validity of the instrument. A recurring phenomenon was the respondent's initial perception of the term "environment" to mean issues of air and water pollution, safety standards and the like. A majority of the respondents seemed to feel misunderstood and under attack by parties they identified as "environmentalists" and initially exhibited signs of distrust and hostility toward the researcher until this issue was clarified. Once the respondents recognized that the term "environment" as used in the study meant all factors outside the firm's boundaries, rapport increased and they were able to relate their perceptions to the "linkage" model of the environment used in the study.

During the course of the interview, the researcher read each question in turn to the respondents; at this time, the respondent was given a card containing the response scale for that particular question. For example, the respondent was given a card containing the following seven-point scale: (1) not at all; (2) to a very slight extent; (3) to a slight extent; (4) to some extent; (5) to a great extent; (6) to a very great extent; and (7) completely; and then asked this question:

"Using the scale on the card before you, please choose the number that best indicates the extent to which each of the following areas influences product innovation decisions in your firm. What is the extent to which Manufacturing influences product innovation decisions in your firm? (Question 9)

The response was then recorded and the question repeated for all of the subunits in that firm. (The response cards and questionnaire are displayed in Appendix A). The same procedure, using the appropriate response card was used for the other questions listed in the questionnaire.

As the units of analysis were organizations and subunits, and not individuals, a mean score on each variable for each subunit in each organization was constructed from the responses of the four executives interviewed in each organization. This resulted in measures of variables which represented the pooled perceptions of the executive group.

The same questions were asked of all of the respondents with the exception of question 1 which had to do with the organization's structure, and question 20 which had to do with the firm's performance. These two questions were only asked of the president of each company.

There is some difficulty in equating numerical responses with complex concepts such as power and environmental complexity. At best the responses are an over-simplified approximation of highly abstract mental constructs, and consequently, the findings should be interpreted with a

degree of caution. Because of the complexity and abstractness of the issues it is problematic whether the respondents are in fact identifying similar issues. In an attempt to deal with this issue, the research strategy was designed to allow time during the interviews so that respondents would be able to grasp the meaning of the concepts before being questioned. This raises the issue of researcher bias. Every study is somewhat biased, if for no other reason than the questions asked and issues raised are the researcher's and not the respondent's. An advantage of this study is that the bias is at least systematic as the respondents in each organization were all interviewed by the same researcher who made every effort to maintain a common approach with all the respondents.

Development of the Instrument

The instrument used in guiding the interviews was a twenty-item questionnaire which was pretested with executives in local firms that were not part of the sample. The actual field study took place during the spring and fall of 1974. The interviews were carried out using the schedule shown in Appendix A.

The original intent was that the questionnaire be self-administered. However, the pilot study showed that the questions, as they stood, did not elicit a common conceptualization of the issues on the part of the respondents; consequently, the interview strategy was chosen. As mentioned earlier, most of the respondents had difficulty with the term "environment" responding rather narrowly in social responsibility terms. The pilot questionnaire also contained six more items than did the final version. These were dropped, either because respondents saw them as

duplicating other items, or the questions were not sufficiently discriminating. For example, allocation of the budget was initially intended to represent a measure of subunit power. To tap this dimension of power, respondents in the pilot study were asked to indicate which subunits should get what percentages of any hypothetical budget increase, and conversely, what would be the effects of a budget cut. However, it was found that in manufacturing firms, the manufacturing subunit had the largest budget, and, because it was the largest, it would be the first to be cut, and also, the first to be increased. Interviews subsequently showed, both in the pilot and final sample, that the distribution of financial resources did not hold a high priority with the respondents. In the same vein, analysis of the twelve firms sampled, shows that the capital supply environmental component was seen as the most simple, static and least uncertain component of the environment.

The Instrument

This section discusses the instrument used and the rationale behind the selection of the items.

The first question investigates the functional responsibilities of the subunits in the subject organization. This was the first question asked of the president of the firm during the initial interview. If the responses indicated that the organization did not meet the criteria listed above, the interview was terminated at that point and that firm dropped from the sample.

Questions 12 through 17 were designed to capture perceptions of the environmental dimensions of complexity, change and uncertainty in six environmental components of labor supply, process technology,

product technology, markets, capital supply and material supply. Question 18 served as a check on the previous six items. If the respondent indicated that there were environmental factors he had not mentioned, they were noted and the respondent was then asked to indicate the degree of change and uncertainty he saw associated with them. Any factors mentioned in this manner were included in the appropriate component during analysis.

The remaining questions have to do with economic performance and respondents' perceptions of power and task activities and have been adapted from the work of Lawrence and Lorsch (1969). Questions 2, 9, 10 and 11 investigate the dimensions of power which are identified as a subunit's ability to change its activities on its own; and subunit influence in the areas of product innovation, marketing strategies and capital budgeting. Questions 3, 4, and 5 generate the data for the variables of Task Interdependence and Asymmetry. Question 6 investigates perceptions of Task Difficulty, while question 7 deals with perceptions of Task Understanding. Respondents are asked in question 8 to rank subunits in the order in which they are seen as critical to the firm's success.

The data on organizational performance are generated in questions 19 and 20 which have been taken directly from Lawrence and Lorsch (1969:261-262). The president of each firm was asked to respond to question 20, while all respondents were asked question 19.

Summary

This chapter discussed the manner in which the sample was selected and the manner in which the field study was carried out. The rationale underlying the selection of the instrument and its development were further discussed.

CHAPTER FIVE

RESULTS OF THE STUDY

The findings of this study can conveniently be grouped according to those which deal with the organization's environment and those which have to do with subunit power. The discussion of the results are divided accordingly.

Table 5 is a summary of the findings of the study in terms of the hypotheses which were tested. Because of the interrelationships between variables, the body of the chapter will not deal with each hypothesis in order, but rather will discuss the variables and their relationships to each other. The methods used in the analysis will be indicated as the discussion develops.

Table 5. Summary of Results

Hypothesis One

Units which are seen as operating in simple-static environments will experience the least perceived uncertainty.

Hypothesis Two

Units which are seen as operating in complex-dynamic environments will experience the greatest perceived environmental uncertainty.

Hypothesis Three

Units which are seen as operating in simple-dynamic environments will experience greater perceived environmental uncertainty than units operating in complex-static environments.

Results

Pearson product-moment correlation between static-dynamic dimension and uncertainty: .86, $p = .003$; between simple-complex dimension and uncertainty: .61, $p = .036$ (Table 6). No environments were identified as being both dynamic and simple, consequently the 2X2 cell configuration of environmental states as hypothesized was not directly testable.

Hypothesis Four

Low performing organizations will experience greater perceived environmental uncertainty than will high performing organizations in similar environments.

Results

Analysis of variance comparing organizational performance and overall perceived environmental uncertainty: $F = .089$, n.s. (Table 8). Hypothesis supported only in the case of the market component of the environment. Spearman rank-order correlation between perceived uncertainty in the market component and organization performance: $-.68$, $p = .025$.

Hypothesis Five

The greater the degree of task interdependence of a subunit, the greater the power of that subunit.

Results

Pearson product-moment correlation between task interdependence and subunit power: .50, $p = .002$, (Table 19).

Hypothesis Six

The greater the degree of asymmetry in task interdependence of a subunit in relationship to other subunits in that organization, the greater the power of that subunit relative to other subunits.

Results

Chi-square = .50, n.s. (Table 21).

Hypothesis Seven

The greater the degree of difficulty associated with a task, the greater the power of the subunit associated with accomplishing that task.

Results

Pearson product-moment correlation between task difficulty and subunit power: $-.06$, n.s. (Table 19).

Hypothesis Eight

The less well understood the activities of a subunit are by others in the organization, the greater the power of that subunit.

Results

Pearson product-moment correlation between task understanding and subunit power: .19, n.s. (Table 19).

Hypothesis Nine

The greater the complexity of an environmental component, the greater the power of that subunit which deals with that component.

Results

Pearson product-moment correlation between environmental complexity and subunit power: .50, $p = .002$, (Table 19).

Hypothesis Ten

The greater the rate of change associated with an environmental component, the greater the power of that subunit which deals with that component.

Results

Pearson product-moment correlation between environmental change and subunit power: .39, $p = .019$ (Table 19).

