AN EMPIRICAL INVESTIGATION OF THE RELATIONSHIPS BETWEEN ENVIRONMENTAL CHARACTERISTICS AND ORGANIZATIONAL VARIABLES

by

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ABSTRACT

In the September 1974 issue of the Administrative Science Quarterly, Ray Jurkovich presented a core typology for analyzing and interpreting organizational environments. His 64-cell typology, which was developed on a theoretical basis, sought to identify organizational environments along five major dimensions: complexity, routineness of problem/opportunity states, directly related sectors, organized sectors and movement which included change rate and the stability of change. Most previous theorists and researchers in the field of organization-environment interaction have focused on the complexity and movement dimensions. Jurkovich argued that this was not sufficient and that the four-cell typologies of Thompson (1967), Lawrence and Lorsch (1967) were "essentially over-simplified".

In his article, Jurkovich merely presented the dimensions. He did not operationalize the dimensions nor did he demonstrate empirically the viability of his typology. Consequently, the first undertaking in the present study was to develop operational definitions for these dimensions. Data on environmental characteristics and organizational variables (departmental structure, time perspective taken in planning and frequency of changes to plans) were collected from 64 organizational units which came from 21 different business and industrial firms located in British Columbia. The data on
environmental characteristics were subjected to principal components analysis to assist in detecting the underlying structure. Six discrete dimensions were obtained. However, these were different from the ones hypothesized by Jurkovich on a theoretical basis. The six dimensions that were obtained on an empirical basis were pluralism, degree of interdependency, routineness of problem/opportunity states, organized sectors, directly related sectors and change rate.

Based on the results of regression analyses which sought to relate environmental characteristics to organizational variables, two dimensions (the organized sectors and directly related sectors dimensions) were found to be least significant in explaining the variations in departmental structure, time perspective taken in planning and frequency of changes to plans. The "degree of interdependency" dimension was found to be significant in two of the regression functions where "time perspective taken in planning" was used as the dependent variable. Based on these findings, it was believed that a 16- or 8-cell typology was quite capable of explaining the variations in the three organizational variables, without too much loss of explanatory power.

To test the hypotheses that were investigated in this study, the data were systematically subjected to a carefully planned series of data analyses, including multivariate regression, canonical correlation, discriminant analysis and analysis of covariance, to cite only a few. The first set of hypotheses
which sought to relate environmental characteristics to perceived environmental uncertainty was strongly supported. The second set of hypotheses sought to examine the relationships between environmental characteristics and organizational variables. The departmental structure, time perspective taken in planning and frequency of changes to plans of organizational units located in different cells varied significantly from each other. Two variables: size and perceived environmental uncertainty were introduced as test factors to elaborate the relationships between the dependent and independent variables. When size was held constant, the relationships between environmental characteristics and organizational variables became more pronounced. Perceived environmental uncertainty interpreted the relationships between environmental properties and organizational characteristics, because it was only when uncertainty was perceived and recognized by decision makers that there would be subsequent changes in departmental structure and frequency of changes to plans.

This study showed that it was indeed possible to measure environmental characteristics on more than two dimensions, and that environmental characteristics did have an impact on organizational variables.
ACKNOWLEDGEMENTS

First of all, I would like to thank the members of my committee for their encouragement, support and assistance during the various stages of my doctoral programme at the University of British Columbia. Special thanks is due to Vance Mitchell, my committee chairman, who contributed not only as an academic advisor but above all as an enthusiastic friend.

Clearly the study would have been impossible had not the senior executives who participated in the research given un-sparingly of their time. While it would not be possible to identify such firms and individuals by name for reasons of anonymity and confidentiality, I would like to thank all those executives who contributed to the successful completion of the data collection process.

As is customary, I hasten to add that while I am grateful to these various sources for their assistance and cooperation, I assume full responsibilities for the findings and conclusions of this study.

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CHAPTER ONE
INTRODUCTION

Towards the late 1950's*, many leading organizational theorists became increasingly aware of the inadequacy of viewing complex organizations as "closed systems." The tenets of the closed system approach came under fire. As Katz and Kahn put it:

Traditional organization theories have tended to view the human organization as a closed system. This tendency has led to a disregard of differing organizational environments and the nature of organizational dependency on environment. It has also led to an overconcentration on principles of internal organizational functioning, with consequent failure to develop and understand the processes of feedback which are essential to survival. (1966, p. 29)

The study of environmental properties is not new. Murray (1938) distinguished between the "alpha" press, or the environment as it is, and the "beta" press, or the environment as perceived by the individual. Lewin, in his Field Theory of Social Science (1950) hypothesized that "behaviour is a function of personality and environment". These early researchers adopted a more micro view towards individual-environment interaction. They focused on the individual's need structure and how this

* Although Ludwig von Bertalanffy advocated a "general system theory" as early as the 1920's, his views received little attention until shortly after World War II. Beginning in the early 1950's, researchers from varied disciplines started to explore "systems theory", and many arrived at the same conclusion expressed by Kenneth Boulding in a 1953 letter to Bertalanffy. "I seem to have come to much the same conclusion as you have reached, though approaching it from the direction of economics and the social sciences rather than from biology - that there is a body of what I have been calling 'general empirical theory' or 'general system theory' in your excellent terminology, which is of wide applicability in many different disciplines." (Bertalanffy, 1968, p. 14)
interacts with the "alpha" and "beta" presses to produce a resulting set of behaviour. Murray, for example, "saw the individual as interacting with various environments (presses) according to the degree to which they gratify or satisfy his needs." (Pervin, 1968, p. 63) The concepts of organizational environment and organizational climate, as they are generally understood today, were not clearly distinguished. In current literature, most researchers are agreed that organizational climate is a subset of the concept "organizational environment." The latter includes the political, legal and social structures which impinge or impose constraints upon the functioning of the organization. The term, organizational climate, on the other hand, generally refers to the properties or attributes internal to a given organization. Thus, organizational climate is a "less general, less broad concept than environment." (Taguiri & Litwin, 1969, p. 21)

In most instances, studies published prior to the mid-sixties which did look into situational variables usually dealt with organizational climate variables, rather than with organization environmental characteristics as defined and understood by researchers such as Lawrence and Lorsch (1967).

The classical, neo-classical and early human relations schools of management all were concerned primarily with internal structural attributes and processes. The external environment was largely ignored or treated as a constant, as these theorists and researchers sought univeralistic principles of structure, control and planning. Virtually all of the published literature
on management was devoted to intraorganizational phenomena. As a result, a great deal was known about particular organizations and their internal functioning, but much less information was available to answer questions such as why organizations/industries differ as they do, what are the bases for such differences, why are some styles of leadership effective/ineffective in one organization but not in another. In short, the "closed system" approach restricted our vision to a micro level, which is hardly sufficient for the purposes of viewing and understanding modern, complex organizations where there is a high degree of interdependence or interaction among sectors in society in terms of resource acquisition and product disposal.

Even when research was directed toward intraorganizational phenomena, the "closed systems" view proved to be inadequate. Campbell et al (1970), for instance, found that an investigation of the factors that account for managerial effectiveness in an organization or organizational unit simply could not ignore the importance of environmental or situational characteristics:

... the other three classes of variables (predictors, or individual differences developed before the manager was selected for his position; experimental treatments, in the form of training and development programmes; and organizational rewards, or motivators) have never been able to account for much more than half the variability in measures of managerial effectiveness. In the majority of instances, it has been much less than that. Much of what remains unexplained must be a function of differences in environmental or situational characteristics... the sketchy empirical evidence that does exist suggests significant environmental effects... there simply seems to be a consensus that the situation 'makes a difference.' It could not be any other way. (1970, pp. 385-6)
This inability to explain increasingly multi-dimensioned intraorganizational phenomena*, coupled with growing awareness of the interdependence between organizations and other sectors of society**, called for an approach much broader in scope. More and more investigators turned to an "open systems" approach as better suited to the requirements of modern organizational analysis.

"(Open) systems theory is basically concerned with the problems of relationships, of structure, and of interdependence rather than with the constant attributes of objects." (Katz & Kahn, 1966, p. 18) Open systems theory suggests that we view the unit under study, or focal organization (to borrow W. Evan's terminology), as only a part of a larger system. The various components of the system are in a state of constant interaction with each other, though in varying degrees of intensity and frequency. In essence, the open systems approach calls for an

* As Tuite and Chisholm (1972, v-vi) succinctly put it: "Organizations have grown in scale and scope of activities, generating more complex forms of organizational structure as attempts are made to respond to the problems accompanying growth .... Organizations continue to push out their boundaries and domains in terms of sources, markets, technologies and geography such as the growing multinational conglomerates."

** Organizations are becoming increasingly aware of or sensitive to those environmental factors which affect inputs to the organization as well as outputs of the organization in terms of its acceptability to the community at large. Gone are the days when organizations could act unilaterally with total disregard to government policies, actions of labour unions and sentiments of the public. Organizations have to pay lip service to or act in accordance with the principle of corporate responsibility by taking these sectors into consideration in the formulation and implementation of corporate goals and objectives.
investigation of organization-environment interaction. As Frank Baker (1973) has stated:-

To conceptualize an organization as an open system is to emphasize the importance of its environment, upon which the maintenance, survival and growth of an open system depend. (p. 163)

The systems approach, with its emphasis on the importance of the environment, is not new to other disciplines of inquiry. Economists have always been concerned with the problem of organizational adjustments to the environment, even though "by and large these were treated simply as formal exercises in profit maximizing logic." (Miles, 1974, p. 245) However, the sad fact was that until quite recently, economists on the one hand, and organizational theorists, on the other, have taken quite separate routes. Chandler (1962) lamented:-

That the expansion and government of industrial enterprises in a market economy should be closely related to the changing nature of the market seems obvious enough. Yet many writers dealing with business administration often discuss leadership, communication, and structure with only passing reference to the market. On the other hand, economists, antitrust lawyers, and other experts of market behaviour have said little about the impact of the market on corporate administration. (p. 492)

This quotation points out the futility of attempting to undertake organizational analysis with complete disregard of the environment. The source of many organizational problems originates in the environment, outside the organization. Thus, an organizational theorist who seeks to account for variations in organizational phenomena must incorporate environmental variables as well. An open systems approach provides a framework that is well suited for such analytical purposes.
The open systems approach is intuitively simple. It postulates that "everything is related to everything else, though in uneven degrees of tension and reciprocity... But as intuitively simple as it is, the systems view has been difficult to put into practical use. We still find ourselves ignoring the tenets of the open systems view, possibly because of the cognitive limits of our rationality." (Tosi & Hammer, 1974, p. 16)

Any researcher who attempts an open systems approach is confronted with a whole new set of problems. In the first place, he must come to grips with a multitude of variables which may or may not vary concomitantly. Second, he must develop satisfactory measures for operationalizing many dimensions which were hitherto unexplored empirically. Third, he must adopt more sophisticated statistical techniques for analyzing the data although this last problem has been overcome to a considerable extent by the development of advanced multivariate statistical procedures. For example, the Pugh et al (1968) study showed the feasibility of a multivariate approach to the study of organizational structure.

The preceding discussion may serve to explain, at least in part, why there is such a dearth of empirical research on organization-environment interaction. Despite the fact that most books on organizational theory and behaviour published after the mid-sixties have either explicitly stated or alluded to the
importance of the environment*, the sad fact remains that intensive analyses or empirical studies of organization environmental characteristics have been few. As Brinkerhoff and Kunz (1972) noted, "this is still a relatively underdeveloped area in terms of empirical analyses." (p. xix)

Several researchers have approached the topic of organization-environment interaction from different perspectives. Emery and Trist (1965) tried to develop a typology of organizations based on the degree of interconnectedness and the degree of turbulence in the environment. Evan (1966) attempted to describe the environment in terms of organizational sets. Other researchers (e.g. Selznick, 1949; Litwak and Hylton, 1962) have focused on transactional interdependencies. Thompson and McEwen (1958) examined the impact of the environment on goal-setting. Despite the impressive work of these researchers, few attempts have been made to develop a typology comprehensive enough for the systematic investigation and analysis of organizational environments on an empirical basis. Lawrence and Lorsch's (1967) work represents a pioneering effort in this field of endeavour.

Lawrence and Lorsch made no claims that their typology was comprehensive. They acknowledged that they were treading

* Leavitt, Pinfield and Webb noted that their book, Organizations of the Future (1974) was a result of an international conference attended by social scientists and administrators from the U.S. and Eastern and Western Europe. "Although no guidelines beyond the request for orientation to the future were offered, many of the contributed papers and much of the discussion turned out to be centrally concerned with the relationship between the organization and its environment". (p. v)
on "exceedingly complex" (p.6) territory, but opted for parsimony by "using as few concepts as possible to find an answer to our fundamental question." (p. 5) Empirical investigations (Lawrence and Lorsch, 1967; Duncan, 1970) utilizing the four-cell typologies advanced by Lawrence and Lorsch and Thompson (1967) have provided useful insights into the "fundamental" relationships between the organization and its environment. They have also highlighted the significance or impact that environmental characteristics have upon the internal structure, operating strategies, and indeed efficiency, of the organization.

Only when suitable groundwork has been established are the conditions ripe for new progress to be made in the field. The work of Ray Jurkovich appeared to be a significant move in that direction. In an article entitled "A Core Typology of Organizational Environments" published in the September 1974 issue of the Administrative Science Quarterly, he pointed out that the existing four-cell typologies of Lawrence and Lorsch and Thompson were "essentially oversimplified." As an alternative, he offered a 4 x 16 matrix as a conceptual scheme for "broadening and refining the existing parts of a conceptual puzzle and adding a few others to contribute to a better understanding of the whole." (Jurkovich, 1974, p. 380)
Figure 1: Jurkovich's Core Typology of Organizational Environments

<table>
<thead>
<tr>
<th>General Characteristics</th>
<th>Noncomplex</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Routine</td>
<td>Nonroutine</td>
</tr>
<tr>
<td></td>
<td>Organized</td>
<td>Unorganized</td>
</tr>
<tr>
<td></td>
<td>Organized</td>
<td>Unorganized</td>
</tr>
<tr>
<td></td>
<td>Organized</td>
<td>Unorganized</td>
</tr>
</tbody>
</table>

* D = direct  I = indirect

<table>
<thead>
<tr>
<th>Movement</th>
<th>Stable</th>
<th>Unstable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low change rate</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Stable</td>
<td>Unstable</td>
</tr>
<tr>
<td>High change rate</td>
<td>49</td>
<td>64</td>
</tr>
</tbody>
</table>

Source: Jurkovich, 1974, p. 381

It should be noted at the outset that no argument was offered for a magic in numbers, i.e. "the more cells, the better." Nor was it expected that striking differences in internal structuring and operating strategies would exist between organizational units in two adjoining cells. The most significant differences should certainly exist between organizational units located in the four extreme corners, namely cells 1, 16, 49 and 64. In general however, one would hope that a more elaborate typology, encompassing more dimensions for characterising the environment, could assist organizational researchers and practitioners in
viewing those units which fall into the "grey" zones, but which hitherto have been grossly lumped into one of four primary cells in the absence of a more comprehensive typology. There is probably a great deal of truth in Miles' (1974, p. 256) assertion that "the areas which remain incomplete are obviously the most difficult ones, so the limitations of previous research are more often those of omission rather than commission." Any clarifications in this respect could assist in the generation of more specific and sophisticated hypotheses concerning relationships between environmental and organizational variables, which hopefully could be subsequently verified in the field. The results of studies based on a more comprehensive typology could greatly enrich the existing body of knowledge and the range of instruments available for interpreting the environment. These contributions could in turn assist in the development of better "fits" between a given organizational unit and its environment through more accurate perception of the latter's pervading influence on the former's success and long-run survival.

Any advance in this area also could facilitate research in at least two other related areas of inquiry:

(1) A more refined basis for differentiating between environments could lead to the development of a better core typology of organizations themselves.

After a critical review of existing classificatory schemes for differentiating organizations, Hall (1972) came to the conclusion that:
Since organizations are highly complex entities, classificatory schemes must represent this complexity. An adequate classification would have to take into account the array of external conditions (emphasis mine), the total spectrum of actions and interactions within an organization, and the outcome of organizational behaviours. (p. 41)

(2) A more comprehensive typology of organizational environments could lead also to the development of a more satisfactory framework for analyzing or assessing organizational effectiveness. As Etzioni (1960) noted, the organizational unit has to adjust to its environment in order to survive:

The changes that an organization attempts to introduce are usually specific and limited ... Moreover, the organization's orientation to the elements it tries to change is also highly influenced by their existing nature. In short, a study of effectiveness has to include an analysis of the environmental conditions and of the organization's orientation to them. (1961, p. 463)

This suggestion is in line with some of the latest research in the area of organizational effectiveness. Richard Steers (1976) for instance, incorporated organizational environment as one of the dimensions in his multidimensional approach to analyzing organizational effectiveness.

However, before predictive statements of high validity can be made, much empirical work must be done. Jurkovich merely presented dimensions -- he did not operationalize them, nor did he demonstrate empirically the viability of his typology. The present study sought to test the viability of the Jurkovich typology as an instrument for analyzing the environment faced by organizations -- to verify, on an empirical basis, whether
the descriptive typology holds and whether the dimensions can be measured. Consequently, a major portion of this study was devoted to the identification and measurement of various environmental characteristics.

One first step towards the assessment of Jurkovich's typology was to determine whether the environmental dimensions under investigation were in fact independent. It was recognized that some of the variables may be so highly inter-related that it would make more sense to combine them in a more reduced typology encompassing fewer dimensions than the one presented by Jurkovich, without losing any of the significant refinement suggested by the original typology.