Hypothesis Eleven

The greater the degree of uncertainty associated with an environmental component, the greater the power of that subunit which deals with that component.

Results

Pearson product-moment correlation between environmental uncertainty and subunit power: $-.01$, n.s. (Table 19).

Hypothesis Twelve

The more a subunit's activities are seen as critical, the greater the power that will be attributed to that subunit.

Results

Pearson product-moment correlation between criticalness and subunit power: .58, $p = .0002$ (Table 19).

Discussion of the Results of the Study

The first issue that will be discussed is the findings relative to organization environments. The next section will deal with the findings relative to subunit power.

The basic intent of this section is to test for a relationship between perceptions of change, complexity and uncertainty. A Pearson product-moment correlation (r) is computed, comparing the total organization scores on these dimensions for all organizations ($N=12$). The results are presented in Table 6. The static-dynamic dimension shows a stronger relationship ($r=.86$) with perceived uncertainty than does the simple-complex dimension ($r=.61$).

The environment is conceptualized as being comprised of six components: labor supply; process technology; product technology; market; capital supply; and material supply. Correlations between the organizational scores on these six components are also computed, with the results shown in Table 6.

Table 6. Partial Correlations of Static-Dynamic and Simple-Complex Environmental State Dimensions with Perceived Environmental Uncertainty

Variable Correlated with Perceived En- vironmental Un- certainty	Zero Order	p.	Correlation Holding Constant	First Order
Organization Environments (N-12):				
Static-Dynamic	.86	.0003	Simple-Complex	.78
Simple-Complex	.61	.036	Static-Dynamic	.00
Environmental Components (N-72):				
Static-Dynamic	.86	.0001	Simple-Complex	.76
Simple-Complex	.63	.0001	Static-Dynamic	.10

The strongest relationships are between the static-dynamic dimension and perceived uncertainty. A partial correlation between these variables shows that the relationship between change and uncertainty remains strong while the correlation between complexity and uncertainty drops. This indicates that the more dynamic the environment is seen by those in the organization, the greater the amount of uncertainty experienced. This supports the findings of Duncan who reports: "the complexity of the decision unit's environment does not have much impact on uncertainty until those factors considered in decision making begin to change, that is, become dynamic" (1972:325).

A high degree of change is always associated with a high degree of complexity. The correlations between the static-dynamic and simple-complex dimensions are .81 ($p=.002$) for organization environments and .69 ($p=.001$) for environmental components. The original research design was to dichotomize the variables of change and complexity into dimensions of static-dynamic and simple-complex as shown in Table 1., Chapter One, constructing a 2x2 cell arrangement. However, when this was done to the environmental dimensions of the twelve organizations in this sample, five each fell into Cells 1 and 4, while only one each fell into Cells 2 and 3. Similar results were reported by Duncan (1972:323). In his sample of ten manufacturing subunits and twelve research and development subunits, seven manufacturing subunits were found in Cell 1 and none in Cell 4, while none of the research and development subunits were found in Cell 1, but seven were in Cell 4.

These findings support the theoretical work of Emery and Trist (1965), Thompson (1967), and Terreberry (1968) and further provide an extension of the empirical work of Duncan (1972). As these writers have

suggested, the more dynamic, complex and turbulent the environment is seen, the greater the degree of uncertainty associated with that environment. The strongest relationship is between change and uncertainty. If an environment is seen as dynamic, it is also seen as complex. In this sample, no environments were identified as being dynamic and simple.

This study provides an empirical operationalization of the dimensions of environmental uncertainty and lends support to the utility of the linkage model of the environment discussed in Chapter One. Organization participants are able to respond in terms of the linkage model of environments, and the data gained lends itself to analysis. As the model is designed to be organizationally non-specific, future research should be across other classes of organizations as a test of these assumptions.

Performance

One of the major variables used in organizational analysis is that of organizational performance. It holds a strong position in the work of the "contingency theorists" who, in the words of Lawrence and Lorsch, seek an answer to the "fundamental question: what kind of organization does it take to deal with various economic and market conditions?" (1969:1). They, and others (e.g., Khandwala, 1973; Keller, et al., 1974; Reimann, 1974) have found significant differences in organizational characteristics between high and low performing organizations.

The variable of economic performance will be used in the analysis of the organizations in this study. Empirical measures of three performance indicators of: sales; before tax profits; and return on investment before taxes; were obtained for the last five years, expressed

as per cent of change over that time period. The results are shown in Table 7. These three measures have been added to arrive at an overall performance ranking for the organizations.

Based on the performance scores of Table 7, organizations are ranked into high, medium, and low performance categories and a one-way analysis of variance (ANOVA) is computed for organizational uncertainty scores.

Table 7. Organizational Performance

Company Code	Percentage change over last five years				Overall Ranking	Mean Pooled Subjective Assessment of Org. Per- formance
	Sales	Profit	R.O.I.	Total		
114	224	615	9	848	1	85%
113	117	226	84	427	2	87%
107	79	106	-33	152	3	81%
108	58	64	19	141	4	76%
112	64	31	19	108	5	63%
103	-10	65	50	105	6	61%
111	12	47	5	64	7	75%
109	-5	1	3	-1	8	68%
110	30	-25	-31	-26	9	79%
104	-10	-48	N.A.	-58	10	72%
105	12	-40	-38	-66	11	93%
101	-25	-42	-30	-97	12	48%

The results displayed in Table 8, show that there are no significant differences in the amount of uncertainty experienced by organizations when ranked on performance.

Table 8. Analysis of Variance: Organizational Performance upon Perceived Environmental Uncertainty of Organizations

Source	SS	df	ms	F	p
Total	60.690	11			
Between	1.178	2	.589	.089	.92
Within	59.512	9	6.612		

Mean Perceived Uncertainty Scores		$\bar{X}$	SD
High Performance		12.26	2.86
Medium Performance		11.05	2.91
Low Performance		12.27	1.99

A one-way ANOVA is then computed in a similar fashion for each of the six environmental components of: labor supply, process technology, product technology, market, capital supply and material supply, with the results shown in Table 9. For five of the six environmental components, there is no significant difference in perceived environmental uncertainty between organizations when ranked on performance. Higher performing organizations, however, experience significantly less environmental uncertainty in the market component than do lower performing organizations.

The marketing component differs in one important respect from the other five components in the environmental model used in this study. It is the part of the organization's environment that has the greatest effect on product disposition and, in the case of organizations such as those in this sample, the consequent conversion of resources into system inputs. In "profit making" firms, as the label implies, the emphasis is on profits as an indicator of organizational performance, and the performance focus is on the market place. Profit figures are seen as an assessment of the firm's abilities to cope with the market segment of its environment. Clearly, factors such as internal efficiencies in the

Table 9. Analysis of Variance: Organizational Performance Upon Perceived Environmental Uncertainty of Environmental Components

Source	SS	df	ms	F	p	Perf. Level	Mean Uncertainty $\bar{X}$	Scores SD
Labor Supply								
Total	10.710	11				High	2.77	.613
Between	3.640	2	1.820	2.317	.154	Med.	1.54	1.027
Within	7.070	9	.785			Low	2.63	.962
Process Technology								
Total	8.401	11				High	2.06	.484
Between	8.606	2	.102	.107	.899	Med.	1.90	.975
Within	.205	9	.956			Low	1.74	1.244
Product Technology								
Total	14.555	11				High	1.19	1.247
Between	1.010	2	.505	.336	.723	Med.	1.38	.923
Within	13.545	9	1.505			Low	1.88	1.45
Market								
Total	5.979	11				High	2.02	.676
Between	3.597	2	1.798	6.800	.016	Med.	1.70	.506
Within	2.382	9	.264			Low	2.99	.290
Capital Supply								
Total	11.956	11				High	1.90	.360
Between	2.535	2	1.267	1.211	.342	Med.	1.10	1.273
Within	9.421	9	1.047			Low	.81	1.178
Material Supply								
Total	7.465	11				High	2.31	.688
Between	.645	2	.323	.426	.915	Med.	2.75	.744
Within	6.820	9	.756			Low	2.22	1.117

production process, abilities to procure needed inputs and others, significantly affect profitability, but as a cursory review of business periodicals will show, marketing activities are identified as a primary component in determining organizational profitability, and, conversely, profits are seen as a primary indicator of market effectiveness.

If past experiences mediate present assessments of uncertainty, it could be expected that in organizations with an empirical measure of effectiveness, such as increased profitability, there would be found a high degree of confidence in assessing states of uncertainty. This proves to be the case. When perceptions of environmental uncertainty in the market component is compared to the firm's increase in profits over the last five years, there is a strong relationship between past profitability and perceived uncertainty ($\rho = -.68$, $p = .025$). The more profitable a firm has been in the past, the less uncertainty there is associated with the market environmental component.

This relationship between perceived uncertainty and profitability is not found when the other five environmental components are examined. The following are the Spearman rank-ordering correlations between perceptions of environmental uncertainty in environmental components and the firm's percentage increase in profits over the last five years.

Labor Supply	.02
Process Technology	.20
Product Technology	.12
Capital Supply	.21
Material Supply	.13

Inspection shows that the relationships, while small, are in the opposite direction. More profitable firms tend to see somewhat more uncertainty in these five components. One reason for this could be that measures of performance in these areas are more ambiguous and harder to

determine. It is more difficult, for example, for a manufacturing firm to determine performance criteria in the area of material supply than it is in product disposition. A question for future research is to determine whether this relationship between perceptions of uncertainty and performance measures holds in other classes of organizations where profit criteria are not present. For example, how do universities perceive the part of the environment that affects their fund-raising activities? Do universities that have been successful in obtaining monetary resources perceive less environmental uncertainty in the capital supply component than those who have been less successful? Does the relationship between concrete measures and perceptions of uncertainty hold in all organizations? These are questions that must be addressed in future research.

Performance as an Independent Variable

An additional measure of performance was obtained in this study by asking respondents for a subjective assessment of organizational performance relative to competitors in their industry. The average of the pooled responses is shown in Table 7. A Spearman rank-order correlation (ρ) was computed between the measure of subjective assessment and organizational performance. For all organizations this correlation is .37. In the six high performing firms, the correlation is very high (.94); however this is not the case with the low performing firms. For these six, the correlation is .14. This measure has been used in many previous studies as an indicator of organizational performance (e.g., Reimann, 1974; Keller, et al., 1974; Lawrence and Lorsch, 1969), with high correlations reported with other performance measures.

This finding highlights one of the methodological difficulties in organizational analysis. Many studies have compared relationships between organizational variables with performance as the independent variable. In most cases, the sample seems to be biased toward good performance. In one of the few discussions directly dealing with this issue, Reimann notes the difficulty in persuading firms with "financial difficulties or labor problems" to take part in organizational studies. He reports that "all of the firms in this study were at least moderately successful, "and", concludes that "the sample of firms in this study was biased in favor of good performance" (1974:705).

The question that arises is: to what degree does a performance bias affect research findings? Subjective measures of organizational performance have gained currency in the literature, due in a large part to the difficulty of obtaining empirical measures. This approach seems justified in view of the strong correlations when reported, and is supported by the correlations reported for the high performing firms in Table 7. But what is to be made of the reported assessments of those in low performing firms, those who have enjoyed declining profits? The eleventh ranked firm, for example, reports a figure of 93 per cent, in comparison to competitors. Thompson (1967) discusses the selection of performance criteria in terms of environments and abilities. He does not, however, discuss the effects of past performance. The relatively high subjective assessments of the lower performing firms in this sample leads to the question of how criteria are selected. If past performance has not been high, do evaluators change the assessment criteria? When things are not going well, are those who are doing more poorly selected for comparison?

In this study it is shown that high performing firms perceive less environmental uncertainty in the marketing component than do low performing firms. However, if only the eight highest performing firms are considered, the opposite conclusion would be reached. High performing firms experience slightly more ($\bar{X}=1.70$). (Data from Table 9) The point to be made here, is that the use of performance as an independent variable must be approached with some caution. This issue will be discussed further in a later part of this study.

Variance in Perceived Environmental Uncertainty

The discussion to this point has dealt with the relationships between performance, change, complexity and uncertainty. We turn now to the issue of differences in perceptions across environmental components. A one-way ANOVA is performed on organization uncertainty scores across the six environmental components with the results shown in Table 10.

Table 10. Analysis of Variance: Environmental Components
Upon Perceived Environmental Uncertainty

Source	SS	df	ms	F	p
Total	69.470	71			
Between	16.205	5	3.241	4.016	.003
Within	53.265	66	.807		

There is a significant difference in perceptions of uncertainty in the various environmental components. As Table 11 shows, the labor supply, material supply and market components of the environment are seen as the most uncertain, followed by process technology, product technology, and finally, the capital supply component is seen as the least uncertain. In an earlier part of this discussion, a strong correlation was noted

Table 11. Mean Organization Scores of Environmental Dimensions, by Environmental Components

Components							Total Org. Score
Labor	Proc. Tech.	Prod. Tech.	Mar- ket	Capi- tal	Mat't.		
Simple-Complex Dimension							
X	5.92	4.83	2.67	6.00	2.58	5.67	10,700
S.D.	2.27	3.48	1.97	2.00	2.35	2.50	8,342
Static-Dynamic Dimension							
X	2.54	2.56	1.91	3.03	1.80	3.09	14.94
S.D.	.39	1.30	1.39	.85	1.61	.77	3.34
Uncertainty Dimension							
X	2.54	1.90	1.48	2.24	1.27	2.43	11.86
S.D.	.67	.87	1.15	.74	1.04	.82	2.44

between the dimensions of change, complexity and perceived uncertainty (Table 6). In a similar fashion, a Pearson product-moment correlation is computed between these dimensions for each of the environmental components with the results shown in Table 12. The strongest correlations between the environmental state dimensions are to be found in the least uncertain environmental components. The lowest correlations are in the most uncertain components of labor supply, material supply, and market, which are also the components in which changes have the most sense of immediacy for the organization. These three are most closely linked to the transformation process of the system. It is in these components that environmental effects will be most quickly felt by the organization. These components are seen as highly uncertain regardless of the degree of change or complexity associated with them. In environmental components with a lesser degree of immediacy, the relationships between the environmental state dimensions are much stronger. This suggests

Table 12. Correlations of Environmental State Dimensions
by Environmental Component Type

Correlations Between:			
Environmental Component	Change and Uncertainty	Complexity and Uncertainty	Change and Complexity
Labor Supply	.45	.03	-.09
Process Tech.	.92*	.61	.73
Product Tech.	.99*	.93*	.94*
Market	.61	.11	.29
Capital Supply	.95*	.91*	.92*
Material Supply	.79	.29	.65

*p. greater than .001

that perceptions of uncertainty are a result of the interaction of three factors: change, complexity, and immediacy, tempered by a fourth factor of past performance. Conditions in the environment which have the most immediate effects on the organization are seen as most turbulent, complex and uncertain. Conditions with less immediacy are seen as less uncertain, simpler, and more static. This raises the question of the effect of feedback on perceptions of uncertainty. Consequences of decisions in areas that have more immediate feedback such as labor and material supply provide evidence as to the success of past predictions. Also, these are areas where decisions are made on a frequent basis. Consequently, it might be expected that areas where decisions must be frequently made and the effects quickly felt would be identified as highly uncertain. Areas such as capital supply and product technology, where decisions are relatively infrequent and consequences long term have a lower degree of uncertainty associated with them. Perceptions of uncertainty seem to be related to the immediacy of consequences, not necessarily the potential severity of those consequences over time.

Power

This section will discuss the relationships between subunit power and the variables included in Hypotheses Five through Thirteen. Table 13 displays a correlation matrix of organization scores on these measures.

Table 13. Correlation Matrix of Organization Scores

Variable (N=12)	2	3	4	5	6	7	$\bar{X}$	SD
1. Power	.72	.48	.18	.74	.59	.33	13.05	1.09
2. Task Interdependence		.74	.09	.71	.84	.68	28.28	3.51
3. Task Difficulty			.25	.31	.60	.51	13.02	1.69
4. Task Understanding				.03	.29	.44	10.77	1.23
5. Environmental Complexity					.81	.61	1070	834
6. Environmental Change						.86	14.94	3.34
7. Environmental Uncertainty						-	11.86	2.44

To be significant at the .05 level, r must be greater than .58.