It must be emphasized that the present study was not concerned with the assertion and testing of causal relations* between environmental properties and organizational variables, nor with their impact upon organizational effectiveness or performance. These are undoubtedly very important areas for research and would be a logical sequel to the study reported here. However, such an undertaking was beyond the scope of the present study given the current dearth of knowledge concerning relationships between environmental characteristics and organizational effectiveness. To try to establish a normative defini-

* Friedlander & Margulies (1969, p. 173) noted that "although we are using terminology indicative of causal direction (i.e. prediction of, impact upon, etc.), our measures (correlations) are temporarily concurrent." Although the terms "impact upon", "predictor variables" and other related terminologies were used in the research reported here, they should not be interpreted as assertions of causal direction because of the correlational nature of the study.
tion of the relationships between environmental and organizational characteristics would be premature. The present study was of an exploratory nature. It was concerned primarily with empirical investigation and description of existing relationships between environmental and organizational variables, utilizing a typology which had not been previously explored empirically (at least to this researcher's knowledge).

It is believed that the research reported here

(1) provides some evidence that Jurkovich's typology is an improvement over previous typologies as both a conceptual and methodological framework for interpreting and understanding the environment; and

(2) opens a path for further (normative) research and studies of the relationships between environmental characteristics and organizational functioning.
SUMMARY

In this chapter, a brief overview was presented of the literature and research pertaining to organization-environment interaction, and the limitations of using a "closed systems" view for studying organizational phenomena were discussed.

The objectives of the study were stated. These were primarily two-fold:-

(1) To verify, on an empirical basis, Jurkovich's core typology for analyzing organizational environments. The necessity was noted of developing operational definitions for measuring the environmental characteristics identified in the Jurkovich matrix.

(2) To examine the relationships between environmental characteristics and certain organizational variables.

Finally, a rationale was provided for using a more expanded typology for analyzing and interpreting organizational environments.
CHAPTER TWO
MAJOR CONCEPTS AND PROPOSITIONS

The major concept in this study is the environment faced by the departmental unit in a large organization.

This chapter describes the rationale for using departments as the units of analysis. It also presents the rationale for operationalizing the variables and the measures that were selected and/or developed for use in the study.

An initial version of the instrument (see Appendix 2) used for data collection was pre-tested with a group of four senior executives. This pilot study assisted in the detection of questions or areas that respondents had difficulty understanding or interpreting. Inter-item analysis of the responses given by the pre-test subjects were performed. The modifications made as a result of the pilot study were incorporated into the final version of the instrument (see Appendix 3).

2.1 UNIT OF ANALYSIS

In this study, major departments in organizations, rather than the organizations as entities, were used as the units of analysis. The reasons for so doing were primarily two-fold:-

(1) To minimize the "wash-out" effect. If Thompson's perspective is adopted and complex organizations are viewed as "open systems, hence indeterminate and faced with uncertainty, but at the same time as subject to criteria
of rationality and hence needing determinateness and certainty" (1967, p. 10), we see that organizations are faced with two apparently contradictory and incongruous demands. On the one hand, they must exhibit a certain degree of standardization or stability in their structures to reduce the amount of uncertainty. On the other, they must demonstrate enough flexibility to cope with unexpected changes in order to remain viable. Weick (1969) noted that these two requirements for stability and flexibility could be mutually exclusive. However, there are two ways in which the organization could satisfy these apparently conflicting demands: (i) by alternating between stability and flexibility in its structuring of activities; (ii) by differentiation, i.e. simultaneously expressing these two forms in different parts of the organization.

It is reasonable to assume, and there is evidence to support the contention, that large and complex organizations frequently resort to the latter course of action. Leavitt suggested that an organization be viewed as a differentiated set of subsystems, rather than as a unified whole: "... we need to become more analytical about organizations; we need to take a more microscopic look at large organizations and to allow for the possibility of differentiating several kinds of structures and managerial practices within them." (1962, p. 98) This contention was supported empirically by Hall (1962), Lawrence and Lorsch (1967), Duncan (1970) and Lorsch and Allen (1973), to cite only a few.
If the premise is accepted (with its accompanying evidence) that the environments confronting major units within large organizations are indeed different, then any attempt to sum across units in order to arrive at an overall index of complexity or uncertainty for the organization as a whole could prove to be frustrating. At best it would tend to present an inaccurate or distorted picture of the environment faced by the major operating units.

(2) To increase the sample size in order to render the application of many types of statistical analyses meaningful.

2.2 Composition of Organizational Environment

The concept of "environment implicitly includes the notion of boundary, the 'dividing line' between inside and outside." (La Porte, 1971, p. 10) Once the boundary has been drawn, the specific components and factors on either side of the "dividing line" have to be identified.*

Despite the volume of literature dealing with the subject of organization-environment interaction, either in passing or as a principal focus, few attempts have been made to clearly conceptualize the environment or its make-up. Emery and Trist (1967)

* In this study, following Duncan's (1970) segmentation of the environment into its internal and external components, it was assumed that the boundary line between the organization and the environment is easily determinable. In fact, this is not so. Starbuck (1975) compared the problem of finding the organization's boundary to that of finding the boundary of a cloud, and came to the conclusion that the former undertaking was more difficult. Organizations are open systems. Consequently, they are constantly changing and their boundaries fluctuate accordingly. However, for purposes of the present study, an arbitrary line had to be drawn between the organizational unit and its external environment. Duncan's list of internal and external environments' components provided a tool that was useful from an analytical point of view.
dealt with the causal texture of the environment, but did not specify its constituent components or factors. Lawrence and Lorsch (1967) treated the environment as a total entity and did not distinguish between the organization's internal and external environments.

Duncan (1970) has made a significant contribution in this direction by segmenting the environment into its internal and external components:

The internal environment will consist of those relevant physical and social factors within the boundaries of the organization or specific decision unit that are taken directly into consideration in the decision making behaviour of individuals in that system, (whereas)... The external environment will consist of those relevant physical and social factors outside the boundaries of the organization or specific decision unit that are taken directly into consideration in the decision making behaviour of individuals in that system. (p. 12)

Duncan then proceeded further to identify specific environmental components and the factors associated with each. (see Figure 2). The environment, both internal and external, is thus conceptualized and analyzed with respect to some focal organization, or in this study, organizational unit. Each of these factors and components could be treated as a stimulus to which the focal unit is exposed and which may, alone or in conjunction with several others, elicit or affect the actions taken by that unit. The transactions that take place between these factors/components and the organizational units themselves are complex, variable across organizations, and reciprocal in nature.

Duncan's list was developed as the result of 'some preliminary research' (Duncan, 1970, p. 51), although he did not specifically state how it was generated. The list incorporates many of the variables -- professionalization and technology, to cite only two -- which have been examined by various researchers as they relate to the degree of organizational autonomy, the structuring of activities in organizations, centralization, etc. "Professionalization" which is included under the "Organizational Personnel Component" has been the subject of extensive investigation in recent years (e.g. Hall, 1968; Montagna, 1968). The
"Technological Component" is another variable that was the focus of attention by many researchers in the field of organizational analysis. (Woodward, 1965, 1970; Hage and Aiken, 1969; Mohr, 1971). The list is fairly comprehensive and was considered to provide sufficient definitional distinction for the present study. (Duncan noted that his list was developed specifically for industrial organizations). Clearly no organizational unit was expected to identify all the factors and components as relevant to their own functioning. This list was used rather "as a master to code the response of decision unit members as they identified components of their environment." (Duncan, 1970, p. 53)

Duncan's conceptualization of the components and factors making up the organization's internal and external environments could be compared against Osborn's specification of the composition of an organization's environment. Osborn (1971) categorized an organization's environment into three components: the macro, aggregation and task environments.

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... The aggregation environment consists of the associations, interest groups and constituencies operating within a given macro environment (and)... The task environment is defined as that portion of the total setting which is relevant for goal setting and goal attainment. (Osborn & Hunt, 1974, pp. 231-2)

Unfortunately, Osborn failed to break down the composition of these three sub-dimensions into as much detail as in the list provided by Duncan, hence the two classifications may
not be usefully comparable. Duncan's typology of factors and components comprising the organization's internal and external environments covers the aggregation and task environments, but does not deal with the macro environment (as defined by Osborn) in any explicit way. However, the macro environment could be taken as fairly uniform for all organizations operating within a given geographic location and could be largely ignored where research is conducted within one given cultural environment.

Since it was planned to limit the present research to a large metropolitan area in Western Canada, Duncan's list appeared to be adequate.* However, if one were to study organizations or organizational units located across national or cultural boundaries, then clearly the macro environment would have to be taken into consideration.

2.3 ENVIRONMENTAL CHARACTERISTICS

Once the components of the internal and external environments have been specified, one can proceed to the identification and measurement of the dimensions. As stated in Chapter One,

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*Duncan's list was used as part of the instrument after some slight modifications and re-wording (see Worksheet #1 in Appendix 3). Since departments were used as the unit of analysis, at first the author made a further distinction between the internal-internal environment and the internal environment. (see Worksheet # 1 in Appendix 2). The former refers to the environment within the department itself; and the latter refers to the inter-departmental environment or the environment within the company but outside the department under investigation. In the pre-test, it was found that the decision makers had to check all the components and factors in the internal-internal environment as being relevant. This is understandable because no department could function without taking into consideration the factors that were mentioned in the internal-internal environment. Consequently, this section was eliminated in the actual sample.
Jurkovich's typology was presented as a conceptual scheme to assist in understanding the different types of environments confronting organizations. His typology encompasses dimensions, such as the degree of complexity and stability, which have been investigated previously in the field and "a few new notions ... that are felt to be of importance." (Jurkovich, 1974, p. 380) As stated previously, Jurkovich did not operationalize these dimensions. Consequently, the first major task was to develop operational definitions for these dimensions.

Jurkovich identified five major dimensions for characterizing the environment faced by the organization. These were:-

(1) complexity vs. non-complexity
(2) routineness vs. non-routineness of problem/opportunity states
(3) organized vs. unorganized sectors
(4) directly vs. indirectly related sectors
(5) movement which was made up of two sub-dimensions:-
   (a) high vs. low change rate
   (b) stable vs. unstable change
As will be argued in later discussions, several of these so-called dimensions could be comprehensively defined and measured only in terms of two or more variables. Thus, there arose the question of whether the two or more variables comprising a dimension or sub-dimension could be summed together to arrive at an overall measure of that concept.

Inter-item reliability coefficients were calculated for items that made up a variable or sub-dimension. Correlations between variables or sub-dimensions that made up a dimension were also computed. The environmental dimensions derived after inter-item analysis and computation of correlations were then subjected to principal components analysis to come up with "the simplest factor structure" (SPSS, 1975, p. 484) to describe the observed data.

This is not meant to imply, however, that factor analysis was utilized to generate new theories or constructs. Factor analysis is not an appropriate method for discovering full-blown theories about the structure of a domain. Armstrong's article on "Derivation of Theory by Means of Factor Analysis or Tom Swift and his electric factor analysis machine" clearly illustrates that "factor analysis, by itself, may be misleading as far as the development of theory is concerned." (Armstrong, 1967, p. 17).
The principal objective of factor analysis is to attain a more parsimonious description of observed data through its data-reduction capacity. In Mulaik's terms, "exploratory factor analysis represents nothing more than a mathematical transformation of the information contained in the correlation matrix into a form which may (or may not) be more interpretable than the correlation matrix itself." (1972, p. 365) Even Louis Thurstone, one of the earliest proponents of the technique, cautioned that exploration with factor analysis required carefully chosen variables, and that the results obtained should be treated as tentative and provisional in suggesting ideas for further research.

2.4 Complexity

In an article entitled "Architecture of Complexity" (cited in La Porte, 1975, p. 5), Herbert Simon (1965) avoided a formal definition of "complexity" and only suggested that complex systems were ones "made up of a large number of parts that interact in a nonsimple way." Child (1972, p.3) defined environmental complexity as the "heterogeneity and range of environmental activities which are relevant to the organization's operations." La Porte (1975, p. 6) was more specific. He defined complexity as a function of three sets of variables:

The degree of complexity of organized social systems \( Q \) is a function of the number of system components \( C_i \), the relative differentiation or variety of these components \( D_j \), and the degree of interdependency among the components \( I_k \). Then, by definition, the
the greater \( C_i, D_j \) and \( I_k \), the greater the complexity of the organized system (Q).

(p. 6)

La Porte's definition of the concept appeared to be, by far, the most comprehensive and adequate. Consequently, it served as a guideline for operationalization of this concept in the present study. \( C_i \) and \( D_j \) in La Porte's definition could be investigated under the concept of "pluralism" of the internal and external environments. Thus, a definition of complexity called for:

(1) An examination of the "pluralism" of the internal and external environments, i.e. an identification of the factors/components in both the internal and external environments that are relevant to the department's operations, namely its specification of goals, decision making, goal attainment, etc. "A complex environment is one in which the number of interactive relationships relevant for decision making require a high degree of abstraction in order to produce manageable mappings." (Downey and Slocum, 1975, pp. 573-4). It was hypothesized that the greater the number of factors/components that an organizational unit has to deal with in its operations, the greater the perceived uncertainty.

As the number of direct links to organizations, providing primary and secondary resources increases, so does the likelihood of perceived contingency, i.e. more outside units must be taken into account. If the organization's (in this case, organizational unit's) collective cause-effect beliefs are not able to account for this increase, uncertainty is also likely to increase. Direct dependent connections to outside organizations are compounded by indirect dependency connections among
supporting organizations. As networks of direct and indirect dependencies expand, they become the roots of considerable uncertainty for an organization. (La Porte, 1971, p. 13)

(2) A specification of the extent or degree to which these various factors/components affect or restrict the department's activities pertaining to goal setting, decision making and goal attainment. This factor compounds the degree of complexity, and hence perceived uncertainty, experienced by an organizational unit because it increases the number of contingencies and constraints that the focal unit must cope with.

Since organizations or organizational units do not operate in a vacuum,

... the maintenance of organizations depends upon some degree of exchange with outside parties. This dependency upon the environment is seen to impose a degree of constraint upon those directing an organization. As Sadler and Barry put it (1970:58) "an organization cannot evolve or develop in ways which merely reflect the goals, motives or needs of its members or its leaders, since it must always bow to the constraints imposed on it by the nature of its relationship with the environment." (Child, 1972,p.3)

When many organizational outcomes are determined by the actions of others in the environment, the decision maker experiences contingency. "The greater the extent this determination is associated with 'outsiders' the greater the perceived contingency or dependency of the units on elements in its environment." (La Porte, 1971, p.5)

At the same time, increased interdependency or dependency creates and adds to the problems of internal control and coordination. Interdependency entails joint activities
or efforts on the part of the two or more participating units. This will mean, in turn, that a set of arrangements has to be established and worked out between the participants. Some autonomy would be lost in the process and this imposes greater constraints on some aspects of functioning within the units.

Duncan's operationalization of the Simple-Complex dimension merely fulfilled the first objective, namely the identification of the "pluralism" of the internal and external environments. As Jurkovich noted, "just how the various locations differ is assumed rather than explicitly stated." (1974, p. 382)

If one is to argue that environmental complexity is positively related to perceived uncertainty, then clearly the second objective must be met as well. This would call for some measure of dependency and/or interdependency. "The concept of interdependence helps us focus on the problem of interorganizational exchanges." (Aiken and Hage, 1968, p. 270) This is in line with Osborn and Hunt's conceptualization of environmental complexity: "Based on a review of the literature, it is apparent that environmental complexity may represent the interaction effect among three variables: (1) risk (2) dependency, and (3) interorganizational relationships". (1974, p. 231)

In their study, Osborn and Hunt (1974) operationalized risk as the degree of heterogeneity -- "... as heterogeneity among task environment organizations increases, the probability of a stable equilibrium decreases and risk increases..."; and
environmental dependency as "the degree to which a system relies upon specific elements in the environment for growth and survival and the extent to which the important environmental elements affect each other." (p. 234) Interorganizational relationships were viewed "in terms of the (departmental) chief executive's orientation toward such interaction". (p. 236) The focal unit's interaction with other sectors in the environment is conceived of as a dynamic, rather than a static relationship because it changes over time. Hence it should be more appropriately studied under the "Movement" dimension rather than under the "Complexity" dimension.

2.4(a) PLURALISM

For the purposes of this study, Duncan's operationalization of the "pluralism" of the internal and external environments is more comprehensive than that of Osborn and Hunt. The latter merely measured the degree of heterogeneity among task environments along the following dimensions: objectives, goals, output, ownership location, size and structure. (Osborn and Hunt, 1974, p. 238). Duncan's measure, on the other hand, required the respondent to check the factors and components in the "Internal and External Environments List" that are relevant to decision making for their unit and explain why he takes each of these into account in decision making. (Schedule III, Part A, Ques. 1)

A specific Simple-Complex environmental index was then computed for each unit under study by multiplying the number of
This product expresses the contribution of both the number of factors and the degree to which they are similar (found in one component) or are dissimilar (found in several components).... squaring the number of components is an indicator of similarity-dissimilarity in that the more components the factors are in, the more dissimilar they are, and this is then expressed in \( C^2 \).... The rationale for squaring \( C \) is that the amount of variance between components is greater than the amount of variance between factors and thus should be weighted as such in the development of the index. (Duncan, 1970, pp. 54-55)

It is argued that the Simple-Complex index should take into consideration whether the factors/components were located in the internal environment (within the organization) or the external environment (outside the organization), and that they should be weighted accordingly. Presumably, if the majority of relevant factors/components are located in the internal environment, the amount of perceived environmental uncertainty confronting such a unit should be lower than that for an organizational unit whose relevant factors/components are located primarily in the external environment. This should be so because factors/components in the organization or organizational unit itself are presumably easier to control, and cause-effect beliefs about such

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* For the benefit of those readers who are not familiar with Duncan's (1970) work, his formula for calculating the Simple-Complex Environmental Index is as follows: \( (F) \times (C^2) \). (p. 54) For example, a decision unit that has to take into consideration three factors all located within one component would receive a score of 3 (the computation being \( 3 \times 1^2 = 3 \)). On the other hand, a decision unit that has to take into consideration 3 factors located in 3 different components would receive a score of 27 (the computation being \( 3 \times 3^2 = 27 \)).
group's activities should be more accessible and reliable. Under Duncan's formulation, both units would receive the same score because his Simple-Complex index merely takes into account the number of factors and components, regardless of their location.