Table 14. Correlation Matrix of Organization Scores Controlling for Organization Performance

() = low performance: 101, 104, 105, 109, 110, and 111

Variable	2	3	4	5	6	7	$\bar{X}$	SD
1. Power	.91 (.41)	.25 (.43)	.12 (.59)	.68 (.81)	.59 (.51)	.38 (.10)	13.63 (12.47)	.72 (1.05)
2. Task Interdependence		.37 (.87)	.01 (.46)	.68 (.72)	.79 (.90)	.52 (.75)	30.08 (26.48)	2.77 (3.41)
3. Task Difficulty			.78 (.20)	-.03 (.57)	.37 (.69)	.69 (.36)	13.56 (12.47)	1.13 (2.08)
4. Task Understanding				-.14 (.86)	-.02 (.73)	.45 (.64)	10.46 (11.08)	1.12 (1.35)
5. Environmental Complexity					.83 (.89)	.61 (.63)	1445 (695)	996 (448)
6. Environmental Change						.83 (.86)	15.86 (14.02)	3.32 (3.39)
7. Environmental Uncertainty						-	12.51 (11.21)	2.35 (2.57)

To be significant at the .05 level, r must be greater than .81.

Two control variables will be used in the analysis. They are organizational performance and organization environment type. Table 14 displays a correlation matrix of organization scores of high and low performing firms. Table 15 is a correlation matrix of these same measures by high and low environmental uncertainty.

Table 15. Correlation Matrix of Organization Scores Controlling for Organization Environment

() = low uncertainty: 101, 104, 109, 111, 113 and 114

Variable	2	3	4	5	6	7	$\bar{X}$	SD
1. Power	.82 (.69)	.03 (.64)	-.52 (.56)	.64 (.98)	.34 (.73)	-.24 (.39)	13.45 (12.65)	1.21 (.89)
2. Task Interdependence		.03 (.81)	-.83 (-.08)	.61 (.78)	.10 (.91)	-.39 (.61)	30.64 (25.92)	1.93 (3.15)
3. Task Difficulty			.06 (.06)	-.40 (.63)	-.41 (.68)	.14 (.25)	13.81 (12.22)	.88 (2.01)
4. Task Understanding				-.71 (.44)	-.24 (.05)	.15 (.24)	11.25 (10.29)	.97 (1.35)
5. Environmental Complexity					.83 (.82)	.25 (.48)	1528 (611)	949 (354)
6. Environmental Change						.65 (.56)	17.44 (12.44)	1.86 (2.48)
7. Environmental Uncertainty						-	13.81 (9.90)	1.40 (1.41)

To be significant at the .05 level, r must be greater than .81.

To test for significant differences in the variables when the sample is split as shown in Tables 14 and 15, a T-test between the mean scores of these variables is computed with the results shown in Table 16.

With the exceptions noted, none of the T values were significant. The largest values for the independent variables are associated with performance. Slightly more power is reported in high performing firms

Table 16. Mean Differences Between Organization Scores by Performance and Organization Environment Type

	High and Low Performance	High and Low Uncertainty
df = 10	t	t
Power	1.482	.910
Task Interdependence	1.775	2.209
Task Difficulty	.798	1.257
Task Understanding	.236	1.000
Environmental Complexity	1.189	1.567
Environmental Change	.670	2.792*
Environmental Uncertainty	.646	3.403**

*p = .019

**p = .007

than in low. With this exception, there is less variation related to performance than to environment type.

A major theme guiding this analysis is that power differentials of subunits have their bases in interdependencies arising from division of labor. These interdependencies are influenced not only by the nature of the tasks to be performed, but they are also shaped by circumstances in the environment. The variable of task interdependence used in this study is a measure of the degree to which organizational subunits are affected by the activities of other subunits in the same system. A high organization score on this measure would indicate a high degree of task interdependence in that organization.

Each subunit, by virtue of task requirements, is closely linked to other subunits. Contingency theory would predict that this situation of high system interdependence would arise in response to environmental demands. A highly complex, turbulent, dynamic environment would require a high degree of interdependence in order to respond to rapidly changing conditions (Galbraith, 1972). This proves to be the case in this sample of organizations. For all twelve organizations the Pearson

product-moment correlations between the organization scores on task interdependence and the environmental state dimensions of complexity, change and uncertainty are as follows.

Data from Table 13.

Complexity	.71 (p = .010)
Change	.84 (p = .0006)
Uncertainty	.68 (p = .015)

Index of Subunit Power

An additive index of subunit power is constructed by combining the average pooled respondent scores in four areas: influence in product innovation decisions; influence in capital budgeting decisions; influence in marketing strategy decisions; and the degree to which a subunit can change its activities on its own. For a discussion of the criteria for index construction, see Galtung (1967). The following tables show the correlation matrix of the index items and the distribution of index scores.

Table 17. Correlation Matrix of Subunit Power Index Items

N = 36	2	3	4
1. Influence in Product Innovation Decisions	.10	.50	.56
2. Influence in Capital Budgeting Decisions		-.04	.23
3. Influence in Marketing Strategy Decisions			.54
4. Change own Activities			-

Table 18. Distribution of Subunit Power Index Scores

Company Code	Manufacturing	Sales	Engineering	Organization Score
101	3.88	4.38	4.16	12.41
103	4.59	4.94	4.62	14.15
104	3.67	3.17	4.75	11.58
105	3.16	3.88	4.36	11.40
107	4.69	5.75	4.56	15.00
108	4.31	5.50	3.94	13.75
109	3.88	5.31	5.00	14.19
110	3.62	4.75	4.81	13.19
111	3.25	5.25	3.56	12.06
112	4.44	4.56	4.19	13.19
113	3.69	5.06	4.06	12.81
<u>114</u>	<u>3.94</u>	<u>5.19</u>	<u>3.75</u>	<u>12.88</u>
$\bar{X}$	3.93	4.81	4.32	13.05
S.D.	.495	.728	.454	1.095

In this sample, the sales subunits are the most powerful in nine of the twelve firms, with engineering the most powerful in the remaining three. This is similar to Perrow's (1970b) results where he found marketing to be the most powerful subunit in his sample of firms. However, it must be emphasized that these results should not be generalized to all manufacturing firms. Hinings, et al., (1974) report production to be most powerful in their sample of breweries and container manufacturers, while in this sample, it was the least powerful. Generalized comparisons of power cannot be made without specifying the issues that power is related to. For example, Hinings, et al., do not report the raw power scores in their study for all organizations, but they do provide scores on one of their firms as an example of the decision areas included in their power measure. Three of their issues are similar to those in this study. They are: marketing strategies, introduction of new products, and overall capital budget. When their reported scores on these issues are examined, it is found that sales is most powerful, followed by

manufacturing and then engineering. The point here, as discussed earlier, is that the identification of which subunit is "most" powerful will be influenced by the issues selected. Power is, to a large degree, the function of issues selected, and any interpretation of power studies must be made with this in mind.

Analysis

The analysis is done in three directions. First, a correlation analysis is made across all of the organizations to test for general trends. Then, as each organization is an independent system, an intra-organization analysis is made between variables within each organization. Finally, an investigation is made into the relative distribution of power within organizations, and relationships with performance.

Correlational Analysis

A correlation matrix is computed for all thirty-six subunit scores. The results are shown in Table 19.

Table 19. Correlation Matrix of Subunit Scores

Variable (N = 36)	2	3	4	5	6	7	8	9
1. Subunit Power	.50	.19	-.06	.19	.50	.39	-.01	.58
2. Task Interdependence		.41	.16	-.08	.52	.50	.43	.22
3. Asymmetry			.03	-.10	-.10	.01	.16	.02
4. Task Difficulty				.22	-.17	.02	-.04	-.26
5. Task Understanding					-.01	.20	.05	.02
6. Environmental Complexity						.77	.53	.45
7. Environmental Change							.74	.38
8. Environmental Uncertainty								.13
9. Criticalness								-

To be significant at the .05 level, r must be greater than .33

All but two of the variables are related positively to subunit power, as predicted, but only four of the correlations reach a level of significance. The variable of criticalness will not be included in this part of the analysis and will be discussed in a later section. After criticalness, task interdependence and environmental complexity are the variables most strongly related to subunit power, followed by environmental change, and then asymmetry and task understanding. Environmental uncertainty and task difficulty exhibit a slight negative relationship with power.

Task interdependence is a measure of the degree to which the task activities of one subunit affect other subunits. A high degree of interdependence affords a subunit more opportunities for influence and the exercise of power. In Hickson et al.'s terms: to the degree that "subunits control contingencies for one another's activities (they) draw power from the dependencies thereby created" (1971:222). Before power can be exercised, opportunities for influence must be present. A high degree of interdependence affords such opportunities.

Environmental complexity, environmental change, and task interdependence are all highly inter-related. This suggests the degree of task interdependence has its roots in the complexities and dynamics of the environment. The variable of environmental complexity is a measure of the number of factors identified in the environment which affect the firm's activities and can be interpreted as a measure of the organization's dependence on the environment. To the degree that an organization is affected by circumstances in an environmental component, subunits which deal with that component are provided more opportunities for the exercise of power by virtue of the contingencies they control

for other subunits, stemming from the environment. In other words, the more highly integrated into the system a subunit is, by virtue of its links with the environment and the pervasiveness of its task activities, the more opportunities present for that subunit to exercise power.

If power is based in the dependencies of one subunit on another, it might be expected that in an interdependent system, a subunit which controls more dependencies for others, but in turn, is less dependent on other subunits, would, by virtue of this dependency differential, be more powerful. While the relationship between subunit power and asymmetry is in the predicted direction, it is low. One reason for this might be that, in this sample of organizations, they show a high degree of equality in interdependence. On a scale of respondent scores ranging from a value of -2.17 to +3.34, forty-one per cent (15/36) of the subunit scores fell on five points of the scale ranging from -.5 to +.5, while fifty-eight per cent (21/36) fell between the values of -.75 to +.75. It might be expected that small amounts of asymmetry such as in this sample would not show much relationship to power. In those organizations in this sample whose asymmetry scores had a range of greater than plus or minus 1.5, the correlation between subunit power and asymmetry was higher ($r=.31$, six organizations: 104, 107, 113, 109, 112, and 110) than in those organizations with a smaller range of scores ($r=-.06$). This suggests that before asymmetry can be much of a factor in contributing to subunit power, the range, or spread, between subunits must be relatively large. In highly integrated systems, where the range is small, it provides little base for power.

In the theory section of this study, the variable of task understanding was suggested as a measure of task substitutability. As

Table 19 shows, there is a small, and not significant, correlation between subunit power and task understanding. This leads to the question of whether the notion of task substitutability is a viable issue when the subunits in question are part of the organization's "core technology" (Thompson, 1967). Thompson stresses the efforts made by organizations to seal off and protect the core technology from outside influences. In view of this protective stance, it seems doubtful that much consideration would normally be given to the idea of substituting a component of the core technology. Subunits, or task activities, which are peripheral to the core technology might be more likely candidates for substitution consideration. This possibility was not investigated in this study, as the sample of firms was deliberately chosen so that the subunits were highly integrated components of the core technology.

Task difficulty might be a function of the class of organizations in this sample. Nine of the twelve firms identified the engineering task as the most difficult, two ranked it second most difficult, and one ranked it third. This suggests that, for these manufacturing firms, at least, the task of engineering is seen as highly difficult, irrespective of environmental conditions or economic performance.

Environmental uncertainty shows no relationship with power which is not so surprising if it is assumed that it is not uncertainty itself, but rather successful coping which gives rise to power.

In summary, complexity in the subunit's environmental domain and task interdependence are the most strongly related to subunit power, followed by environmental change, task difficulty, asymmetry, environmental uncertainty and task understanding, in that order. In the next section, the intra-organization rankings will be examined to see if these relationships hold within organizations.

Intra-Organization Analysis

Power exists among inter-related units. Consequently, this section will investigate the relative ranking of subunits solely within each system of three subunits. The ranking of each variable for all subunits is shown in Table 20. Table 21 contains the number of times each variable was ranked first for each subunit first-ranked on power.

Inspection of Table 21 shows that the intra-organizational relationships between variables is similar to those in the correlational analysis (Table 19). After criticalness, task interdependence and environmental complexity are the variables most strongly related to power, followed by environmental change, asymmetry, task understanding, environmental uncertainty and then task difficulty. Comparison of rankings controlling for performance shows little difference between high and low performing organizations with the exception of task difficulty (Table 22). In the six low performing organizations, four first-ranked power subunits are also first-ranked on task difficulty, while no subunits first-ranked on power are also first-ranked on this variable in high performing firms.

There are more differences in rankings when organizations are compared on the basis of environmental type as shown in Table 23, especially in the rankings of task interdependence and environmental complexity. In organizations characterized by high environmental uncertainty, five first-ranked power subunits were also first-ranked on task interdependence, and the remaining was ranked second. In firms with environments that are seen as lower in uncertainty, all of the first ranked power subunits were first-ranked on environmental complexity and were also ranked higher on the other environmental state dimensions. This

Table 20. Intra-Organization Ranking of Variables

Comp. Code	Power	Task Int.	Asym.	Task Diff.	Task Und.	Env. Comp.	Env. Chg.	Env. Unc.	Crit.
101	1(S)*	1	3	2	1	1	2	1	1
	2(E)	3	2	1	2	3	3	3	3
	3(M)	2	1	3	3	1	1	2	2
103	1(S)	1	3	2	1	1	3	3	1
	2(E)	1	1	1	2	1	2	2	2
	3(M)	3	2	2	2	3	1	1	2
104	1(E)	1	1	2	2	1	1	1	1
	2(M)	3	3	3	2	3	3	3	2
	3(S)	2	2	1	1	2	2	2	3
105	1(E)	1	1	1	3	3	3	3	1
	2(S)	3	3	3	2	1	2	1	2
	3(M)	2	2	2	1	1	1	2	2
107	1(S)	1	2	2	2	2	2	3	1
	2(M)	3	3	2	3	1	1	2	2
	3(E)	2	1	2	1	3	3	1	3
108	1(S)	1	1	3	3	2	2	1	2
	2(M)	2	2	2	1	1	1	2	1
	3(E)	3	3	1	1	3	3	3	3
109	1(S)	2	3	1	1	1	1	2	2
	2(E)	1	1	2	2	2	2	1	1
	3(M)	3	2	2	3	2	2	3	3
110	1(E)	2	1	1	2	3	3	3	1
	2(S)	1	2	2	1	1	1	1	1
	3(M)	3	3	3	2	2	2	2	3
111	1(S)	2	2	1	1	1	1	1	1
	2(E)	2	1	3	2	3	3	3	2
	3(M)	1	2	2	3	2	2	2	2
112	1(S)	1	1	3	2	1	1	2	1
	2(M)	2	3	2	1	1	2	1	1
	3(E)	3	2	1	3	3	3	3	3
113	1(S)	1	2	3	2	1	1	1	1
	2(E)	1	1	1	1	3	3	3	3
	3(M)	3	3	2	3	2	2	2	2
114	1(S)	3	3	3	2	1	2	2	1
	2(M)	1	2	2	3	2	1	1	2
	3(E)	2	1	1	1	3	3	3	3

*(S) = Sales Subunit; (E) = Engineering Subunit; (M) = Manufacturing Subunit

suggests that the environment is more of a factor in those firms operating in a more placid environment. When the environment is more turbulent, interdependence is a stronger factor.

Table 21. Total Ranking of Variables For All Subunits First-Ranked On Power

Variable	Number of Times Ranked:			Chi-square	df	p
	1st	2nd	3rd			
Task Interdependence	8	3	1	6.50	2	.038
Asymmetry	5	3	4	.50	2	.778
Task Difficulty	4	4	4	.00	2	-
Task Understanding	4	6	2	.50	2	.778
Environmental Complexity	8	2	2	6.00	2	.049
Environmental Change	5	4	3	1.25	2	.535
Environmental Uncertainty	5	3	4	.50	2	.778
Criticalness	10	2	0	14.00	2	.001

Table 22. Ranking of Variables For Subunits First-Ranked On Power Controlling For Performance

Variable	Number of Times First-ranked:		Average Ranking:	
	High Perform.	Low Perform.	High Perform.	Low Perform.
Task Interdependence	5	3	1.33	1.5
Asymmetry	2	3	2.00	1.33
Task Difficulty	0	4	2.66	2.00
Task Understanding	1	3	2.00	1.66
Environmental Complexity	4	4	1.33	1.66

Table 22 (cont'd.)