In this study, factors that were located in the internal environment received a weighting of 1; those that were located in the external environment were assigned a weight of 2. The number of components was squared as an indicator of similarity-dissimilarity as was done in Duncan's index. This scheme was used to arrive at an overall measure of the "Pluralism" dimension. Thus, a unit which had to take into consideration three factors, one of which was located in the internal environment, and two in the external environment but in different components, received a Pluralism Index Score of \((1 + 2 + 2) \times 3^2\) = 45. The set of figures in the small brackets represents the weights assigned to each of the three factors. The \(3^2\) is equivalent to the \(C^2\) in Duncan's formulation of the Simple-Complex Environmental Index, i.e. the number of different components the relevant factors are located in. Compare this with a score under Duncan's formulation. Under Duncan's Simple-Complex Environmental Index, the same unit would receive a score of \((3 \times 3^2 = 27)\).
2.4(b) Degree of Interdependency

The topic of interorganizational dependency has been discussed and investigated by several researchers using different terminologies and with varying degrees of generality. Aiken and Hage (1968) looked into the subject of organizational interdependence; Baker (1971) talked about component interdependence; Levine and White (1961) examined exchange and cooperation between organizations; while Warren (1972) was concerned about concerted decision making.

There are many ways in which organizational dependency and interdependency could be viewed. Emerson (1962), for instance, has suggested that power be conceived as the obverse of dependency. The concept of "power" is a very complex one and by no means easily operationalized. A more fruitful way of looking at the variable of environmental dependency is to adopt Thompson's (1967) perspective and view dependency in terms of constraints. The extent to which the decision maker of a given organizational unit feels constrained by the activities of other factors/components is a measure of the unit's dependency upon those elements for its continued operations.

This dimension was operationalized by collecting information on the following:-

(1) Asking the decision maker to enumerate and list, where relevant, the number of joint programmes that the organizational unit has been involved with in the course of the past three to four years. Aiken and Hage (1968, p. 272 ff) used this as one measure of organizational interdependency. The decision maker
was asked to indicate (i) the goals of each joint programme and (ii) the amount of interdependency that was involved in each -- in terms of the pooling of financial, technical and personnel resources.

Asking the decision maker to state the goals of each joint programme overcome the problem of defining separate joint programmes. In their study, Aiken and Hage found that the organizations which had "a history of successful relationships (those that endured for more than two years)" with a particular organization would most likely engage in a number of joint programmes with the same organization. "This raised the problem of whether different joint programmes with the same organization should be counted as separate programmes. (In the present research, the programme was counted as separate) if it involved different activities. Thus a research programme and an education programme with the same organization,... would be counted as separate joint programmes." (Aiken and Hage, 1968, p. 279).

Aiken and Hage found that it was important to ask questions pertaining to the amount of interdependency because they "did discover that organizational leaders tended to think of the purchase of services as a joint programme. To solve this problem (the interview schedule included) a series of follow-up questions about the amount of staff shared and the amount of funds contributed by each organization involved in the joint programme." (Aiken and Hage, 1968, p. 279)

(2) Asking the decision maker to indicate on a five-point scale (ranging from 1 = Very Seldom to 5 = Very Often), the approximate
frequency with which each of the relevant factors/components comprising the internal and external environments directly restrict the activities of his unit - activities would be specified, such as goal setting, decision making, goal attainment. (see Osborn and Hunt, 1974, pp. 238-9). The emphasis here is on the word "directly" because in the final analysis or in a very broad sense, most if not all factors or components in the internal and external environments "restrict" the activities of the focal unit. In this study, the term "restrict" was used in an immediate sense, i.e. to refer to short-term effects, as opposed to medium-, long-term and/or indirect effects.

In the pre-test, it was found that respondents had some difficulty in interpreting the word "restrict". Incorporating suggestions from the pre-test subjects, the question was subsequently rephrased to: "Please indicate the extent to which you depend on them to accomplish your department's objectives."

As in the case of measuring the "pluralism" of the internal and external environments, it is important to differentiate between the restraints imposed by the internal environment and the external environment. The reasoning is similar to that presented earlier in discussing the formulation of the "Pluralism" index. The Aston group failed to differentiate between inter-organizational dependence and intra-organizational dependence in their study of British factories. Mindlin and Aldrich (1975) argued that it was important to make such a distinction. The latter view was adopted in this study.
(3) Asking the decision maker to indicate how serious is the restraint imposed by these factors/components (identified in (2) above) upon his department's operations. Restraints were scaled on a range from 1 = "not serious at all, i.e. annoying but does not incur any financial loss whatsoever" to 5 = "very serious, i.e. disrupting organizational goals and plans completely, has the effect of halting operations altogether."

During the pre-test, it became evident that this question should be elaborated to include the phrase "the seriousness of that variable (upon your department's operations) when it comes into play." A department may not be frequently restricted by a particular factor/component, but when that factor comes into play (however infrequently), it could have a tremendous impact upon the department's operations.

(4) Asking the executive to indicate the extent to which he could exert some influence over each of those factors/components which he has to take into consideration in decision making.

In the pre-test instrument, there were two questions designed to tap this particular variable (see Questions 4 and 5, Schedule III, Part A in Appendix 2). However, the pre-test subjects felt that the two questions were identical in that they were tapping opposite ends of the same variable/dimension. Hence the two questions were collapsed into one (see Question 4, Schedule III, Part A in Appendix 3).

A measure of environmental dependency or interdependency was then computed by adding (following inter-item analysis, of course) the respective scores on the four questions above. The
score on question (1) was obtained by multiplying each joint programme with its respective magnitude (i.e. amount of pooled resources). The products of all joint programmes (derived in a similar manner) that the focal unit had engaged in over the course of the past year or two were then summed. Weights were assigned to each joint programme prior to the multiplication and summation on a basis similar to that used for the Pluralism index, i.e. a joint programme with a sector in the internal environment received a weighting of 1, while that with a sector in the external environment received a weighting of 2. The scores on this question were then rank-ordered and converted to a 5-point scale ranging from 1 = very low degree of interdependency to 5 = very high degree of interdependency.

The score on question (2) was derived by multiplying and then summing the number of factors/components that the focal unit depended upon for accomplishing its objectives by the extent of such dependence. Each factor or component was weighted as in (1) above. Consider for example a unit which has to take into consideration 3 factors located in 3 different components, one in the internal environment and the others in two separate components in the external environment, and where the responses the decision maker assigns to each of these factors are 2, 4, 5 respectively. Then the unit's score on this variable would be 

\[ (1 \times 2) + (2 \times 4) + (2 \times 5) \] = 20. The first multiple in each pair of small brackets is the weight assigned to the factor (1 for internal environment; and 2 for external environment), and the second multiple in each pair of small brackets is the response
selected for that particular factor. Thus, a high score would indicate high interdependence or low independence.

To arrive at a score for question (3), each factor or component upon which the focal unit depended was multiplied by the seriousness of the restraint imposed by that particular factor. The products for all factors or components that were derived in a similar manner were then summed. To make things simpler, we will use the example of the same hypothetical unit that has to take into consideration 3 factors located in 3 different components. The responses that the decision maker selects in this instance are 1, 4 and 3 respectively. The unit's score on this variable would be \([1 \times 1) + (2 \times 4) + (2 \times 3)\] = 15. The higher the score, the higher the interdependency. Again, the first multiple in each pair of small brackets represents the weights assigned to the factor (1 for internal environment, and 2 for external environment).

The score on question (4) was computed by multiplying each relevant factor or component (with weights assigned in a similar manner) by the amount of influence that the decision maker can exert over that component. Thus, the same hypothetical unit would receive a score of \([1 \times 1) + (2 \times 3) + (2 \times 5)\] = 14 if the decision maker selects response category 1 for the internal factor and response categories 3 and 5 respectively for the two external factors. The higher the score, the higher the unit's interdependence upon factors in the internal and external environments.
2.5 Routine vs. Non-Routine Problem/Opportunity States

"The environment is always both a threat and a resource". (Perrow, 1970, p. 112). However, it was not the purpose in this study to differentiate between cases where the environment constitutes a threat to the focal unit, and those where it presents itself as an opportunity. The objective here was to identify whether such problem/opportunity states could be approached as routine (programmed) or non-routine (non-programmed) activities.

Decisions are programmed to the extent that they are repetitive and routine, to the extent that a definite procedure has been worked out for handling them so that they do not have to be treated de novo each time they occur.... Decisions are non-programmed to the extent that they are novel, unstructured and consequential. There is no cut-and-dried method for handling the problem because it has not arisen before, or because its precise nature and structure are elusive or complex, or because it is so important that it deserves a custom-tailored treatment. (Simon, 1960, pp. 5-6)

Simon's definition of the programmability of the task is quite similar to Perrow's notion of variability and search. Perrow (1970, p. 75 ff) distinguished between the analyzability and variability of the stimuli or problem/opportunity states. Because no two stimuli ever present themselves in exactly the same manner, a stimulus is said to be analyzable when "incremental adaptations from existing programmes or portions of existing programmes can easily be made to standardize the new situation." Where the stimulus is unfamiliar or unanalyzable, "considerable search behaviour must be instituted and the search ... must take place without manuals, computers or clerks who have the requisite information and programmes." The variability of the stimuli, on
the other hand, takes into consideration the number of stimuli - "sometimes the variety is great and every task seems to be a new one demanding the institution of search behaviour of some magnitude (whether analyzable or unanalyzable.)"

It was hypothesized that the more routine the problem/opportunity state, the lower the degree of uncertainty. Where the decision is repetitive, i.e. where situations of a similar nature have occurred before in the past, the cognitive load required is reduced considerably.

In this study, the "routineness/non-routineness of problem/opportunity states" dimension was operationalized along the definitions put forward by Simon and Perrow. This called for:

(1) An examination of the discrepancy between environmental demands and the organizational unit's capacity. This required an identification of the unit's capacity in terms of knowledge, capital and other physical/material resources, including personnel, together with an assessment of how well these stand up to the demands made by the environment.

A decision maker can approach an opportunity or problem by asking whether his organization possesses the technologies, people, cash reserves and other resources to handle or solve a situation without disturbing current activities. (Jurkovich, 1974, p. 383)

This assessment was conceptually similar to Duncan's notion of "perceived influence over the environment". A decision unit's perceived influence over the environment is a function of "the decision unit's ability to (a) affect the demands made on it, (b) affect the expectations of performance made on it, (c) deal
with alternatives to, and (d) have some control over the factors and components taken into consideration by the decision unit in the decision making process." (Duncan, 1970, p. 36)

Thus, internal resources possessed by the focal unit will determine, to a large extent, not only whether it will be able to effect the demands made on it by the environment; but also whether it could resort to alternative courses of action and/or exercise some control to effect changes or ameliorate the demands imposed by the environment.

(2) An investigation of the amount of search for critical information to clarify the decision problem at hand. Where the decision problem is familiar, i.e. problems of a similar nature have arisen before in the past and have been successfully resolved, the amount of search effort exerted would be minimal. Where the problem is unanalyzable or non-routine however, the focal unit would have to expand a considerable amount of effort to search for alternative courses of actions or ways of resolving the problem.

2.5(a) Amount of Discrepancy

To measure the amount of discrepancy between environmental demands and the organizational unit's capacity, the researcher collected information along the following lines, some of which were adapted from the Lawrence and Lorsch questionnaire, and some of which were taken from Duncan's instrument for measuring the degree of perceived influence over the environment.

(1) Asking the decision maker to list the major kinds of problems
related to technological know-how, market information, personnel and other specified issues encountered by his unit in competing (operating) in the industry. To make sure that the decision maker remembered to put down all the major kinds of problems, he was asked to recall the problem or opportunity states that had arisen for his unit in the course of the past year.

(2) For each of the problem/opportunity states indicated above, the decision maker was asked to indicate on a 5-point scale the extent to which he perceives his unit measures up to these demands in terms of: technological know-how, market information, personnel, etc. Point "5" would indicate that he had no problem whatsoever in that respect, i.e. his unit possessed the full capabilities to meet that demand. Point "1", on the other hand, would indicate that the environmental situation completely threw his unit off balance and there would be no way that his unit could ever satisfy such demands.

(3) Asking the decision maker to indicate on a 5-point scale the difficulty of achieving effective solutions to each of them. The scale ranged from 1 = very difficult to 5 = very easy.

(4) Asking the decision maker to indicate the frequency of occurrence of such problems in terms of:

(a) the specific number of times problems of a similar nature have arisen in the course of the past year; and

(b) an estimate of the likelihood for each problem that it will arise again in the future.

(5) For each of the problems identified above, the decision maker was requested to indicate which of the various decision procedures
he used to arrive at the decision or recommendation. If he used more than one procedure, he was requested to split up the percentages accordingly. It was expected, however, that usually he would be likely to put 100 next to one of the four alternatives enumerated below:

(a) ---% Relied on routine/standardized procedures which had been used successfully in the past
(b) ---% Made incremental adaptations from existing procedures easily (with minimal amount of search effort)
(c) ---% Made step-by-step modifications to existing procedures with difficulty
(d) ---% No cut-and-dried method for dealing with the problem. Considerable search for alternative (i.e. new) ways of approaching/solving the problem.

2.5(b) Amount of Search for Critical Information

To measure the amount of search for critical information, the following questions were asked:

(1) The amount of search effort exerted by the focal unit (in terms of man-hours, or weeks/months) to gain critical information to clarify each of the major problems enumerated in the previous section. The decision maker was asked to indicate whether any special task force was set up for the purpose and/or whether outside help (such as consultants, etc.) was sought.

(2) The decision maker's evaluation of the degree to which such search efforts proved fruitful in terms of the degree of trust he placed upon a significant portion of the information acquired.
The decision maker was asked to assign a probability figure ranging from 0.0 = "not confident at all" to 1.0 = "completely confident."

During the pre-test, the respondents indicated that the questions in this section (Schedule III, Part B in Appendix 2) were too laborious. After several interview sessions, it became apparent to the author that respondents, in general, appeared to have an aversion for questionnaires that contained a great number of items even though each item called for relatively short answers. The author re-arranged the questions to come up with a revised questionnaire that contained few broader content questions, each of which sought to cover several items contained in the original instrument. (see Schedule III, Part B in Appendix 3). Thus, the author was able to come up with a more condensed instrument without, in actual fact, losing much of the information asked for in the original pre-test instrument. Question 2 in Schedule III, Part B in Appendix 3, for instance, encompasses questions 7 through 10 in the pre-test instrument. (Appendix 2). Only two questions, namely items 4 and 5 in the original pre-test instrument (Appendix 2) were deleted from the revised version. The respondents had difficulty enumerating the number of past occurrences and they were generally at a loss when assigning probabilities about future occurrences. It was felt that the information called for in question 6 in the original instrument (or question 1 in the revised instrument, Appendix 3) was sufficient for the purposes of calculating a "routineness" index. The revised version was used in obtaining data for the research reported here.
The routineness dimension was thus measured in terms of three variables:- frequency of routine procedures, search for critical information and programmability. Each of these variables was tapped by one or more items. The items in a given variable were subjected to inter-item analysis before being added to form an overall score for that particular variable.

The first variable or frequency of routine procedures was tapped by Question 1 in the revised instrument (Schedule III, Part B, Appendix 3). The score on this question was obtained by calculating the frequency of routine procedures. Thus, if a respondent replied by assigning 50% to Procedure A ("relied on routine/standardized procedures which had been used successfully in the past") and 10%, 30% and 10% respectively to Procedures B ("made incremental adaptations from existing procedures easily"), C ("made step-by-step modifications to existing procedures with difficulty"), and D ("no cut-and-dried method for dealing with the problem"), his frequency count for routine procedures would be 60% (summation of frequency counts for A and B). In order to make summation easy with scores obtained on the other two variables, the frequency count was converted to a five-point scale by dividing the frequency count into 20. Thus, the same respondent would receive a scaled routine score of \((60 : 20) = 3\). The higher the scaled routine score, the greater the reliance upon routine procedures in that particular department.
The "search for critical information" variable was initially hypothesized to consist of scores on questions 2 and 3. (Schedule III, Part B, Appendix 3). Each respondent indicated the number of task force(s) that were set up in his department. These were rank-ordered and split into five even categories. A department which received a score of 5 engaged in very few or no task force efforts, i.e. the nature of their work was highly routine and no elaborate task force was necessary to solve problems/opportunities arising in their department. The response to the part pertaining to "outside help" was scored in a similar manner. The "degree of trust in a significant portion of the information obtained" (question 3) was converted into a five-point scale by dividing the subject's response to this question by 20. Thus a score of 5 would indicate a response of 0.8 to 1.0, or a high trust in the information gained. As will be discussed in greater detail in Chapter Four, the score on "degree of trust" did not correlate highly with the scores on the other two items in the "search for critical information" variable. Hence this item was eliminated in the calculation of the overall score for "search for critical information" variable.

The "programmability" variable was hypothesized to consist of scores on questions 4 through 6 (Appendix 3). In order to come up with an overall "ability to measure up to demands" score, the subject's response to question 4 was multiplied by the scaled frequency of routine procedures and then added to the response to question 5 multiplied by the scaled frequency of non-routine procedures. This sum was then divided
by 5 to end up with a 5-point scale ranging from 1 = low programmability to 5 = high programmability. The formula could thus be written as:

\[
\text{Overall Ability to Measure up to Demands} = \left( \frac{\text{Score on ability to measure up to demands made by routine problems}}{\text{Scaled frequency of routine procedures score}} \right) + \left( \frac{\text{Score on ability to measure up to demands made by non-routine procedures}}{\text{Scaled frequency of non-routine procedures score}} \right)
\]

Thus, if a respondent checked 5 and 4 to questions 4 and 5 respectively, and his scaled frequency of routine procedures score was 3.5, his "Overall ability to measure up to Demands" score would be \( \frac{(5)(3.5) + (4)(1.5)}{5} = 17.5 + 6 \div 5 = 4.7 \). This score was then correlated with that for question 6 to come up with an overall "programmability index".