Variable	Number of Times First-ranked:		Average Ranking:	
	High Perform.	Low Perform.	High Perform.	Low Perform.
Environmental Change	2	3	1.83	1.83
Environmental Uncertainty	2	3	2.0	1.83
Criticalness	5	5	1.16	1.16

Table 23. Ranking of Variables for Subunits First-Ranked on Power Controlling for Environmental Type

Variable	Number of Times First-ranked:		Average Ranking:	
	High Uncert.	Low Uncert.	High Uncert.	Low Uncert.
Task Inter dependence	5	3	1.16	1.66
Asymmetry	4	1	1.50	2.33
Task Difficulty	2	2	2.00	2.00
Task Understanding	1	3	2.16	1.50
Environmental Complexity	2	6	2.00	1.00
Environmental Change	1	4	2.33	1.33
Environmental Uncertainty	1	4	2.50	1.33
Criticalness	5	5	1.16	1.16

The question arises as to why environmental variables should loom larger in organizations with placid environments. An answer to this might be that in placid environments, that part of the environment which is relatively more turbulent will attract more attention, or will stand out more in relation to the rest of the environment. In a highly turbulent environment, the relative differences between components will not

be as noticeable. To test this assumption, a Coefficient of Relative Variation (CRV) (Mendenhall, et al., 1974:139) is computed for scores of the environmental state dimensions of the manufacturing, engineering and sales domains. A T-test is then performed on the results comparing differences between organization environmental states. As Table 24 shows, there is a significant difference between these scores.

Table 24. Mean Differences in Coefficient of Relative Variation Values for Environmental State Dimensions of Manufacturing, Engineering and Sales Subunits, by Organization Environment Type

Variable	$\bar{X}(\text{CRV})$	SD	df	t	p
Environmental Complexity					
High Uncert.	.284	.098	10	4.183	.0018
Low Uncert.	.856	.320			
Environmental Change					
High Uncert.	.227	.083	10	4.687	.0009
Low Uncert.	.768	.270			
Environmental Uncertainty					
High Uncert.	.227	.083	10	4.692	.0009
Low Uncert.	.774	.373			

Interpreting the variable of complexity as a measure of environmental dependence, in a relatively placid environment, control of environmental dependencies provides a base of power for that subunit controlling those dependencies. However, in a turbulent, uncertain environment, when all environmental components are relatively equal in perceived uncertainty, no one subunit is clearly identified as controlling critical dependencies. Under these conditions, the subunit controlling the most internal dependencies is seen as the most powerful. Control of dependencies, or contingencies, for other subunits seems to be the strongest factor in explaining subunit power. Control of environmental

contingencies or "external" dependencies most directly leads to power, with control of "internal" dependencies having a secondary position, coming to the fore when, because all environmental components are seen as being relatively equal in uncertainty, no one subunit stands out from the rest. It is under these conditions that asymmetry is more of a factor, reflecting the importance of internal contingencies.

It must be noted that the preceding analysis is based upon a very small sample of organizations. Consequently, these results must be interpreted with a great deal of caution and should be considered primarily as indicators of future research directions.

Criticalness

The variable of criticalness shows the strongest relationship with subunit power. In ten of the twelve firms in this sample, the first-ranked power subunit was seen as the most critical. While the relationship is clear, the direction of causality is not. Is a subunit seen as powerful because its activities are critical to the organization, or is it seen as critical because it is powerful? It is interesting to note that in only one of the firms did manufacturing identify sales as the most critical, yet sales is overall seen as both the most critical and most powerful in most of the firms. The correlations between the variable of criticalness and other variables is in the same directions and similar to the correlations between subunit power and other variables. Criticalness could almost be a surrogate measure for power. Perhaps it is.

Relationship With Other Studies

There are two major studies in the literature that have dealt at some length with some of the variables in this study: the work of Lawrence and Lorsch (1969) and the work of an English group as described in Hickson, et al., (1971) and Hinings, et al., (1974). Comparison will be first made with the work of Lawrence and Lorsch.

Questions 3 through 11, and questions 19 and 20 in the instrument used in this study have been directly adapted from the instrument of Lawrence and Lorsch as described in Organization and Environment, however the interpretation of the data generated by these questions is different. The variable identified as "task difficulty" in this study is measured by the same question used by Lawrence and Lorsch to represent "uncertainty of causal relationships". Similarly, "task understanding" is measured by the same question which represents "clarity of information" in their study. These two measures were part of a three-item index of environmental uncertainty in their work. Tosi, et al., compared this index with an alternative uncertainty measure and found correlations between the index and their measures ranging from "slightly positive to strongly negative" (1973:32). A similar result is found in this study. The correlation between task difficulty (uncertainty of causal relationships) and perceived environmental uncertainty is $-.04$ (from Table 19). The correlation between task understanding (clarity of information) and uncertainty is $.05$ (Table 19). As mentioned earlier, task difficulty seems to be more a function of task, rather than environment. Lawrence and Lorsch do not report all of the individual scores on this measure for all of the firms in their sample, but they do in the case of the plastics industry. Here they

report values of 5.3, 3.8 and 3.5 for the engineering task, sales task and manufacturing task respectively (1969:29). Their presentation of scores in other parts of their study is somewhat ambiguous (e.g., p. 91, 253) but they seem to be best interpreted as showing that the engineering task is seen as the most difficult in their sample. In this study, this proved to be the case in nine of the twelve firms. This suggests that for most manufacturing firms, the task of engineering a product is commonly seen as the most difficult, irrespective of environmental conditions.

Three of the measures of the English group have a correspondence with measures of this study. Their measure of "perceived workflow pervasiveness" is similar to the variable of "task interdependence" in this study. They report a correlation of .53 between pervasiveness and subunit power, while the correlation between subunit power and task interdependence in this study is .50 (Table 19). In an earlier discussion it was suggested that the variable of task understanding might be a measure of substitutability. It is correlated .19 with subunit power (Table 19) which compares to a correlation of .28 reported by the English group between their measure of perceived substitutability and subunit power. Perceived uncertainty in this study shows little correlation (-.01) with power while a correlation of .15 is reported by Hinings, et al.

As the organizations in these samples are all manufacturing firms, the similarities discussed above suggest that the findings here might be applicable to manufacturing firms in general. A question for further research is to determine the degree to which these findings would be replicated in other classes of organizations.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

One of the major contributions of this study is the conceptualization of a model of organization environments which is not organization-specific and lends itself to empirical analysis. By specifying environmental components in terms of systemic inputs, comparisons across organizations are facilitated. Based on prior theoretical work conceptualizing organizations as open systems, six systemic inputs are identified. These six inputs are the avenues or "linkages" between the organization and its environment and are: 1) labor; 2) materials; 3) capital; 4) product technology; 5) process technology; and 6) markets.

With a framework for environment identification established, the characteristics of environments can then be investigated. An environmental characteristic which has gained much attention in the literature is that of uncertainty. However, to this point, it has not been well identified or operationalized. This study builds on previous work in this area and empirically demonstrates the relationship of perceptions of change and complexity to perceived uncertainty. The more dynamic and complex the environment is seen, the greater the degree of uncertainty associated with that environment. The strongest relationship is between the dimension of change and uncertainty. If an environment is seen as dynamic, it is also seen as complex. In this sample, there were no environments identified as being both dynamic and simple.

The dimensions of performance and immediacy have a mediating effect on perceptions of uncertainty. There is a strong relationship among the firms in this sample between past organizational profitability and perceptions of uncertainty in the market component of the environment. The more profitable a firm has been in the past, the less uncertainty there is associated with the market component.

There is a significant difference in perceptions of uncertainty in the various environmental components. Labor, material and markets are seen as the most uncertain components of the environment followed by process technology, product technology and then capital, which is seen as the least uncertain. The environmental components which have the greatest sense of immediacy for the organization in terms of effects - labor, material and markets - are seen as highly uncertain regardless of the degree of change or complexity associated with them. These results indicate that perceptions of uncertainty are a result of the interaction of three factors of change, complexity and immediacy, and tempered by a fourth factor of past performance.