The scores on the three variables were then correlated to determine whether they could be added to form a "routineness" dimension.
2.6 Organized vs. Unorganized Sectors

According to Jurkovich, "an organized sector refers to another organization or cluster of organizations covered by a formal rule set that is legitimate only for the role set intended by those rules... (whereas) an unorganized sector refers to those actual or potential customers who use the organization's goods and services but are not bound together by formal or informal rules requiring patterned coordinated interaction to reach formally defined goals." (Jurkovich, 1974, p. 385)

Jurkovich hypothesized that because organized sectors are generally easier to come to grips with, they would presumably lower the focal unit's degree of perceived uncertainty. The actions of organized sectors are usually planned and/or stated formally. Hence the focal unit could more easily predict the outcomes that such actions would have upon its own operations, and/or develop plans or strategies to counteract or meet their actions.

While it is true that organized sectors would lower the focal unit's degree of perceived uncertainty in this sense, Jurkovich has failed to consider that organized sectors do pose a threat in other ways which might result in increased overall uncertainty. Organized sectors, as opposed to unorganized groups such as consumers, can impose serious constraints upon the activities of the focal unit which the latter could not ignore. Although corporations talk a lot about social responsibility, in practice, most profit-oriented institutions still
appear to be guided by the "public be damned" principle. The unorganized or consumer groups simply do not possess the "bargaining clout" vis-à-vis the focal unit to ensure that their views and well-being will be taken into consideration. The organized sectors, on the other hand, have real bargaining power, with the amount varying, according to how dependent the focal unit is upon them. The focal unit has to coordinate its policies with those of the organized sectors for fear of reprisals, or for mutual gain. This thus imposes greater contingencies upon the focal unit and hence increases perceived uncertainty.

Whether the uncertainty described above offsets the advantages accrued from dealing with organized sectors was not known and was investigated in this study. The results of this analysis will be discussed in Chapter Five.

The "organized vs. unorganized sectors" dimension was measured by asking the decision maker to supply information on the following:-

(1) Indicate whether each of the factors or components that are taken into consideration in the unit's functioning is organized or unorganized. Organized or unorganized would be defined in terms of whether the factor or component could introduce real and direct threats to or restraints upon the activities of the focal unit. The emphasis here is on the words "real and direct". "Real and direct" imply that the sector possesses the "bargaining clout" vis-à-vis the focal unit to ensure that its views and well-being will be taken into consideration. Thus,
consumer groups would generally be classified as unorganized sectors. As in the examination of the "pluralism" of the internal and external environments, the terms "threats and restraints" were used in an immediate sense. In the final analysis, or in a very broad sense, most, if not all, factors or components in the internal and external environments can, however indirectly, be said to impose "threats and restraints" upon the activities of the focal unit.

(2) The decision maker was asked to indicate which category, organized or unorganized, presented him with more uncertainty in decision making.

Each respondent's score on this dimension was calculated by dividing the number of relevant factors/components he identified as being "organized" into the total number of factors/components that he has to take directly into consideration in decision making. Thus, a respondent who identified 4 out of the 7 factors that he had to take into consideration as being "organized" would receive a score of 57.14%. The higher the percentage, the more the unit's transactions were with organized sectors.
2.7 Directly vs. Indirectly Related Sectors

Jurkovich defined directly related sectors as those with which the focal unit "exchanges without the use of intermediaries", and indirectly related sectors as "those which produce goods and services or provide resources that must be acquired through intermediaries." (Jurkovich, 1974, p. 385)

It was hypothesized that (i) the more indirect an exchange with a given sector and hence the less the unit's control over interaction, and (ii) the more a focal unit's dealings were with indirectly related sectors, the greater the degree of perceived environmental uncertainty experienced by the focal unit.

This dimension has further reaching ramifications for an organization's functioning and strategies than are usually attributed to it in the literature of organizational theory. Indirectly related sectors are capable of generating so much uncertainty for the focal organization or unit that it often resorts to "buying up" or merging with such sectors where possible, so as to reduce the amount of uncertainty. In a study of the increasing trend for merger of hospitals in the United States, Kimberley (1975) cited the desire to seek direct control as one of the primary reasons:

It would appear on the basis of the results here, that factors over which organizational members have very little direct control are very important in determining structural outcomes. Recent developments in the organization of health services in the United States suggest that external factors play an important role in other kinds of organizations as
well. The increasingly large number of hospital mergers and the development of community-wide integrated health care delivery systems are two examples to reduce environmental uncertainty by increasing the amount of direct control by organizational members of certain segments of the environment. (pp. 7-8)

This trend is not unique to health and welfare organizations alone. Industrial organizations often resort to such strategies when faced with problems of control and resource acquisition. However, it was beyond the scope of the present study to examine merger activities which result directly or indirectly from the organization or organizational unit's desire to control factors/components external to the organization.

To come up with a measure of whether a unit's dealings were predominantly with directly or indirectly related sectors, information was gathered on the following:

Using Duncan's internal and external environments' list, the respondents were asked to indicate whether their unit's dealings with each of these factors were direct, or whether they were carried out through an intermediary or intermediaries*; and if so, was more than one intermediary involved. In general, the greater the number of intermediaries for one particular transaction, and the greater the total number of intermediaries that the focal unit had to contend with as a whole; then the greater the amount of perceived uncertainty because of increasing problems of control and coordination.

* In this study, an intermediary is defined as a middle-man -- a third party or person who is not a direct partner in the exchange relationship. For example, a trading agency that markets the goods of smaller manufacturers (who do not sell direct to the consumers) is an intermediary.
Each respondent's score on this dimension was calculated in a manner similar to that for the "organized" dimension. The number of relevant factors/components that the decision maker identified as being "directly related" are divided into the total number of factors/components that he has to take into consideration in decision making. Thus, a respondent who identified 2 out of the 7 factors that he had to take into consideration in decision making as being "directly related" would receive a score of 28.57%. The higher the percentage, the more the unit's transactions were performed on a "directly related" basis.
2.8 MOVEMENT

The last, but by no means least important, dimension in Jurkovich's core typology has to do with the movement in the organizational environment. Most researchers on organization-environment interaction have focused on this dimension because it is hypothesized to be highly related to the amount of perceived environmental uncertainty experienced by the organization or organizational unit. (Dill, 1958; Burns and Stalker, 1958; Emery and Trist, 1965; Lawrence and Lorsch, 1967; Duncan, 1970; Osborn and Hunt, 1974).

The movement characteristic takes into consideration two dimensions:

1. The change rate, which includes the frequency and magnitude of change; and
2. The stability of change, or the predictability of the change pattern.

It is important to distinguish between these dimensions and not merely equate the two as some researchers have done. It is quite possible for an organization or organizational unit to experience rapid but largely predictable change in the environment. In such instances, the amount of uncertainty confronting the organization is relatively low as "it knows reasonably well what environmental conditions it will face in the future." (Miles, 1974, p. 248)

Child (1972, p.3) argued that the "degree of change ... may be seen as a function of three variables: (1) the frequency
of changes in relevant activities; (2) the degree of difference involved at each change; (3) the degree of irregularity in the overall patterns of change - in a sense the 'variability of change.'" Jurkovich himself noted that the first two variables could be viewed as the change rate, whereas the third variable "involves the stability or instability of an environment". (1974, p. 388)

It was hypothesized that both these dimensions affect to varying extents the degree of perceived environmental uncertainty experienced by the focal unit. When the factors and components comprising the focal unit's internal and external environments are in a continual state of flux, the unit finds it difficult, if not impossible at times, to keep itself up-to-date on all the changes and their implications for its own operations and activities.

High rates of change ... makes it difficult (for the focal unit) to construct and test cause-and-effect beliefs about the character and behaviour of dependency relationship and the consequences of their change. If modifications of cause-effect beliefs proceed more slowly than the changes in the environment, uncertainty is greatly heightened. (La Porte, 1971, p. 18)

Changing cause-and-effect beliefs impose constraints and "preclude the testing and reuse of conceptual maps by the individual over time." (Downey and Slocum, 1975, p. 573 ff). When conceptual mappings or relationships between objects are in a state of constant flux, the decision maker cannot readily avail himself of routines which were tried out and worked in the past. "This constant state of map obsolescence can be expected to increase the perception of uncertainty." (Downey and Slocum, 1975, p. 574).
2.8(a) **Change Rate**

In this study, the change rate dimension focused on the frequency and magnitude of changes that took place in the factors and components which made up the focal unit's internal and external environments. This dimension was measured by collecting information on the following:

1. The decision maker was asked to indicate on a 5-point scale, ranging from 1 = very seldom to 5 = very often, the frequency of changes (in goals, policies and programmes) that took place in each of the relevant factors/components comprising the internal and external environments' list in the course of the past year or two.

A study of goals will provide insight into where the organization is going. As Etzioni (1964) noted: "On the surface, an organizational goal may be defined as a desired state of affairs that organizations attempt to realize." However, goal reorientation is by no means the sole way through which one could observe changes in another organization. In general, the formal or official goals remain relatively fixed and stable over a given period of time. What change more frequently are the paths to the goals -- or in other words, the policies and programmes designed and implemented by an organization to attain goals. As Buck (in Thompson and Vroom, 1966, p. 117) notes, "paths become goals for the subsequent levels of the organizational hierarchy."

However, it is by no means easy to study goal and
programme changes in the sectors that the focal unit has dealings with, either because they are not always visible or well known to the focal unit, or simply because they do not exist for some groups. "Unorganized sectors, however -- made up of customers, for example -- have no such things as formal goals." (Jurkovich, 1974, p. 386).

Consequently, a more fruitful strategy was to ask the top decision maker in the focal unit to enumerate the frequency of goal, policy and programme changes in each of the factors/components comprising the internal/external environments' list, where they are known. This was supplemented by similar information concerning any kinds of "ongoing changes" in those sectors which were perceived to be relevant to the focal unit's operations and activities. This included a study of changes in consumers' preferences, the general rise in standard of living, etc. (Schedule III, Part A, Question 8 in Appendix 3).

(2) After estimating the frequency of changes in each of these factors and components, the chief executive was asked to specify on a 5-point scale the magnitude of each change in terms of the seriousness of the impact it had upon the focal unit's operations. The scale ranged from 1 = "not serious at all = may be annoying but does not require any reorientation or modification to existing departmental goals, policies or courses of action pursued by the department" to 5 = "very serious = disrupting existing departmental goals and plans very seriously. Major reorientation or modifications to existing goals and plans are required as a result of the change."
A rate of change score was then computed for each unit by multiplying the frequency of changes by the magnitude of each change.

As stated previously, a distinction was made between factors and components in the internal and external environments because elements in the internal environment are presumably easier to come to grips with, and hence the amount of perceived uncertainty posed by such factors/components should be lower. In a similar vein, changes in elements in the internal environment are presumably more easily manageable because information about such changes, and knowledge about ways and means of coping with such changes are more abundant and fairly well-defined. For example, it would be much easier for a decision maker to cope with his own company's new policies pertaining to the marketing and sale of its products than it would be for him to stay on top of the new marketing strategies adopted by his competitors in the industry. The change rate score for each departmental unit should therefore take into consideration whether such changes occurred in the internal or external environments. Changes in the internal environment received a weighting of 1; while those in the external environment received a weighting of 2.

The formula for calculating the change rate score for each respondent is:

\[
\text{Change Rate Index} = \sum \left( \frac{\text{Frequency of change}}{\text{Magnitude of Change}} \right) \times \text{Weighting assigned to change depending on its location}
\]
Thus, a respondent who indicated that the frequency with which his departmental unit had to contend with changes in each of the relevant sectors and factors (assuming the first two are located in the external environment and the remaining in the internal environment) are 2, 4 and 5 respectively, and estimated the magnitude of such changes to be 5, 4 and 3 respectively, would receive a change rate score of \( (2 \times 5)(2) + (4 \times 4)(2) + (5 \times 3)(1) \) = 67.

2.8(b) Stability of Change

The stability of change focused on the stability, and hence predictability, of contingencies confronting the focal unit.

Under the complexity dimension, the focal unit's relationships/interdependencies with other factors and components in the internal and external environments were discussed. It was also hypothesized that the more factors and components the focal unit has to take into consideration, and the higher the interdependence with such sectors, the greater the complexity confronting the unit. However, it was noted that the investigation of the complexity dimension would be primarily a static one. "The degree of homogeneity/heterogeneity was viewed at a single point in time. But another important characteristic is its stability, a characteristic that is bound to a time dimension." (Ebert, 1975, pp. 40-41).

An investigation of the stability of change rate took into consideration:-
(1) The degree to which the factors/components in the internal and external environments that are relevant to the focal unit's functioning remain stable "i.e. remain the same over time, or are in a process of change." This would involve determining the "frequency with which decision unit members take into considera­tion new and different internal and/or external factors in the decision making process." (Duncan, 1970, pp. 17-18)

(2) Duncan's operationalization of the static/dynamic dimension merely revolved round the identification of whether the sectors that the focal unit deals with remain stable, and the frequency with which new factors were taken into consideration in the decision making process. It is argued that this was not sufficient. Any operationalization of the "stability of change rate" dimension had to incorporate some measure of the predictability of the change rate, i.e. did the change follow a trend, or did the change come from "out of the blue", so to speak. In the latter instance, however, the change would be so sudden and completely unpredictable that the focal unit would, in most probability, be far less likely to possess the capabilities to cope with the change. It was hypothesized that changes of the latter sort would greatly increase the focal unit's degree of perceived environmental uncertainty.

Duncan's operationalization of the Static-Dynamic dimension fulfils the first objective and was used for tapping this component in the present study. Duncan's questionnaire asked the respondents to indicate on a 5-point scale "how often do new and/or different things have to be considered by you in
decision making." *(Duncan, 1970, p. 192)*

The predictability of change rate or trend was assessed by:

(1) Asking the decision maker to indicate on a five-point scale the adequacy or inadequacy of the warning period preceding the onset of the change. The scale ranged from \( \text{1} = \) "inadequate = there was some advance notice about the change. However, the warning period was so short that your department was not able to gather sufficient information to deal with the change" to \( \text{5} = \) "adequate = sufficient for gathering adequate information to deal with the change." All organizations face changing environments to a certain extent. Whether an organization can successfully respond and adapt to such changes depends to a large extent on whether there is a considerable lead time so that the organizational unit can gather "reasonably adequate information as to what might be expected to plan the adaptation." *(Haas, 1973, p. 267).*

Each unit's score on this variable was obtained by summing and then averaging the subject's response to each of the relevant factors/components in the internal and external environments. Thus, a respondent who has to take 3 factors into consideration in decision making and who indicated the "adequacy of warning period" associated with each of these factors as 3, 2

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*Duncan's 5-point scale ranged from 1 = never to 5 = very often. This was reversed and slightly modified in the present study to coincide with the direction of the other scales. In this study, 1 = very often and 5 = very seldom.*
and 4 respectively would receive an overall score of 
\[ \left( \frac{(3 + 2 + 4)}{3} \right) = 3. \]

(2) Asking the decision maker to indicate on a 5-point scale, ranging from 1 = very little knowledge to 5 = very high knowledge, the extent to which his department knows what to expect after the change takes place.

Considerable overlap was expected between the responses to this question and the one for determining discrepancy between environmental demands and organizational capacities. But the emphasis here was on knowledge of what to expect, on predictability while the "routineness" dimension encompassed knowledge as well as other material resources.

The unit's score on this variable was calculated in a manner similar to that for the "adequacy of warning period."

Each departmental unit's score on the stability dimension was calculated by adding and then averaging the respondent's subscores (following inter-item analysis, of course) on: (i) frequency with which new and different elements have to be taken into consideration, (ii) adequacy of warning period and (iii) knowledge of what to expect.

2.9 Uncertainty

The concept of "uncertainty" is one of the most widely used and misused terms in every day language as well as in organizational theory and decision making literature. On the one hand, decision theorists have adopted a micro approach when viewing uncertainty. Researchers such as Knight (1921), March
and Simon (1958, p. 137) and Morris (1964), for instance, usually talked about uncertainty in terms of the individual's inability to assign probabilities with respect to the occurrence of specific events. Although this notion of uncertainty is important, the usage of the term in ordinary language carries a much broader connotation than the mere ability or inability to assign probabilities. On the other hand, researchers such as Lawrence and Lorsch (1967) have adopted a more macro approach and defined uncertainty with respect to three components: "(1) the lack of clarity of information; (2) the long time span of definite feedback; and (3) the general uncertainty of causal relationships." (p. 27). Lawrence and Lorsch's uncertainty measure "was vague in its definition of lack of information and general uncertainty of causal relationships. This lack of clarity in definition then inhibits the development of specific operational measures of uncertainty." (Duncan, 1970, p. 8).

In my opinion, the best measure of perceived environmental uncertainty available to date is that developed by Duncan.* The measure was developed empirically by asking respondents at various levels and positions in a large industrial manufacturing organization to explain what uncertainty meant to them. Although Duncan experienced some difficulty in getting the executives to verbalize their conception of uncertainty,

* Duncan explained the rationale behind the development of his measure as follows: "The objective in developing this new measure of uncertainty was to formulate some scales of the various components of perceived uncertainty that would link the concept to the empirical level that then could be assessed for their reliability and validity. An additional rationale for this empirical approach in defining the concept was to provide a definition that organizational members could understand and verbalize about in the dissertation research itself." (1970, p. 61)
"there was a remarkable degree of similarity with regard to the way in which the concept was ultimately defined." (1970, p. 9).

The merits of Duncan's measure lay in its operationality and in its ability to embrace dimensions from both the macro and micro definitions of the concept.

In his terminology, the three components which make up or contribute to a decision maker's degree of perceived uncertainty are:-

(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
(3) not being able to assign probabilities with regard to how environmental factors are going to affect the success or failure of the decision unit in performing its function. (Duncan, 1970, p. 10).

Components (1) and (2) are similar to Lawrence and Lorsch's formulation in their emphasis on the general lack of information that prevails in decision making. Component (3) is more akin to the micro mathematical definitions in its focus upon the decision maker's ability or inability to assign probabilities to events in the decision making process. However, this component is broader than the usual mathematical formulations in that it assesses not only the decision maker's ability to assign probabilities, but also "how confident is the individual about the assignment of the probability." (Duncan, 1970, p. 10).

In Duncan's study, all three scales, particularly the first two, exhibited high reliability and homogeneity for "scales of such small size." (Duncan, 1970, p. 99).
In this study, the perceived environmental uncertainty questionnaire developed by Duncan was used with minor modifications. (see Appendix 4). Since Duncan (1970) specifically stated how the scores on the three components of uncertainty were computed, and his basic approach was followed in the present research, Duncan's formulae are not repeated here. Those readers who are not familiar with Duncan's scoring procedures are referred to Appendix 5.

2.10 Generation of Propositions

As noted in the Introduction, this study was concerned only with examinations of relationships, and not specifically causal ones, between environmental characteristics and uncertainty. It was merely asserted that where such environmental conditions prevail, one was likely to find a high or low degree of perceived uncertainty. Given the present state of our understanding about the relationship between environmental characteristics and uncertainty, and the fact that this study was only correlational in nature, it would be impossible to assert causality in either direction.

Before proceeding to stipulation of the hypotheses relating environmental characteristics to the degree of perceived environmental uncertainty, it is important to point out that the degree of perceived environmental uncertainty experienced by the decision maker is not solely the function of environmental characteristics. As Downey and Slocum (1975, pp. 566-67) noted, "variability in perceptions of uncertainty are a function of
environment, individual differences, the variety of an individual's experience and social expectations." Several researchers (Andrews, 1970; Duncan, 1970; Anderson and Paine, 1975) pointed to the importance of individual differences, such as the degree of tolerance for ambiguity, internal and external control, etc. in determining the degree of perceived environmental uncertainty experienced. However, it was not within the scope of the present study to examine the impact of these other variables and how they interact with each other to produce a resulting degree of perceived uncertainty.

Throughout the definition of the various environmental dimensions, it has been postulated that these environmental characteristics could influence the amount of perceived environmental uncertainty experienced by the decision maker. Intuitively, the three components comprising the degree of perceived uncertainty are different, although related, concepts. However, in this study (see Chapter Four) as well as in Duncan's (1970), it was found that all three components were highly related. This high intercorrelation could be due to the respondents' inability to clearly separate the components, or it could simply be that the instrument is not sensitive enough to pick up such differences.

Given the hypothesized relationships between environmental characteristics and perceived environmental uncertainty, the first four propositions that were investigated in this study could be stated as follows:-
Hypothesis 1:
An organizational unit located in the extreme north-west corner cell (i.e. low complexity, high routineness, low and stable change rate, and whose transactions are primarily with organized sectors on a directly related basis) would experience the lowest amount of uncertainty.

Hypothesis 2:
An organizational unit located in the extreme north-east corner cell (i.e. high complexity, low routineness, low and stable change rate, and whose transactions are primarily with un­organized sectors on an indirectly related basis) would experience a moderately high degree of uncertainty.

Hypothesis 3:
An organizational unit located in the extreme south-west corner cell (i.e. low complexity, high routineness, high and unstable change rate, and whose transactions are primarily with organized sectors on a directly related basis) would experience a moderately low degree of uncertainty.

Hypothesis 4:
An organizational unit located in the extreme south-east corner cell (i.e. high complexity, low routineness, high and unstable change rate, and whose transactions are primarily with un­organized sectors on an indirectly related basis) would experience the highest degree of uncertainty.
It should be noted that one would naturally expect the differences in the degree of perceived environmental uncertainty to be most marked between organizational units located in the extreme north-west and south-east corner cells. The differences in perceived environmental uncertainty between organizational units located in the extreme north-east and south-west corners would be more subtle. An organizational unit located in the extreme north-east corner cell would be operating in an environment that is highly complex, non-routine, whose transactions are predominately with unorganized sectors on an indirectly related basis, but the change rate is low and stable. On the other hand, an organizational unit located in the extreme south-west corner cell would be operating in an environment that is low in complexity, highly routine, whose transactions are predominately with organized sectors on a directly related basis, but where the change rate is high and unstable.

2.11 Organizational Variables

In order to cope with environmental uncertainty, the manager has to adapt the internal structuring of the unit, and adopt strategies for monitoring or coping with the environment. As J.D. Thompson stated: "... we will conceive of complex organizations as open systems, hence indeterminate and faced with uncertainty, but at the same time as subject to criteria of rationality and hence needing determinateness and certainty." (1967, p. 10). Internal structuring and planned strategies are some of the means by which organizations seek to approach some
degree of rationality. The success, and indeed survival of the unit is dependent upon the choice and adoption of structures and strategies suitable for the particular situation with which it is confronted.

It is argued that the environment confronting organizations in different industries and units within the same organization do differ, although in varying degrees and along different dimensions. Given this premise, then there is no one best way of structuring internal activities and operations, and no one best strategy that would be applicable across all units and industries. As Burns and Stalker (1961, p. 125) noted: "The beginning of administrative wisdom is the awareness that there is no one optimum type of management system." This is in contradistinction to the approach previously advocated by scientific management and the early human relations schools which sought to prescribe the "one best way". In the past decade or so, the trend has been towards the use of structure as a dependent variable which is developed in response to environmental constraints. In essence, this calls for a contingency approach to handling environmental uncertainty.

Most organizations avail themselves of one of two strategies for dealing with environmental uncertainty. One of these is passive and involves adaptation. The other is non-passive and involves actively managing or monitoring the environment to reduce the level of uncertainty. No one organization can resort to either strategy exclusively all the time. Under
some circumstances where the environment falls into Emery and Trist's category of "turbulent field","individual organizations, however large, cannot expect to adapt successfully simply through their own direct actions." (Emery and Trist, 1965, p. 28).

This study only dealt with the way in which organizational units sought to adapt to environmental demands by means of internal structuring, time perspective taken in planning and frequency of changes/ modifications to plans and policies. Burns and Stalker (1958), Woodward (1965), Thompson (1967) and Perrow (1970), to cite only a few, have presented evidence to support their contention that under relatively stable conditions, where the degree of perceived environmental uncertainty is low, a more rigid or mechanistic structure would be more appropriate. On the other hand, under conditions of high uncertainty, a more flexible or organic structure would be more suitable.

Duncan's three basic components constituting the uncertainty concept are all "explicitly or implicitly grounded in the concept of information as a counterpart of uncertainty." (Downey and Slocum, 1975, p. 570). Thus, in order to deal with environmental uncertainty, the organizational unit was hypothesized to structure its internal components in such a manner as to facilitate the acquisition and dispersion of information needed for decision making and functioning. The various elements of internal structuring that have frequently been investigated by researchers are standardization, formalization, participation in decision making or decentralization, and role specialization.
(Hage and Aiken, 1967; Pugh et al, 1968; Burns and Stalker, 1961). All or most of these variables have been used at different times in the identification of organic or mechanistic structures.

It should be noted that the organizational structure implemented by a given unit could not be assumed to be constant and unchanging over time. In his study, Duncan went beyond the usual contingency approach of identifying different types of structures for different functional units. He tested and indeed found some support for his hypothesis that "the same organizational unit may implement different organizational structures at different points in time .... These different structures may be implemented in making different types of decisions to gather and process the necessary information to adapt effectively to the particular degrees of perceived uncertainty associated with the decision." (Duncan, 1970, p.26). In this study, however, the more traditional approach was followed by examining the predominant structure that prevailed within a given functional unit.

Thus an organizational unit that was exposed to a very high degree of environmental uncertainty would be more likely to adopt a more flexible or organic structure to deal with the high uncertainty and resulting high information demands. Standardization and formalization of rules and procedures would be kept to a minimum because each new case or situation would be assumed to be so different that routines and procedures which had been tried out before are rendered inapplicable for the
present circumstances. Heydebrand (1973, p. 27 ff) insisted that it is important to make a distinction between two types of rules: operative and regulative. "Operative" rules are "usually an integral part of job descriptions, blue-prints for specific technical operations (e.g. how to assemble a certain machine, or check its performance, etc.), and generally of functionally specialized activities within a larger system of division of labour. Such rules are typically embedded already in the nature of the production process, i.e. in the task structure." "Regulative rules", on the other hand, are generally "seen as the core element of bureaucratic red tape (and) refer to highly formalized procedures of legal-bureaucratic administration. Regulative rules are thus explicitly part of the organizational control structure." Thus, in units which employ professional practitioners or craftsmen (specialists), operative rules may be prevalent. These "may have internalized highly specific operative rules as well as standards of workmanship and quality without engaging in 'bureaucratic' behaviour. Similarly, the 'professional' administrator may have enough discretion and decision making autonomy to be 'flexible' about the legalistic application of regulative rules." (Heydebrand, 1973, p. 28). In this study, the degree of standardization and formalization of rules and procedures, as they appeared in mechanistic structures, only applied to regulative rules and not to operative ones.

Under conditions of high perceived environmental uncertainty, greater participation in decision making is
encouraged because the novelty of the situation calls for variety in approaches. Hage and Aiken (1969), for instance, found that the product-moment correlation between degree of routineness of the work and the degree of participation in organizational decisions was -.72, indicating that the more routine and hence more certain the work performed by the organization, the less broadly based was decision making. (Also see Leavitt, 1951; Shaw, 1954).

Thompson (1967, pp. 11-13) argued that one of the ways by which organizations could hope to approach some degree of rationality in their operations would be by specialization of roles and functions. Thus, organizations subdivide into different functional departments and different departments employ specialists, in the hope that their greater expertise in a particular field will help to reduce the amount of uncertainty. Child (1973, p. 178) for example, hypothesized that specialization is a function of the task and technology of the organization.

Conversely, an organizational unit that is confronted with a low degree of perceived environmental uncertainty could resort to a more mechanistic structure because the information gathering and processing needs for decisions are assumed or expected to be minimal. The decisions that will arise in the unit are assumed to be fairly routine and information on how to handle and dispose of such cases is assumed to be well-known or easily accessible. Thus, the establishment and imposition of rules and procedures through standardization and formalization
are possible. In addition, the extra amount of time and effort that is involved in participatory decision making is assumed to be unnecessary and uncalled for because the solution is thought to be fairly well-known. Also, where decisions and procedures are generally of a routine nature, specialization needs are reduced to a minimum.

It should not be construed, however, that all organizations or organizational units fall into one of either extreme forms. Burns and Stalker (1961) noted that neither the mechanistic nor the organic types exist in pure form in the real world, but rather organizations, or organizational units in this instance, fall along a continuum bounded by these two extreme forms.

It was also hypothesized that the amount of perceived environmental uncertainty confronting the organizational unit also influenced the time perspective taken in planning and the frequency of changes to plans and programmes for that particular unit. Departments confronted with a fairly stable and certain environment were able to adopt longer-range planning strategies with ease, and with few modifications along the way. On the other hand, organizational units operating in a highly unstable and uncertain environment were forced to resort to shorter-range planning strategies, and we would expect major and frequent modifications as changes intrude upon plans.

Thus the dependent variables investigated in this study were:

(1) The extent of structuring of operating activities within
the unit. This was measured by the degree of standardization, formalization, role specialization and amount of participation in decision making. In this study, standardization was defined as "the extent to which activities and roles are subject to procedural rules"; formalization was used to indicate the extent to which "communications and procedures in a (department) were written down and filed away"; role specialization referred to the "division of labour within the department"; and decentralization in decision making referred to the actual amount of participation in decision making that was allowed in the unit.

Hage and Aiken's (1967) instrument for measuring job codification and rule observation, which could be used as an index of standardization, was adapted for use in this study. (see Schedule II, Part B, Appendix 1). Pugh et al (1968) have developed fairly comprehensive measures for role specialization and formalization. Their approach was adopted in this study with slight modifications. (see Schedule II, Parts A and C, Appendix 1). The operationalization of the "degree of decentralization in decision making" variable developed by the Institute of Social Research, University of Michigan, was used as they were more appropriate for the purposes of the present study. (see Schedule II, Part D, Appendix 1).

(2) The time perspective taken by the decision unit under consideration in planning for its future courses of activities. This variable was tapped by Question 1 in Schedule II, Part E in Appendix 1.
(3) The frequency of changes to existing policies and programmes over the course of such policies and programmes. This last variable was tapped by Question 2 in Schedule II, Part E in Appendix 1.

Thus, the second set of hypotheses that was investigated in this study sought to examine the relationships between environmental characteristics, on the one hand, and organizational variables, on the other. Specifically, they were:

**Hypothesis 5:**
An organizational unit located in the extreme north-west corner cell would most likely possess a mechanistic structure and engage in long-range planning with few modifications to plans along the way.

**Hypothesis 6:**
An organizational unit located in the extreme north-east corner cell would most likely possess a more flexible structure and engage in long-range planning with few modifications to plans.

**Hypothesis 7:**
An organizational unit located in the extreme south-west corner cell would most likely possess a mechanistic structure and engage in short-range planning with more changes to plans.

**Hypothesis 8:**
An organizational unit located in the extreme south-east corner cell would most likely possess an organic structure, engage in short-range planning with frequent and major modifications as changes intrude upon plans.
Again, the differences in departmental structure, time perspective taken in planning and frequency of changes to plans would naturally be more distinct and significant between organizational units located in the extreme north-west and south-east corner cells; while the distinction should be more subtle between those organizational units located in the extreme north-east and south-west corner cells.

To further elaborate and clarify the relationships between environmental characteristics and organizational variables, size and perceived environmental uncertainty were introduced as test factors in this study. Kendall and Lazarsfeld (1950) identified the role of test factors (t) in social research:

Test factors play a crucial role in social research. ... Analysis of survey material means essentially a clarification of the relationships between two variables in the light of one or more additional factors. (1950, p. 167)

Although the concept of test factors (which could be used as intervening or moderator variables) is not new, there seems to be a great deal of confusion surrounding the definition, distinctions and use of such variables. Zedeck (1971) identified some of the problems with the use of "moderator" variables and noted their differential usage in research:

The term moderator variable is used to describe the notion of "population control variable", "subgrouping variable", "referent variable", "predictability variable", "modifier variable", and "homologizer variable". In addition, Saunders' (1955) original definition of the term moderator variable has been generalized by Banas to include qualitative as well as quantitative variables. The procedures used for the above concepts are different and, consequently, often lead to dissimilar results. (Zedeck, 1971, pp. 295-296).
Because of the multiple usages, mis-uses and abuse of "moderator" and "intervening" variables, I shall digress for a moment from the main topic under investigation and be specific about exactly how size and perceived environmental uncertainty were utilized as test factors in this study.

Kendall and Lazarsfeld (1950) identified three ways in which test factors could be used to elaborate the relationships between the sets of independent and dependent variables. The first two types of elaboration were called the "M type". The M type of elaboration is used where "one is interested in noting whether the partial relationships become smaller than the original relationships." (p. 157). The M type of elaboration could be subdivided into two categories depending upon the placement of the test factor. Where the test factor is placed after the independent variable, x, the test factor is called an intervening variable. "In M type, if after introducing the test factor, the partial relationships between x and y is smaller on the average, then we say \( t \) interprets the original correlations. (emphasis mine)"(p. 155). Where the test factor precedes the independent variable, \( t \) is called an antecedent variable and is used for "explanation or control of spurious factors". The third type of elaboration is known as the P type (pp. 164-5). Under this type of elaboration, "we ask ourselves what variables might provide the link between the 'cause' and the 'effect' or what conditions might show the original relationship to be even more pronounced than we originally saw it to be."
The status of size as a predictor of organizational variables is by no means clear and definitive.

On the one hand, there are theorists and researchers who argue for the overriding importance of size in determining structure. Weber (1958, p. 211) for example, commented on the "role of sheer quantity as a leverage for the bureaucratization of a social structure." Pugh et al (1969) concluded that "size causes structuring through its effect on intervening variables such as the frequency of decisions and social control." On the other hand, there are researchers who argue that other variables, like technology for instance, are more salient determinants of structure. Woodward (1965), Perrow (1970), and Aldrich (1972) all made a case for the importance of technology. After a rather comprehensive review of the literature published on the topic of size as it relates to structure, Hall (1972) was of the opinion that:

There are no 'laws' regarding size and other organizational characteristics ... Size, while related to some important characteristics, is not as important as other factors in understanding the form organizations take. When size (and growth) is taken in conjunction with technological and environmental factors, predictions regarding organizational structures and processes can be made. (p. 139)

One possible reason for such diverse findings could be attributed to the fact that size was often used as a predictor variable in most previous research. From Hall's statement above, we could see that size could not and should not be used as a "simple predictor". Rather it should be examined in conjunction with other variables.
In this study, size was used as a test factor under the P type of elaboration. As pointed out earlier, the author was not concerned with the assertion of causal relationships in this study. Rather the objective here was to examine how the original relationships between environmental characteristics and organizational variables would change when size, as measured by the number of people in the department, was held constant.

Thus the next hypothesis that was investigated was stated as:-

**Hypothesis 9:**
Size changes the degree of relationships between environmental characteristics and organizational variables. In other words, the relationships between environmental properties and organizational characteristics is a conditional one, depending on the size of the unit under investigation.