Perceived subunit power is highly correlated with perceived environmental complexity and perceived task interdependence, which suggests that, to a large degree, power arises out of the dependencies created by environmental and task demands. The more a subunit is seen as affecting others by virtue of its task activities, the more power it is seen as having in systemic decision areas. In relatively placid, stable environments, subunits whose environmental domains are identified as more complex and turbulent are in a position to be more easily identified as controlling organization dependencies rooted in the environment and can draw power from this control. However, when the total environment is

identified as complex and turbulent, no one domain stands out, and consequently, no one subunit can lay claim to control of environmental dependencies. In this situation, no single unit is clearly differentiated from the rest in terms of dependency control and so, the focus turns to task dependencies as a base for subunit power.

Some theorists have asserted that there is a relationship between "external" environmental uncertainty and "internal" uncertainty. Two of the variables examined in this study - task difficulty and task understanding - have been used in other work to represent measures of uncertainty. This study failed to find a relationship between these variables and environmental uncertainties. Is this because the measures are methodologically inadequate, or because the assumed relationship does not exist? Perceptions of task difficulty and lack of understanding of other's activities were not significantly related to power in this study. This suggests that task mastery and information control which have been identified as bases of power at the interpersonal level are not salient factors at the organizational level. Intra-organization power, as opposed to interpersonal power, appears to operate on a different set of dynamics, at least in this respect.

More reported differences are found when organizations are compared on the basis of environment type than on the basis of performance. If other organizational characteristics are influenced by the environment, perhaps performance is also. In one of the few reported studies addressing this issue, Lieberman and O'Connor (1972) found that the economic performance of the firms they studied was strongly related to the performance of other firms and the industry as a whole. To the degree that this holds true, this would explain some of the recent studies

which have not found a relationship between "congruence" and performance.

A current issue in the literature is the question of whether organizational effectiveness is related to the "fit" between the organization and its environment. The basic assumption of the supporters of this view is that differences will be found between organizations with similar environments when compared on the basis of performance. It is argued that there is a desired state of congruence or "fit" between the organization and its environment. The nature of this fit is determined by "contingencies" in the organization's environment and performance "emerges as a function of this fit" (Lawrence and Lorsch, 1969:209). This position is not supported by the data in this study. Very little difference is found between variables when organizations are compared on the basis of performance. Organizations experiencing relatively high degrees of environmental uncertainty and turbulence also report higher degrees of task interdependence, irrespective of economic performance levels.

There is little relationship between performance and perceptions of environmental state dimensions, with the exception of the market environmental component. The more profitable a firm has been, the less uncertain the market component of the environment is viewed. Consistent with other reports is the finding that there is more self-reported power in more profitable firms.

This study adds to our ability to identify and conceptualize environmental uncertainty more clearly. Uncertainty is not a generalized concept characterizing an organization's environment. Different parts of the environment are viewed differently in terms of the amount of feedback available and the immediacy of effects as well as the degree of

change and complexity.

The contributions of this study lie as much in the relationships that were not found as well as those that were. In summary, the results of this study give a little clearer picture of that complex abstraction called the environment, give some support to the notion that control of dependencies is a base for power and call into question some of the assumptions about performance.

APPENDIX

UNIVERSITY OF HARTFORD



200 Bloomfield Avenue, West Hartford, Connecticut 06117

Dear Sir:

The majority of companies in the United States are the size of yours. However, we know very little about them..... How are they organized? How are activities coordinated? What is the relationship between organizational characteristics and performance? We are lacking answers to questions such as these.

At the University of Hartford we are trying to learn more about small and medium sized companies so that we can use this information in the courses taught in the Business School. We are asking a number of companies in this area to take part in this study. Could you help us?

Would you and four or five of your top executives take part in a research project dealing with characteristics of your firm and its environment? We would like to interview you and ask some questions relating to these issues. Each interview would last approximately forty-five minutes. The results of the interviews will be treated with the highest degree of confidentiality. No one but the researchers will see this information. Any information made public will be in such a manner as to insure anonymity for your company.

Of course we will supply you with final reports of the project and will be glad to discuss the results with you. May I call you on _____ to discuss this further?

Thank you.

Very truly yours,

Professor Thomas H. Dulz
Research Director
Department of Management

THD:n

Response card for questions 2 through 5 and 9, 10 and 11:

Not at all	To a very slight extent	To a slight extent	To some extent	To a great extent	To a very great extent	Completely
1	2	3	4	5	6	7

Response card for question 6:

No difficulty at all	1	2	3	4	5	6	7	Extremely difficult
----------------------------	---	---	---	---	---	---	---	------------------------

Response card for question 7:

Completely understood by those outside the department.	1	2	3	4	5	6	7	Not at all understood by those outside the department.
--	---	---	---	---	---	---	---	--

Response card for questions 12 through 17:

1	2	3	4	5
never	almost never	sometimes	frequently	very often

UNIVERSITY OF HARTFORD
AUSTIN DUNHAM BARNEY SCHOOL OF
BUSINESS AND PUBLIC ADMINISTRATION

DEPARTMENT OF MANAGEMENT

RESEARCH QUESTIONNAIRE

COMPANY CODE NO. _____

1. To start, we would like to know a little about the organizational structure of your firm. Could you tell us how the various functional areas are identified in your company?

A. Which subunit in your firm has the major responsibility for labor procurement?

B. Which subunit in your firm has the major responsibility for capital procurement?

C. Which subunit in your firm has the major responsibility for marketing your firm's products?

D. Which subunit in your firm has the major responsibility for determining the production (process) technology used in your firm?

E. Which subunit in your firm has the major responsibility for material procurement?

F. Which subunit in your firm has the major responsibility for determining the product characteristics in your firm?

We are interested in the degree of coordination required between the various functional departments in a typical company in your industry. The following series of questions is concerned with this aspect of your company.

2. Using the following scale, please choose the number that best indicates the extent to which each of the following areas is able to change its activities on its own.

Not at all	To a very slight extent	To a slight extent	To some extent	To a great extent	To a very great extent	Completely
1	2	3	4	5	6	7

A. Extent to which Production is able to change its activities on its own.

B. Extent to which Product Engineering is able to change its activities on its own. _____

C. Extent to which Sales is able to change its activities on its own. _____

We would like to know the extent to which one area on your organization is influenced by how other areas perform their own tasks. Using the following scale, please choose the number that best indicates the extent to which each of the areas listed are influenced by how other areas perform their own tasks.

Not at all	To a very slight extent	To a slight extent	To some extent	To a great extent	To a very great extent	Completely
1	2	3	4	5	6	7

3. Extent to which Production is influenced by:

A. The way Product Engineering performs its own tasks. _____

B. The way Sales performs its own tasks. _____

4. Extent to which Product Engineering is influenced by:

A. The way Production performs its own tasks. _____

B. The way Sales performs its own tasks. _____

5. Extent to which Sales is influenced by:

A. The way Production performs its own tasks. _____

B. The way Product Engineering performs its own tasks. _____

6. Please circle the point on the scale below which most nearly describes the degree of difficulty you see associated with the tasks listed for your firm.

Degree of difficulty in:

A. Developing
a product which can be manufactured and sold profitably.

No difficulty at all	1	2	3	4	5	6	7	Extremely difficult
----------------------	---	---	---	---	---	---	---	---------------------

- B. Manufacturing
economically a
product which can be
designed and sold. No
difficulty
at all 1 2 3 4 5 6 7 Extremely
difficult
- C. Selling
a product which can
be developed and
manufactured
economically. No
difficulty
at all 1 2 3 4 5 6 7 Extremely
difficult

Each department in a firm is charged with the responsibility of carrying out some specific sets of activities. Some activities demand an extremely high level of specialized knowledge possessed only by those engaged in those activities and relatively unknown to others in the organization. On the other hand, there are some activities which do not demand as much specialized knowledge and are better understood by others in the firm.

7. We would like your opinion about how well the activities of the following departments are understood by those outside the department in question. For each department, please circle the level of understanding.