The last hypothesis that was investigated in this study used perceived environmental uncertainty as an intervening variable under the M type of elaboration. Specifically, it stated that:

**Hypothesis 10:**
Uncertainty interprets the relationships between environmental characteristics and organizational variables. That is, if we hold perceived environmental uncertainty constant, the partial relationships between environmental characteristics and organizational variables would decrease, because it is only when uncertainty is perceived and recognized that there would be subsequent changes in the structure.
Although the last hypothesis was stated in such a manner as to suggest direction of causal linkages between environmental characteristics, perceived environmental uncertainty and organizational structure, it should not be construed as such. The three dependent variables that were investigated in this study could very well influence the amount of uncertainty experienced by the decision maker. One of the variables examined under departmental structure was role specialization. This component, for example, could actually lower the amount of perceived environmental uncertainty experienced by the decision maker. If there was a great deal of role specialization in a particular department, i.e. more employees were assigned specific functions, these employees could more efficiently gather intelligence about environmental conditions and demands. Consequently, the perceived environmental uncertainty pertaining to that specific function or activity for the department as a whole would be lower than it would have been if no employee was assigned to solely perform that function.

The model that was investigated in this study could be summarized by means of the diagram on the following page.
Figure 3: Model Hypothesizing Relationships between Environmental Characteristics and Organizational Variables

Environmental Characteristics:
- Pluralism
- Environmental Complexity
- Routine vs. Non-routine
- Organized vs. Unorganized Sectors
- Directly vs. Indirectly Related Sectors
- Change Rate
- Stability of Movement

Perceived Environmental Uncertainty:
- Lack of information
- Not knowing outcome
- Inability to assign probabilities

Small Size

Large Size

Departmental Structure:
- Standardization
- Formalization
- Role Specialization
- Participation in Decision Making

Time Perspective Taken in Planning:
- Short-range
- Medium-range
- Long-range

Frequency of Changes to Plans
2.12 SUMMARY

This chapter presented the major concepts and propositions that were investigated in this study.

Major departments in organizations, rather than organizations as entities, were used as the units of analysis. The principal reason for so doing was to minimize the "wash-out" effect.

Environmental characteristics were used as the independent variables in this study. These environmental dimensions were operationalized along the following lines:

(1) Complexity was defined in terms of:
   (a) Pluralism of the internal and external environments.
   (b) Degree of environmental dependency or interdependency.

(2) Routineness of Problem/Opportunity States dimension was based on:
   (a) an examination of the discrepancy between environmental demands and the organizational unit's capacity in terms of technological know-how, capital and other physical/material resources, including personnel.
   (b) an investigation of the amount of search effort undertaken by the focal unit to gather critical information to clarify the decision problem at hand.
   (c) frequency of routine procedures.

(3) Organized sectors dimension was defined in terms of whether the sectors that the focal unit has to take into consideration in its functioning are organized or unorganized.
"Organized" was defined in terms of whether the sector could introduce real and direct threats to or restraints upon the activities of the focal unit.

(4) Directly Related sector dimension was defined in terms of whether the focal unit's dealings with a sector were direct, or whether they were carried out through an intermediary or intermediaries.

(5) The movement characteristic took into consideration two sub-dimensions:

(a) The change rate which included the frequency and magnitude of changes to goals, policies and programmes in those sectors which are relevant to the focal unit's functioning and decision making.

(b) The stability of change or the predictability of change patterns in each of these relevant sectors.

Organizational variables were used as dependent variables. The three dependent variables investigated in this study were:

(1) Departmental structure which was measured in terms of the following variables: formalization, role specialization, standardization, and participation in decision making.

(2) Time perspective in planning.

(3) Frequency of changes to plans and programmes over the lifetime of such plans and programmes.

Size and uncertainty were used as test factors to elaborate the relationships between environmental characteristics, on the one hand, and organizational variables, on the other. Size was defined in terms of the number of employees in the
department. Duncan's operationalization of the perceived environmental uncertainty concept was used. Under Duncan's formulation, uncertainty was defined in terms of three components: (a) lack of information (b) not knowing outcome and (c) inability to assign probabilities.

The hypotheses that were investigated in this study were:

1: An organizational unit located in the extreme north-west corner cell would experience the lowest amount of uncertainty.

2: An organizational unit located in the extreme north-east corner cell would experience a moderately high degree of uncertainty.

3: An organizational unit located in the extreme south-west corner cell would experience a moderately low degree of uncertainty.

4: An organizational unit located in the extreme south-east corner cell would experience the highest degree of uncertainty.

5: An organizational unit located in the extreme north-west corner cell would most likely possess a mechanistic structure and engage in long-range planning with few modifications to plans along the way.

6: An organizational unit located in the extreme north-east corner cell would most likely possess a more flexible structure and engage in long-range planning with few modifications to plans.

7: An organizational unit located in the extreme south-west corner cell would most likely possess a mechanistic
structure and engage in short-range planning with more changes to plans.

8: An organizational unit located in the extreme south-east corner cell would most likely possess an organic structure, engage in short-range planning with frequent and major modifications as changes intrude upon plans.

9: Size changes the degree of relationships between environmental characteristics and organizational variables.

10: Uncertainty interprets the relationships between environmental characteristics and organizational variables.
CHAPTER THREE
SAMPLE AND METHODOLOGY

This chapter describes the sample and method used to collect data for the present study.

3.1 SAMPLE SELECTION

Since major departments were used as the units of analysis and it was assumed that there was considerable differences in environmental characteristics between departments in a given organization, the organizations that were selected for study had to be fairly large.

Many of the large organizations located in the Lower Mainland of British Columbia are regional offices or plants of organizations whose headquarters are located either elsewhere in Canada or in the United States. In order to achieve some variation in the sample, qualifying size was defined in terms of: (a) number of employees -- a minimum of 500 employees could be used as a cut-off point; or (b) assets of parent company; or (c) diversity of products and/or services rendered by the company. The rationale for including the latter two criteria was that regional plants of offices of big industrial corporations do not normally employ many people. If these were omitted, it might not be possible to find a sample which varied significantly in terms of differing environmental characteristics, organizational structure, goals and types of activities.
All the departments selected for study met the following two criteria as well:

(1) Each performed a function that was distinctly different from that carried out by the rest of the organization -- for example, sales, production, research and development departments would be distinctively different units.

(2) Each department was fairly autonomous. The level of autonomy was ascertained by asking the focal unit whether it had the authority to make certain decisions of a pre-specified significance. These included budgetary independence, provision for altering policies and strategies for pursuing departmental goals, etc.

Inkson, Pugh and Hickson (in Price, 1972, p. 37 ff) developed a measure for determining organizational autonomy. Their instrument was adapted for measuring organizational unit autonomy. (See Schedule I, Appendix 1).

The basis of selection was non-random in view of the limited number of firms in the Lower Mainland area which fitted the requirements of the study.

3.2 Composition of Total Sample

All firms included in the study, both those in the pre-test and actual sample, met either one or all three criteria pertaining to size. Of the twenty-one companies studied, seven of them were among British Columbia's ten largest companies in terms of assets, revenues and net incomes. (1975 figures).
The sample included business and industrial firms that were engaged in the production of a variety of products and services. A breakdown of the activities engaged by the participating companies is as follows:

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>No. of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry</td>
<td>5*</td>
</tr>
<tr>
<td>Misc. Manufacturing</td>
<td>4</td>
</tr>
<tr>
<td>Mining</td>
<td>3</td>
</tr>
<tr>
<td>Public Utilities</td>
<td>3</td>
</tr>
<tr>
<td>Realty</td>
<td>2</td>
</tr>
<tr>
<td>Engineering Service</td>
<td>1</td>
</tr>
<tr>
<td>Department Store</td>
<td>1</td>
</tr>
<tr>
<td>Financial Institution</td>
<td>1</td>
</tr>
<tr>
<td>Fishery</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>21</strong></td>
</tr>
</tbody>
</table>

Given the fact that British Columbia is not the industrial centre in Canada (as compared to Toronto and Montreal), the firms that were used in the study represented as much variety as any researcher could reasonably obtain in this region.

As pointed out in Chapter Two, departments rather than organizations as entities were used as the units of analysis.

An analysis of covariance was performed across departments in an organization to determine whether there were significant differences between them. The significance values associated with the three organizational variables investigated in this study were: departmental structure (.017), time perspective taken in planning (.087) and frequency of changes to plans (.054). These figures provide justification for using departments, rather than organizations, as units of analysis.

* Forestry is the top ranking industry in British Columbia. This accounts for the relatively large number of firms (23.8%) included in the sample which fell into this category.
The environment confronting different departments in an organization varied as evidenced by the fact that departments within a given company were assigned to different cells in the Jurkovich 64-cell matrix. In some instances, the differences were very marked. For example, a Finance Department of a company may fall into a cell 1 type of environment, while the Research and Development Department of the same company would be assigned to a cell 62 type of environment.

All the departments included in the study satisfied the two selection criteria pertaining to independence of functional activity and departmental autonomy.

Each performed a function that was distinctly different from that carried out by the rest of the organization.

Results were obtained from 64 departments in 21 different companies. A breakdown of the major activities performed by these departments is as follows:

<table>
<thead>
<tr>
<th>Functional Activity</th>
<th>No. of Departments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing</td>
<td>18</td>
</tr>
<tr>
<td>Finance</td>
<td>12</td>
</tr>
<tr>
<td>Operations/Planning</td>
<td>10</td>
</tr>
<tr>
<td>Personnel</td>
<td>9</td>
</tr>
<tr>
<td>Production</td>
<td>8</td>
</tr>
<tr>
<td>Research and Development</td>
<td>6</td>
</tr>
<tr>
<td>Legal Counsel</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>64</strong></td>
</tr>
</tbody>
</table>

Although it would be more desirable to obtain an equal number of departments engaged in each of the activities, given the fact that (i) the study involved considerable time and cooperation on the part of participating executives, and (ii) the
organizational chart of the organizations varied considerably, it was not possible to achieve such an objective.

The organizational units studied were also checked for departmental autonomy. The adapted version of Inkson et al.'s instrument consisted of thirteen decision issues. Each respondent received a score of 1 when he indicated that the "authority to decide" on that particular issue resided within his own department. The scores for each respondent were summed. The higher the score, the more decisions made within the department, or the more autonomous the unit. In this study, the range was 7 to 13 with a mean of 9.5. This indicated that all the departments included in the study were fairly autonomous.

3.3 Method of Data Collection

As mentioned in Chapter One, operational measures for many of the variables that were studied were non-existent. For this reason, a semi-structured questionnaire format was used for collecting information on many of these variables along with some of the more standardized items which have been used in the field before by other researchers.

The questionnaire was filled out by the senior executive in each of the organizational units studied.

The questions were developed such that only the most senior man in the department would have sufficient knowledge and insight into the areas probed in this study. The people who reported directly to him were not included in the sample
for two reasons: -

(1) In large organizations, each individual who reports directly to the senior departmental executive is usually assigned to one particular area of specialty. Thus, he would not have the perspective necessary to answer the questions posed in this study.

(2) The organizational or departmental charts varied from company to company. In some instances, there were as many as six or seven people reporting directly to the senior departmental executive, while in other instances, there were only two individuals.

As noted earlier, semi-structured questionnaires were used. The advantages of using semi-structured questionnaires were primarily two-fold: -

(1) The interviewer was able to clarify any points which a respondent raised in the context of a specific area of interest.

(2) Respondents felt free to add information which they thought was relevant to the problem under study.

It is stressed again that some of the concepts under investigation were vague and had not been operationally defined or empirically measured in the field before. The free probing and discussion provided by a semi-structured interview format not only ensured more accurate communication of both question and response, but also aided the detection and identification of "problem questions" in the instrument itself -- questions
and issues that subjects experienced some difficulty in responding to and/or understanding. This permitted modifications to the questionnaire which, hopefully, resulted in its becoming a more reliable and valid instrument for future research purposes.

One of the chief disadvantages in using semi-structured questionnaires was that it was more difficult to code responses. However, many of the problems in this respect were surmounted by care in coding and by ensuring consistency by having one researcher code all responses. These precautionary measures at least ensured greater homogeneity and uniformity in the coding of responses.

3.4 PERCEPTUAL VS. OBJECTIVE MEASURES

As in the measurement of other concepts in organizational theory and behaviour, researchers are divided as to whether perceptual or objective measures should be used for the phenomena under investigation. Objective measures have the obvious virtues of accuracy and reliability because they exist independently of the individual's perceptions. However, in instances where objective data are not available or measurable, or where subjective data appear to be more relevant and suitable for the concepts under study, then researchers must resort to perceptual measures. The concepts of the environment and uncertainty as understood and used in this study fall into this latter category.

Most researchers who have explored the concepts of the environment and uncertainty as they affect decision making have in fact argued for the use of perceptual measures. Koffka (1935)
was of the opinion that behaviour could best be understood by reference to the behavioural environment, or the environment as perceived and reacted to by individuals, rather than by reference to the objective and physical environment. This is reasonable in that the environment is viewed as a set of stimuli which is devoid of meaning or "information value" until perceived by an individual. In the terminology of Secord and Backman (1964), perception is the process whereby individuals "organize and evaluate stimuli." Child (1972) suggested that perceptions are responsible for the strategic choices which managers make in fitting the organization to its environment. Thus, Downey and Slocum (1975, p. 567), after reviewing the measures of uncertainty currently in use in empirical research, concluded that "uncertainty, as a counterpart to information, should be considered as perceptually based." Further,

Restriction of uncertainty to a perceptual concept does contain the inherent problem that variations in uncertainty are related to characteristics of the individual. It does not however, preclude the expectation that uncertainty is also related to environmental attributes. Specific attributes of physical environments tend to elicit similar perceptions of uncertainty by individuals. These similar perceptions of uncertainty by individuals, however, stem from similarities in individual perceptual processes rather than from the existence of uncertainty as an attribute of the physical environment. (Downey and Slocum, 1975, pp. 567-568)

Another reason for the use of perceptual measures was that the uncertainty concept was utilized in a contingency approach framework in the present study. "... if uncertainty is to be a useful construct in contingency theory, operationalizations must reflect this notion." (Downey and Slocum, 1975, p. 570).
Most researchers who advocate the use of perceptual measures in identifying environmental properties are not postulating that environments do not exist. Rather, they are arguing that the examination of objective properties in isolation is essentially meaningless and uninterpretable in the context of organizational functioning. As Forehand and Gilmer (1964, p. 365) put it: "Studies that examine in isolation specific objective properties of an organization leave unanswered the questions of how the properties are related to one another and how they are related to useful constructs of organizational functioning."

To overcome this limitation, it would be necessary to demonstrate how these objective properties are interpreted and reacted to by the actors who make up the organization.

The perception of environmental stimuli is an interpretive process. This interpretation process is a function of the lack of inherent meaning of signals associated with environmental characteristics and the less than infinite data processing capacity of the human organism. Man cannot interact directly with his environment; instead, he must map it. (Downey and Slocum, 1975, p. 571).

In commenting upon organizational climate (which was stated previously as a subset of organizational environment), Campbell, Dunnette et al (1970) drew an analogy between that concept and the weather. Precipitation, wind velocity and temperature are all objective realities, but they mean different things to different people. "For example, heavy snow means more indoor activity for most people but increased outdoor activity for some, and what is a 'warm' day for one person may be a 'comfortable' day for another." (1970, p. 386).
This reasoning is clearly in line with the arguments advanced by other researchers. Perrow (1970), for example, argued that environments are neither certain nor uncertain, but are simply perceived differently by different organizations. Weick (1969) was of the opinion that the "important organizational environments are those which are enacted or created through the process of attention." Hence, it is the perceptions of environmental characteristics, rather than the "objective" components, which are the important determinants in decision making and in strategy formulation processes in organizations. There is, indeed, abundant evidence to support the contention that it is perceptions, rather than objective reality (if the latter could be measured at all) that determine behaviour and actions taken by individuals in an organizational setting. Child (1972), for example, found that the strategies adopted by an organization to respond to or counteract the environment are largely influenced by managerial perceptions. "The exercise of (strategic) choice implies a prior evaluation of the situation ... (D)ecisions about organizational structure depend upon the prior processes of perception and evaluation." (Child, 1972, pp. 4-5). Cyert and March (1963, pp. 118-120), and Duncan (1970) came up with essentially similar findings.

Without belaboring the point, it is sufficient to note that perceptions of reality, rather than objective reality itself, are "capable of changing the sensory input" (to borrow Pervin's terminology, 1966, p. 60) of the individuals within the unit. They also interact with the individual's needs, etc. to produce
a resulting set of behaviour, which in turn contributes to the perceived composition or nature of the environment. This is not to assert, however, that managers are always accurate in their perceptions of the environment, or that discrepancies do not exist between managerial perceptions of the environment and the objective environment itself. As Miles (1974, p. 249) noted, "Clearly, the organization will ultimately be victimized by perceptions which ignore or distort crucial environmental elements..."

And researchers such as Richards (1973) reported instances of organizations which experienced severe failure in parts or all of their operations when they were misguided in the long-run by "benign optimism". However, it was beyond the scope of this study to examine the consequences that long-term misperceptions of the environment would have on the long-run effectiveness and survival of the company. As noted in Chapter One, investigations of this nature will have to be reserved for later research.

In light of the arguments for the use of perceptual measures in identifying environmental properties as they affect the amount of uncertainty experienced by the decision maker, and consequently the actions adopted by the focal unit, the bulk of the data collected on environmental properties and uncertainty in this study were of a subjective nature. Objective data, however, were collected where applicable and possible. These pertained to information on departmental size, the degree of role specialization, standardization and formalization.

One of the most serious methodological problems in using perceptual measures is the degree of homogeneity of perceived attributes among all individuals within a given unit. As pointed
out earlier, the questionnaire was administered only to the top man in each department as only he had the necessary perspective to answer the questions probed in this study. Thus the problem of homogeneity of perceived attributes among respondents within a given unit does not arise in this particular study.

3.5 Summary

This chapter contained a review of the sample and methodology that was used in this study.

Data were collected from 64 organizational units which came from 21 different companies engaged in seven different types of business/industrial activities. A semi-structured questionnaire was administered to senior executives in each of the 64 organizational units. The advantages and disadvantage of using a semi-structured questionnaire format were discussed.

The debate among researchers on the use of perceptual vs. objective measures to investigate environmental characteristics and uncertainty was briefly reviewed. Based on the cogent arguments of well-respected researchers in the field and the fact that the model under investigation here was of a contingency nature, it was decided that perceptual measures of environmental characteristics and uncertainty were more appropriate for purposes of this study.
CHAPTER FOUR
ASSESSMENT OF MEASUREMENT INSTRUMENTS

As stated in Chapter One, one of the primary objectives of the present study was to develop and validate the instruments for measuring environmental characteristics.

In order to be operationally useful, any instrument has to meet the dual criteria of validity and reliability.

The question of validity is the question of goodness of mapping (correspondence) between concept and operation. The validity questions asks, in effect, whether the measure used in the operational definition is "truly" a measure of the corresponding property as conceptually defined. The related question of reliability asks whether the measure used as the operational definition can be depended upon to yield the same value in repeated independent assessments of the same actor or object.... Validity and reliability of measures are inextricable parts of the bridge between operational and conceptual definitions. (Runkel and McGrath, 1972, p. 152).

The concept of validity is not a singular one. The five forms of validities that are most commonly investigated by students of psychological measurement are construct, predictive, concurrent, convergent and discriminant validities. Campbell and Fiske (1959) proposed a generalized paradigm for assessing the validity and reliability of a set of measures. This is generally referred to as the "multitrait-multimethod matrix". This paradigm essentially calls for the cross-validation of data obtained on the same set of traits by means of several different methods. However, as pointed out in Chapter
One, measures of many of the environmental dimensions explored in this study did not exist (at least to the author's knowledge). Hence, it would be impossible to apply a paradigm, as rigorous as that proposed by Campbell and Fiske (1959), to assess the measures used in the present study.

In Chapter Two, it was shown how the measures used in the present study were similar to or adapted from existing instruments. Where such measures were non-existent, an attempt was made to demonstrate the relevance of the measures developed to the theoretical concepts under investigation. All the questions developed for the interview protocol are fairly straightforward and could be assessed for their face validity.

Cronbach's coefficient alpha (a special case of which is the Kuder-Richardson formula 20 which is applicable to dichotomous items only) was calculated for all the measures used in the study.

The reasons for choosing this particular index of homogeneity over others were three-fold:

(1) Nunnally argued that Cronbach's coefficient alpha "is the basic formula for determining the reliability based on internal consistency. It, or the special version applicable to dichotomous items (KR-20) should be applied to all new measurement methods." (1967, p. 210)

In his 1951 article, Cronbach demonstrated by means of mathematical equations that:

(a) alpha is the mean of all possible split-half coefficients.
(b) alpha is the value expected when two random samples of items from a pool ... are correlated.

(c) alpha is the lower bound for the coefficient of precision (the instantaneous accuracy of this test with these particular items). Alpha is also a lower bound for coefficients of equivalence obtained by simultaneous administration of two tests having matched items. But for reasonably long tests not divisible into a few factorially distinct subtests, alpha is nearly equal to "parallel-split" and "parallel-forms" coefficients of equivalence.

(d) alpha estimates, and is a lower bound to, the proportion of test variance attributable to common factors among the items. That is, it is an index of common-factor concentration. This indeed serves purposes claimed for indices of homogeneity... (Cronbach, 1951, p. 331).

(2) The formula for calculating coefficient alpha is based on assumptions more realistic than those presumed by the Spearman-Brown formula, which had been a "standard method of test analysis" in the first half of the 20th century. Ghiselli (1964, pp. 284-286) demonstrated by means of mathematical equations that if the Spearman-Brown formula was revised to reflect assumptions that were more realistically based, then the formula would be identical to that for calculating Cronbach's coefficient alpha.

(3) Cronbach (1951, p. 323) demonstrated that coefficient alpha could be used for calculating a reliability coefficient that is independent of test length. The formula for calculation of this index is:

\[
\hat{r}_{ij(\text{est})} = \frac{\alpha}{n + (1 - n)\alpha}
\]
The formula for calculating Cronbach's coefficient alpha is as follows:-

$$\alpha = \frac{n}{n-1} \left(1 - \frac{\Sigma_{i}V_{i}}{V_{t}}\right) = \frac{n}{n-1} \left(\frac{V_{t} - \Sigma_{i}V_{i}}{V_{t}}\right)$$

$$= \frac{n}{n-1} \cdot \frac{2C_{t}}{V_{t}}$$

where $C_{t}$ is the total covariances of all item pairs within the test, and $V_{t}$ is the variance of the total test.

The intercorrelations among items in a given scale or dimension are presented in full below, and the coefficient alphas and $\overline{r}_{ij\text{(est)}}$ for each scale/sub-dimension are also presented. As pointed out in Chapter Two, a separate analysis of the pre-test subjects ($n = 4$) was performed prior to the use of the instrument on the full sample. Since the responses obtained from the pre-test subjects were complete and valid, their responses were also included in the full sample analysis ($n = 64$). As will be noted in the concluding chapter, one of the major limitations of this present study is the relatively small sample size. However, given the facts that (a) the number of firms located in the Lower Mainland region of British Columbia that met the selection criteria is not great which consequently limited the availability of subjects for a study which required a substantial portion of senior executives' time (each interview ran for an hour and a half); (b) a sample of 64 is large enough to render the application of most sophisticated statistical techniques appropriate; and (c) this study is only exploratory in nature, the researcher had little choice
but to accept a sample of 64 respondents or organizational units.

4.1 ASSESSMENT OF SUB-DIMENSIONS

Pluralism

The Pluralism index was calculated on the basis of response to a single question. (Schedule III, Question 1). Consequently, no inter-item analysis could be performed on it.

Environmental Dependency of Interdependency

As pointed out in Chapter Two, an index of environmental dependency or interdependency was to be calculated on the basis of scores to Questions 2, 3, 4 and 5 in Schedule III, Appendix 3. The correlation matrix for these four items is presented below:

<table>
<thead>
<tr>
<th></th>
<th>Dependence</th>
<th>Restraint</th>
<th>Influence</th>
<th>Jt. Programmes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependence</td>
<td>1.0000</td>
<td>0.8568</td>
<td>0.8534</td>
<td>0.8907</td>
</tr>
<tr>
<td></td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
</tr>
<tr>
<td>Restraint</td>
<td>0.8568</td>
<td>1.0000</td>
<td>0.8291</td>
<td>0.8559</td>
</tr>
<tr>
<td></td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
</tr>
<tr>
<td>Influence</td>
<td>0.8534</td>
<td>0.8291</td>
<td>1.0000</td>
<td>0.8922</td>
</tr>
<tr>
<td></td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
</tr>
<tr>
<td>Jt. Prog.</td>
<td>0.8907</td>
<td>0.8559</td>
<td>0.8922</td>
<td>1.0000</td>
</tr>
<tr>
<td></td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
</tr>
</tbody>
</table>

Note: The first figure is the Pearson correlation coefficient. The figure in brackets is the significance level.

Coefficient alpha = .96

$\bar{r}_{ij(\text{est})} = .8571$
Search for Critical Information

This sub-dimension was hypothesized to consist of scores to Questions 2 (which encompasses two items) and 3, Schedule III, Part B, Appendix 3. The correlation matrix for these three items is as follows:

<table>
<thead>
<tr>
<th></th>
<th>Task Force</th>
<th>Outside Help</th>
<th>Trust in Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Force</td>
<td>1.0000</td>
<td>0.8964 (.001)</td>
<td>0.3013 (.016)</td>
</tr>
<tr>
<td>Outside Help</td>
<td>1.0000 (.001)</td>
<td>0.2783 (.026)</td>
<td>1.0000 (.001)</td>
</tr>
<tr>
<td>Trust</td>
<td>0.3013 (.016)</td>
<td>0.2783 (.026)</td>
<td>1.0000 (.001)</td>
</tr>
</tbody>
</table>

The third item does not correlate highly with the other two items. Hence it was decided to eliminate this item from this sub-dimension. Thus, the calculation of coefficient alpha was based on two items.

\[
\text{Coefficient alpha} = .94 \\
\bar{r}_{ij(\text{est})} = .8867
\]

Programmability

This sub-dimension was hypothesized to consist of scores to Questions 4, 5 and 6, Schedule III, Part B, Appendix 3. Responses to Questions 4 and 5 were summarized to form an overall scale of "ability to measure up to demands." This averaged score was then correlated with the score obtained for Question 6.

<table>
<thead>
<tr>
<th></th>
<th>Ability to Measure Up to Demands</th>
<th>Effective Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to Measure Up</td>
<td>1.0000 (.001)</td>
<td></td>
</tr>
<tr>
<td>Effective Solutions</td>
<td>0.9213 (.001)</td>
<td>1.0000 (.001)</td>
</tr>
</tbody>
</table>
Coefficient alpha = .95
\[ \bar{r}_{ij(\text{est})} = .9047 \]

Organized Sector

The index for this dimension was calculated on the basis of response to a single question (Schedule III, Part A, Question 6). Hence no inter-item analysis could be performed.

Directly Related Sector

The index for this dimension was also based on the response to a single question. (Schedule III, Part A, Question 7). Consequently, no inter-item analysis could be performed.

Change Rate

As pointed out in Chapter Two, the change rate index was computed by multiplying the frequency of change rate by the magnitude of change rate. This index does not lend itself to inter-item analysis.

Stability of Change Rate

This sub-dimension was hypothesized to consist of scores to Questions 10, 11 and 12, Schedule III, Part A, Appendix 3. The correlation matrix for these three items is as follows:

<table>
<thead>
<tr>
<th></th>
<th>New and/or Different Things</th>
<th>Adequacy of Warning Period</th>
<th>Knowledge About Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Things</td>
<td>1.0000 (0.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequacy of Warning</td>
<td>0.8780 (0.001)</td>
<td>1.0000 (0.001)</td>
<td></td>
</tr>
<tr>
<td>Knowledge About Events</td>
<td>0.7777 (0.001)</td>
<td>0.8645 (0.001)</td>
<td>1.0000 (0.001)</td>
</tr>
</tbody>
</table>
Coefficient alpha = .94

\[ \overline{r_{ij(\text{est})}} = .8392 \]

Uncertainty: Component # 1

This sub-dimension was hypothesized to consist of scores to Questions 2, 3 and 9, Schedule IV in Appendix 4. The correlation matrix for the three items is:

<table>
<thead>
<tr>
<th></th>
<th>Adequate Information</th>
<th>Difficulty of Collecting Info.</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate Information</td>
<td>1.0000 (.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty of Collecting Info.</td>
<td>0.9293 (.001)</td>
<td>1.0000 (.001)</td>
<td></td>
</tr>
<tr>
<td>Feedback</td>
<td>0.8353 (.001)</td>
<td>0.8552 (.001)</td>
<td>1.0000 (.001)</td>
</tr>
</tbody>
</table>

Coefficient alpha = .95

\[ \overline{r_{ij(\text{est})}} = .8636 \]

Uncertainty: Component # 2

This sub-dimension was hypothesized to consist of scores to Questions 1, 6, 7 and 8, Schedule IV in Appendix 4.

<table>
<thead>
<tr>
<th></th>
<th>Able to Predict</th>
<th>Consider Alternatives</th>
<th>Consider Consequences</th>
<th>Able to Consider Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Able to Predict</td>
<td>1.0000 (.001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consider Alternatives</td>
<td>0.8950 (.001)</td>
<td>1.0000 (.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consider Consequences</td>
<td>0.8972 (.001)</td>
<td>0.9498 (.001)</td>
<td>1.0000 (.001)</td>
<td></td>
</tr>
<tr>
<td>Able to Consider Effect</td>
<td>0.8979 (.001)</td>
<td>0.9526 (.001)</td>
<td>0.9607 (.001)</td>
<td>1.0000 (.001)</td>
</tr>
</tbody>
</table>
Coefficient alpha = .98
\[ \bar{\tau}_{ij(\text{est})} = .9245 \]

Uncertainty: Component # 3

The score on this component was computed by multiplying the probability figure by the range of numbers, and then summing them for all factors. Hence it does not lend itself to inter-item analysis.

Role Specialization

This index was computed by dividing the number of activities that the respondent identifies as being performed by "at least one person on a full-time basis" by the total number of activities specified in the questionnaire, namely 13. This percentage was then converted to a five-point scale. Thus, a score of 1 would represent an indication of 0 to 20% role specialization. This index does not lend itself to inter-item analysis.

Job Codification

The first five questions in Schedule II, Part B, Appendix 1 were used for measuring the amount of job codification. A low score on this variable would indicate low standardization.
The correlation matrix of the five items is:

<table>
<thead>
<tr>
<th></th>
<th>Codif. 1</th>
<th>Codif. 2</th>
<th>Codif. 3</th>
<th>Codif. 4</th>
<th>Codif. 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codif. 1</td>
<td>1.0000 (.001)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Codif. 2</td>
<td>0.7816 (.001)</td>
<td>1.0000 (.001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Codif. 3</td>
<td>0.7870 (.001)</td>
<td>0.6584 (.001)</td>
<td>1.0000 (.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Codif. 4</td>
<td>0.6830 (.001)</td>
<td>0.5944 (.001)</td>
<td>0.7099 (.001)</td>
<td>1.0000 (.001)</td>
<td></td>
</tr>
<tr>
<td>Codif. 5</td>
<td>0.7256 (.001)</td>
<td>0.6622 (.001)</td>
<td>0.7275 (.001)</td>
<td>0.7720 (.001)</td>
<td>1.0000 (.001)</td>
</tr>
</tbody>
</table>

Coefficient alpha = .92

\[ \overline{r_{ij(\text{est})}} = .6969 \]

Rule Observation

The remaining five questions in Schedule II, Part B, Appendix 1, were used for measuring the amount of rule observation. The responses to questions 6 and 7 were reversed to correspond with the direction of responses to the other questions in this section. A low score on this variable would indicate low standardization. The correlation matrix of the five items is:

<table>
<thead>
<tr>
<th></th>
<th>Rule 1</th>
<th>Rule 2</th>
<th>Rule 3</th>
<th>Rule 4</th>
<th>Rule 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule 1</td>
<td>1.0000 (.001)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule 2</td>
<td>0.8462 (.001)</td>
<td>1.0000 (.001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule 3</td>
<td>0.6919 (.001)</td>
<td>0.7034 (.001)</td>
<td>1.0000 (.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule 4</td>
<td>0.7394 (.001)</td>
<td>0.7827 (.001)</td>
<td>0.7463 (.001)</td>
<td>1.0000 (.001)</td>
<td></td>
</tr>
<tr>
<td>Rule 5</td>
<td>0.7079 (.001)</td>
<td>0.7133 (.001)</td>
<td>0.6880 (.001)</td>
<td>0.7095 (.001)</td>
<td>1.0000 (.001)</td>
</tr>
</tbody>
</table>
Coefficient alpha = .926

\[ r_{ij(\text{est})} = .7145 \]

**Formalization**

As in "role specialization", this index was computed by dividing the actual number of communications and procedures that "were written down and adhered to" by the total number of such communications and procedures, namely 10. This percentage was then added to the percentage obtained by dividing the actual number of "written records that were filed away somewhere" by the total number of such activities as enumerated in the questionnaire, namely 20. The summed percentages were then converted to a five-point scale. Thus a low score would indicate a low degree of formalization. This index does not lend itself to inter-item analysis.

**Participation in Decision Making**

Five questions were used to measure the degree of participation in decision making. The responses were coded such that a score of 1 would indicate a high amount of participation actually allowed in decision making. This necessitated reversing the responses to Questions 3 and 4 in this section. The correlation matrix for these five items is:-
### 4.2 Assessment of Dimensions

**Complexity**

In Chapter Two, it was hypothesized that the "complexity" dimension should be defined in terms of pluralism and degree of interdependency. However, the correlations between the scaled pluralism score and those items comprising the interdependency sub-dimension are not high. Their correlations are presented below.

<table>
<thead>
<tr>
<th></th>
<th>Partic. 1</th>
<th>Partic. 2</th>
<th>Partic. 3</th>
<th>Partic. 4</th>
<th>Partic. 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partic. 1</td>
<td>1.0000</td>
<td>(.001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partic. 2</td>
<td>0.8488</td>
<td>1.0000</td>
<td>(.001)</td>
<td>(.001)</td>
<td></td>
</tr>
<tr>
<td>Partic. 3</td>
<td>0.8134</td>
<td>0.6144</td>
<td>1.0000</td>
<td>(.001)</td>
<td>(.001)</td>
</tr>
<tr>
<td>Partic. 4</td>
<td>0.8869</td>
<td>0.7594</td>
<td>0.7355</td>
<td>1.0000</td>
<td>(.001)</td>
</tr>
<tr>
<td>Partic. 5</td>
<td>0.9293</td>
<td>0.8442</td>
<td>0.7493</td>
<td>0.8035</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

Coeficient alpha = .95

\[ \overline{r_{ij\text{est}}} = .7916 \]

Based on these low correlations, it was felt that the two sub-dimensions were in fact independent and could not be combined to form an overall "complexity" index. This independence was further verified in principal components analysis.
Routineness of Problem/Opportunity States

In Chapter Two, it was hypothesized that this dimension would consist of the following three variables: - (1) scaled frequency of routine procedures, (2) search for critical information, and (3) programmability.