A. The activities of _____ are:

completely understood not at all understood
by those outside the by those outside the
department. 1 2 3 4 5 6 7 department.

B. The activities of _____ are:

completely understood not at all understood
by those outside the by those outside the
department. 1 2 3 4 5 6 7 department.

C. The activities of _____ are:

completely understood not at all understood
by those outside the by those outside the
department. 1 2 3 4 5 6 7 department.

Below is a list of major departments in your firm. While an adequate performance by each of these departments is certainly necessary for company survival, a high level of competence in one or two of these departments may be more critical to your success. We would like you to rank the departments listed below in terms of the importance of each in contributing to your company's ability to compete successfully in your industry.

8. Place a "1" beside the department you feel to be most critical. Place a "2" beside the department you feel to be the second most critical, and so on, until you have ranked them all.

A. _____

B. _____

C. _____

D. _____

E. _____

9. Using the following scale, please choose the number that best indicates the extent to which each of the following areas influence product innovation decisions in your firm.

Not at all	To a very slight extent	To a slight extent	To some extent	To a great extent	To a very great extent	Completely
1	2	3	4	5	6	7

- A. Extent to which Production influences product innovation decisions. _____
- B. Extent to which Product Engineering influences product innovation decisions. _____
- C. Extent to which Sales influences product innovation decisions. _____

10. Using the same scale as above, please choose the number that best indicates the extent to which each of the following areas influences decisions on capital budgeting in your firm.

- A. Extent to which Production influences capital budgeting decisions. _____
- B. Extent to which Product Engineering influences capital budgeting decisions. _____
- C. Extent to which Sales influences capital budgeting decisions. _____

11. Using the same scale as above, please choose the number that best indicates the extent to which each of the following areas influences decisions on marketing strategies in your firm.

- A. Extent to which Production influences marketing strategy decisions. _____

B. Extent to which Product Engineering influences marketing strategy decisions. _____

C. Extent to which Sales influences marketing strategy decisions. _____

We now would like to ask you some questions about environmental factors, that is, things outside your company which affect your operations.

12. What do you consider to be the critical environmental factors (those outside your firm) affecting your firm's ability to obtain an adequate supply of labor?

- | | |
|----------|----------|
| 1. _____ | 4. _____ |
| 2. _____ | 5. _____ |
| 3. _____ | 6. _____ |

Using the following scale, please choose the number that best indicates how often each of the above factors changes.

- | 1 | 2 | 3 | 4 | 5 |
|------------------------|-----------------|-----------|------------------------|---------------|
| never | almost
never | sometimes | frequently | very
often |
| Factor 1 changes _____ | | | Factor 4 changes _____ | |
| Factor 2 changes _____ | | | Factor 5 changes _____ | |
| Factor 3 changes _____ | | | Factor 6 changes _____ | |

Using the same scale as above, please choose the number that best indicates how often you are able to predict how changes in each of the above factors will affect your firm.

- | | |
|----------------|----------------|
| Factor 1 _____ | Factor 4 _____ |
| Factor 2 _____ | Factor 5 _____ |
| Factor 3 _____ | Factor 6 _____ |

13. What do you consider to be the critical environmental factors affecting the technology used in producing your products?

- | | |
|---------|---------|
| 1 _____ | 4 _____ |
| 2 _____ | 5 _____ |
| 3 _____ | 6 _____ |

Using the following scale, please choose the number that best indicates how often each of the above factors changes.

1	2	3	4	5
never	almost never	sometimes	frequently	very often
Factor 1 changes _____			Factor 4 changes _____	
Factor 2 changes _____			Factor 5 changes _____	
Factor 3 changes _____			Factor 6 changes _____	

Using the same scale as above, please choose the number that best indicates how often you are able to predict how changes in each of the above factors will affect your firm.

Factor 1 _____	Factor 4 _____
Factor 2 _____	Factor 5 _____
Factor 3 _____	Factor 6 _____

14. What are the critical environmental factors affecting the technology used in designing and developing your products?

1 _____	4 _____
2 _____	5 _____
3 _____	6 _____

Using the following scale, please choose the number that best indicates how often each of the above factors changes.

1	2	3	4	5
never	almost never	sometimes	frequently	very often
Factor 1 changes _____			Factor 4 changes _____	
Factor 2 changes _____			Factor 5 changes _____	
Factor 3 changes _____			Factor 6 changes _____	

Using the same scale as above, please choose the number that best indicates how often you are able to predict how changes in each of the above factors will affect your firm.

Factor 1 _____	Factor 4 _____
Factor 2 _____	Factor 5 _____
Factor 3 _____	Factor 6 _____

15. What are the critical environment factors affecting your firm's ability to market its products?

1 _____ 4 _____
 2 _____ 5 _____
 3 _____ 6 _____

Using the following scale, please choose the number that best indicates how often each of the above factors changes.

1	2	3	4	5
never	almost never	sometimes	frequently	very often

Factor 1 changes _____ Factor 4 changes _____
 Factor 2 changes _____ Factor 5 changes _____
 Factor 3 changes _____ Factor 6 changes _____

Using the same scale as above, please choose the number that best indicates how often you are able to predict how changes in each of the above factors will affect your firm.

Factor 1 _____ Factor 4 _____
 Factor 2 _____ Factor 5 _____
 Factor 3 _____ Factor 6 _____

16. What are the critical environmental factors affecting your firm's ability to obtain an adequate capital supply?

1 _____ 4 _____
 2 _____ 5 _____
 3 _____ 6 _____

Using the following scale, please choose the number that best indicates how often each of the above factors changes.

1	2	3	4	5
never	almost never	sometimes	frequently	very often

Factor 1 changes _____ Factor 4 changes _____
 Factor 2 changes _____ Factor 5 changes _____
 Factor 3 changes _____ Factor 6 changes _____

Using the same scale as above, please choose the number that best indicates how often you are able to predict how changes in each of the above factors will affect your firm.

Factor 1 _____ Factor 4 _____
 Factor 2 _____ Factor 5 _____
 Factor 3 _____ Factor 6 _____

17. What are the critical environmental factors affecting your firm's ability to obtain an adequate supply of materials?

1 _____ 4 _____
 2 _____ 5 _____
 3 _____ 6 _____

Using the following scale, please choose the number that best indicates how often each of the above factors changes.

1	2	3	4	5
never	almost never	sometimes	frequently	very often

Factor 1 changes _____ Factor 4 changes _____
 Factor 2 changes _____ Factor 5 changes _____
 Factor 3 changes _____ Factor 6 changes _____

Using the same scale as above, please choose the number that best indicates how often you are able to predict how changes in each of the above factors will affect your firm.

Factor 1 _____ Factor 4 _____
 Factor 2 _____ Factor 5 _____
 Factor 3 _____ Factor 6 _____

18. Are there any other factors that critically affect your firm that you have not mentioned? Yes _____ No _____ (If yes, what are they?)

1 _____ 4 _____
 2 _____ 5 _____
 3 _____ 6 _____

As the final stage of the research project in which your organization has participated, we are interested in obtaining some assessment and measurement of the performance of your company (or division). We recognize that the information for which we are asking is sensitive, and therefore we want to be explicit about the manner in which it will be used. The data in the form in which we are asking you to report it will only be seen by the researchers and will not be published. Instead, it will be used to develop rank order comparisons between the various organizations which have participated in the study. The name of your company will not be used.

We need your subjective assessment of the performance of your entire organization as it relates to competitors in this industry. Equating 100% to ideal performance we would like you to indicate what percent of this ideal or optimal performance you personally feel your organization is achieving in this industry.

19. I personally feel that the overall performance of my organization should be rated as _____% in this industry.

20. We are also interested in obtaining a few empirical measures of the trend of your organization's performance over the last five years. In the table below we would like you to indicate the percentage change on a year to year basis of three performance indicators: sales; before tax profits; and return on investment before taxes. Considering the base year 1968 as 100, would you please indicate, in the spaces provided below, the level for each indicator for each year. For example, if sales in 1969 were 5% above 1968, you would put 105 in the 1969 column. If sales were 5% below the 1968 level in 1970, you would put 95 in the 1970 column, and so forth.

	1968	1969	1970	1971	1972	1973
Sales	100					
Before Tax Profits	100					
Return on Investment before Taxes	100					

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