The correlation matrix for the items comprising these three variables is:-

<table>
<thead>
<tr>
<th></th>
<th>Routineness</th>
<th>Task Force</th>
<th>Outside Help</th>
<th>Measure Up to Demands</th>
<th>Effective Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routineness</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task Force</td>
<td>0.9476</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside Help</td>
<td>0.9297</td>
<td>0.8964</td>
<td>1.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure Up</td>
<td>0.9328</td>
<td>0.8881</td>
<td>0.9118</td>
<td>1.0000</td>
<td></td>
</tr>
<tr>
<td>Effective</td>
<td>0.8809</td>
<td>0.8479</td>
<td>0.8883</td>
<td>0.9213</td>
<td>1.0000</td>
</tr>
<tr>
<td>Solutions</td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
</tr>
</tbody>
</table>

On the basis of the high correlations between these items, the scores on these items were summed and averaged to form an overall "Routineness" dimension score.
Uncertainty

The correlations among the three components of uncertainty are:

<table>
<thead>
<tr>
<th></th>
<th>Uncertainty 1</th>
<th>Uncertainty 2</th>
<th>Uncertainty 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainty 1</td>
<td>1.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncertainty 2</td>
<td>0.7011</td>
<td>1.0000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.001)</td>
<td>(.001)</td>
<td></td>
</tr>
<tr>
<td>Uncertainty 3</td>
<td>0.6763</td>
<td>0.9806</td>
<td>1.0000</td>
</tr>
<tr>
<td></td>
<td>(.001)</td>
<td>(.001)</td>
<td>(.001)</td>
</tr>
</tbody>
</table>

Given the high correlations among the three components of uncertainty, they were summed and then averaged to form an overall uncertainty index. A score of 5 indicated high certainty.

Structure

The correlations between the scores on job codification and rule observation were as follows:

<table>
<thead>
<tr>
<th></th>
<th>Job Codification</th>
<th>Rule Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Codification</td>
<td>1.0000</td>
<td>0.8876</td>
</tr>
<tr>
<td></td>
<td>(.001)</td>
<td>(.001)</td>
</tr>
</tbody>
</table>

The high correlations between the two scores provide justification for combining them (and then averaging) to form an overall standardization score.

Correlations between the several variables comprising departmental structure were also computed. These are reported on the following page:
<table>
<thead>
<tr>
<th>Specialization</th>
<th>Standardization</th>
<th>Formalization</th>
<th>Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialization</td>
<td>1.0000 (0.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standardization</td>
<td>0.8167 (0.001)</td>
<td>1.0000 (0.001)</td>
<td></td>
</tr>
<tr>
<td>Formalization</td>
<td>0.7572 (0.001)</td>
<td>0.9192 (0.001)</td>
<td>1.0000 (0.001)</td>
</tr>
<tr>
<td>Participation</td>
<td>0.8145 (0.001)</td>
<td>0.9060 (0.001)</td>
<td>0.8781 (0.001)</td>
</tr>
</tbody>
</table>

Based on the high intercorrelations between these variables, it was decided that the scores on these four sub-dimensions should be combined (and then averaged) to form an overall departmental structure score. Thus, an organizational unit that scores low on this dimension would be classified as possessing an organic structure, while an organizational unit that scores high on this dimension would be considered as having a mechanistic structure.

4.3 Summary

This chapter presented a detailed assessment of the measurement instruments used in the study.

Inter-item reliability coefficients were calculated for items that made up a variable or sub-dimension. Cronbach's coefficient alpha was used as a measure of inter-item reliability. These coefficients were also adjusted for test length. Correlations between variables or sub-dimensions that made up a dimension were also computed.
CHAPTER FIVE
ANALYSIS OF RESULTS

It will be recalled that Jurkovich hypothesized that the organizational environment could be viewed in terms of five major dimensions. However, he did not demonstrate, on an empirical basis, whether there was any overlap between these dimensions, and whether more or fewer dimensions than the ones he postulated were necessary for explaining the variations in uncertainty, departmental structure, time perspective taken in planning, and frequency of changes to plans. This chapter seeks to shed light on these topics on the basis of results obtained from analysis of data collected on 64 organizational units.

As noted in Chapter Two, factor analysis was used to assist in detecting the underlying structure of the observed data. The seven environmental dimensions (pluralism, degree of interdependency, routineness of problem/opportunity states, organized sectors, directly related sectors, change rate, and stability of change) that were obtained after inter-item analysis were subjected to principal components analysis. The results of this analysis are presented in this chapter. The factors generated by such analysis were subsequently used as the independent variables for testing the hypotheses that were investigated in this study. The results of these tests also are discussed in this chapter.
5.1 **Factor Analysis on Environmental Dimensions**

The seven environmental dimensions computed after inter-item analysis were subjected to principal components analysis. The three methods of rotation used were (1) direct oblimin oblique, (2) orthogonal quartimax, and (3) orthogonal varimax.

In oblique rotation, the requirement of orthogonality among the factor axes is relaxed. Thus, factors are allowed to be correlated if such correlations do exist in the data. Since the "ultimate goal of any rotation is to obtain some theoretically meaningful factors and, if possible, the simplest factor structure" (SPSS, 1975, p. 484), and the assumptions of oblique rotation are more realistic "because the theoretically important underlying dimensions are not assumed to be unrelated to each other " (SPSS, 1975, p. 483), only the results obtained under oblique rotation need be presented here.

When six factors were specified, the factor pattern obtained after rotation is presented in Table 1 below:

<table>
<thead>
<tr>
<th>Factor Pattern obtained when 7 dimensions were subjected to direct oblimin oblique rotation and 6 factors were specified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pluralism</td>
</tr>
<tr>
<td>Interdep.</td>
</tr>
<tr>
<td>Organized</td>
</tr>
<tr>
<td>Directly</td>
</tr>
<tr>
<td>Change Rate</td>
</tr>
<tr>
<td>Stability</td>
</tr>
<tr>
<td>Routineness</td>
</tr>
</tbody>
</table>
The factor pattern is by no means clear. One thing was evident, however. The Stability of Change Rate dimension loaded highly with the Routineness of Problem/Opportunity States dimension. (Loadings of .82784 and .89532 respectively; \( r = .72956, S = .001 \)). Consequently, the two dimensions were combined and then averaged to form a new Routineness of Problem/Opportunity States dimension. This new dimension was used in all subsequent analysis.

An investigation of the items comprising the Stability of Change Rate and original Routineness of Problem/Opportunity States dimensions would show that the high correlation between these dimensions is not surprising. The items in the Stability of Change Rate dimension seek to identify the frequency with which "new and different" elements have to be taken into consideration in decision making, and the "predictability of such changes" (measured in terms of "knowing what to expect" and "length of warning period"). Where the internal and external environments are stable, i.e. where the elements that have to be taken into consideration in decision making remain relatively constant and fixed over time, and where the organizational unit possesses a high degree of knowledge as to what to expect, coupled with a reasonably long and adequate "warning period", the unit under investigation could more easily (and therefore more likely) resort to routine procedures in its operations and functions. Conversely, where the internal and external environments are in a state of flux, and where the organizational unit is not very capable of facing up to such changes (either due to
lack of knowledge or inadequacy of warning period or both), it would be difficult, if not impossible, for the unit under investigation to resort to routine procedures in its decision making and functioning. In short, the Stability of Change Rate determines the organizational unit's ability or inability to resort to routine procedures.

After the two dimensions (Stability of Change Rate and original Routineness of Problem/Opportunity States) were combined and averaged, the resulting scores on the new Routineness of Problem/Opportunity States dimension were submitted to factor analysis along with the other five dimensions. In this analysis, six factors were specified. The factor pattern that emerged after rotation is presented in Table 2 below.

<table>
<thead>
<tr>
<th>Table 2: Factor Pattern obtained when 6 dimensions were subjected to direct oblimin oblique rotation and 6 factors were specified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Pluralism</td>
</tr>
<tr>
<td>Interdep.</td>
</tr>
<tr>
<td>Organized</td>
</tr>
<tr>
<td>Directly</td>
</tr>
<tr>
<td>Change Rate</td>
</tr>
<tr>
<td>Routineness</td>
</tr>
</tbody>
</table>

The factor pattern in the above matrix is very clear. Each dimension loaded on one and only one factor. The Change Rate dimension loaded highly on Factor 1. The Organized Sector, Directly Related Sectors, Degree of Interdependency, Routineness of Problem/Opportunity States, and Pluralism dimensions each loaded singularly on factors 2, 3, 4, 5 and 6 respectively.
An examination of the correlation coefficients between these six dimensions show that there are some minor correlations between some of the dimensions. However, none of the correlations in the matrix exceed $\pm .364$. This correlation matrix is presented in Table 3 below.

<table>
<thead>
<tr>
<th></th>
<th>Pluralism</th>
<th>Interdep.</th>
<th>Organized</th>
<th>Directly</th>
<th>Change Rate</th>
<th>Routineness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plural.</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interdep.</td>
<td>0.16279</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organ'd</td>
<td>0.10605</td>
<td>0.19805</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directly</td>
<td>-0.07824</td>
<td>-0.10442</td>
<td>0.03209</td>
<td>1.00000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change</td>
<td>0.34669</td>
<td>0.14264</td>
<td>0.03381</td>
<td>0.17539</td>
<td>1.00000</td>
<td></td>
</tr>
<tr>
<td>Routine</td>
<td>-0.25442</td>
<td>0.07412</td>
<td>0.19123</td>
<td>-0.00468</td>
<td>-0.36317</td>
<td>1.00000</td>
</tr>
</tbody>
</table>

Despite the minor correlations, it was deemed advisable to test whether the number of factors could be further reduced. Consequently, four and five factors were requested in two subsequent runs. The factor patterns obtained under these instances are presented in Tables 4 and 5.

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pluralism</td>
<td>0.49139</td>
<td>0.09854</td>
<td>-0.14334</td>
<td>-0.10386</td>
</tr>
<tr>
<td>Interdep.</td>
<td>0.04026</td>
<td>0.53777</td>
<td>-0.09951</td>
<td>-0.16752</td>
</tr>
<tr>
<td>Organized</td>
<td>0.00423</td>
<td>0.02712</td>
<td>0.05973</td>
<td>-0.53082</td>
</tr>
<tr>
<td>Directly</td>
<td>-0.00921</td>
<td>-0.04324</td>
<td>0.61123</td>
<td>-0.06381</td>
</tr>
<tr>
<td>Change Rate</td>
<td>0.71139</td>
<td>0.27499</td>
<td>0.27664</td>
<td>0.12608</td>
</tr>
<tr>
<td>Routineness</td>
<td>-0.48488</td>
<td>0.25880</td>
<td>0.00510</td>
<td>0.00770</td>
</tr>
</tbody>
</table>
Table 5: Factor Pattern obtained when 6 dimensions were subjected to direct oblimin oblique rotation and 5 factors were specified

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
<th>Factor 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pluralism</td>
<td>0.67198</td>
<td>-0.02813</td>
<td>-0.04797</td>
<td>-0.04295</td>
<td>0.01516</td>
</tr>
<tr>
<td>Interdep.</td>
<td>-0.01124</td>
<td>0.58307</td>
<td>-0.10188</td>
<td>-0.13108</td>
<td>0.08953</td>
</tr>
<tr>
<td>Organized</td>
<td>0.04050</td>
<td>0.05264</td>
<td>0.04703</td>
<td>-0.48787</td>
<td>-0.03109</td>
</tr>
<tr>
<td>Directly</td>
<td>-0.05179</td>
<td>-0.05936</td>
<td>0.59048</td>
<td>-0.05330</td>
<td>0.03667</td>
</tr>
<tr>
<td>Change Rate</td>
<td>0.26760</td>
<td>0.36855</td>
<td>0.34989</td>
<td>0.18714</td>
<td>-0.25816</td>
</tr>
<tr>
<td>Routineness</td>
<td>0.01139</td>
<td>0.04147</td>
<td>0.03707</td>
<td>0.03165</td>
<td>0.62267</td>
</tr>
</tbody>
</table>

Since the factor patterns presented in the above tables were not as clear-cut as that obtained under the six-factor pattern matrix (Table 2), it was decided that six factors or dimensions should be used in all subsequent analysis for testing the ten propositions developed in Chapter Two. The matrix based on these six environmental dimensions, which were obtained on an empirical basis, is presented in Figure 4 on the following page. Compare this with the one hypothesized by Jurkovich on a theoretical basis. (page 9)
Figure 4: Typology of Environmental Characteristics Obtained on an Empirical Basis

<table>
<thead>
<tr>
<th></th>
<th>Low Pluralism</th>
<th></th>
<th>High Pluralism</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
</tr>
<tr>
<td>Low Change Rate</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Change Rate</td>
<td>33</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R = Routineness; NR = Non-Routineness; O = Organized; U = Unorganized; D = Directly Related; I = Indirectly Related.
5.2 Regression Analyses

As stated previously, one of the primary objectives of this study was to determine whether an expanded typology was necessary to account for variations in perceived environmental uncertainty, departmental structure, time perspective taken in planning, and frequency of changes to plans.

To assist in this assessment, regression analyses (multiple step-wise, multivariate regression and ordinary regression) were performed. The results of these analyses are presented below.

The organizational units' score on the six environmental dimensions were regressed against their respective overall perceived environmental uncertainty score. The beta weights or standardized regression coefficients, their associated F values with 6, 57 degrees of freedom and significance levels are reported in Table 6 on the following page.
<table>
<thead>
<tr>
<th>Multiple R Squared*</th>
<th>Pluralism</th>
<th>Interdep.</th>
<th>Routine</th>
<th>Org'd</th>
<th>Directly</th>
<th>Change Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.E.U.</td>
<td>.70776</td>
<td>-.34074</td>
<td>-.09508</td>
<td>.17661</td>
<td>.11198</td>
<td>.11908</td>
</tr>
<tr>
<td></td>
<td>(.68257)</td>
<td>(18.828)</td>
<td>(1.569)</td>
<td>(5.341)</td>
<td>(2.502)</td>
<td>(2.572)</td>
</tr>
<tr>
<td></td>
<td>&lt;.005</td>
<td>&lt; N.S.</td>
<td>&lt;.005</td>
<td>&lt;.05</td>
<td>&lt;.05</td>
<td>&lt;.005</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The figures in brackets in the Multiple R Squared column represent $\hat{R}^2$. The figures without brackets in the other columns are the beta weights. The figures between round brackets are the F values. The figures between pointed brackets are the significance levels. Where the significance level is designated by "N.S.", it means that $p>.10$

These six environmental dimensions were able to account for more than 70% of the variance in perceived environmental uncertainty. All the environmental dimensions, with the exception of the Degree of Interdependency factor, were statistically significant at the .05 level or less. The Change Rate dimension was the single greatest contributor to the amount of variation in perceived environmental uncertainty. This was in accord with the findings of most previous researchers who utilized the four-cell typologies (Lawrence and Lorsch, 1967; Duncan, 1970). The Change Rate, Pluralism and Degree of Interdependency dimensions

* Since the sample size was not large (although certainly large enough to render applicable the statistical procedures used), it was decided to attenuate the Multiple R Squared obtained from n = 64 by applying the formula to estimate "the shrinkage in going from a sample of any particular size to an infinitely large sample." (Nunally, 1967, pp. 163-164). The formula is

$$\hat{R}^2 = 1 - \left[ (1 - R^2) \left( \frac{N - 1}{N - k} \right) \right]$$

where $\hat{R}$ = unbiased estimate of population multiple correlation
R = multiple correlation found in sample of size N
k = number of independent variables
were negatively related to the amount of perceived environmental uncertainty. As measured in this study, an uncertainty score of 5 indicates a high degree of certainty or low uncertainty; whereas scores of 5 on the Change Rate, Pluralism and Degree of Interdependency dimensions indicate high change rate, high degree of pluralism, and high degree of interdependency respectively. Thus, where the change rate is high, and the amount of pluralism and interdependency are high, the organizational unit would experience a high degree of uncertainty. The Routineness of Problem/Opportunity States, Organized Sectors and Directly Related Sectors are measured such that a score of 5 indicates high amount of routineness, and transactions with units that are predominantly "organized" on a "directly related basis". Thus an organizational unit that scores high on these three dimensions would experience low uncertainty or enjoy a high degree of certainty in its decision making activities.

In Chapter Two, the researcher questioned whether organized or unorganized sectors, as a whole, present the focal unit with more uncertainty in decision making. The second part of Question 6, Schedule III, Part A (Appendix 3) was designed to shed light on this topic. While the results of regression analysis showed that the Uncertainty and Organized Sectors dimensions were positively related, it should be borne in mind that the "organized sector" index for each organizational unit was calculated on the basis of response to the first part of the question only (i.e., the number of sectors that the focal unit has transactions with that are organized). The response
to the second part of the question could not be included in the calculation of the index because approximately fifty percent of the respondents indicated that either (a) it did not really matter whether they had to deal with organized or unorganized sectors, or (b) they had no opinion on the issue. Those subjects who were able to verbalize their opinion were almost evenly divided between those who felt that the organized sectors present them with greater uncertainty in decision making and those who felt otherwise.

Some of the typical reasons mentioned by those respondents who view organized sectors, as a whole, as presenting greater uncertainty appear below:

Governments and organized sectors, as a whole, present us with more uncertainty. This has to do with the question of scale and control. (Planning Department in a Public Utilities Company).

Organized groups present us with more uncertainty. We have no control over their productivity or the legislation under which they work. (Production Department in a Manufacturing company).

The organized sector poses the greater uncertainty. The fact that they are unified is why. (Production Department in a Forest Products Company).

The organized sectors present us with more uncertainty ... in view of the increased emphasis on the legal aspects of being organized. (Sales Department in a Forest Products Company).

Some of the typical reasons cited by those respondents who view unorganized sectors, as a whole, as presenting more uncertainty in decision making appear below:-

Organized groups have certain guidelines which they follow. Therefore, they are more predictable.
Unorganized sectors, on the other hand, are unpredictable. (Finance Department in a Public Utilities company).

... with respect to customers, it is very difficult to predict what their general feeling will be tomorrow. Organized sectors tend to have long-range plans, although they do not always stick to it. Nevertheless, this makes their activities more orderly and predictable. (Operations Planning Department in a Public Utility company).

Thus, the relationship between Organized Sectors and Uncertainty obtained by means of regression analysis in this study is far from conclusive and final. The relationship needs to be explored further in a much larger and more varied sample.

Stepwise multiple regression was next performed using the six environmental dimensions as the independent variables and departmental structure, time perspective taken in planning, and frequency of changes to plans as the dependent variables. Uncertainty and size were used as test factors in each of these functions. In Table 7, five sets of beta weights are reported for each regression function. The first set is labelled "Total". These are the beta weights obtained when the whole sample (n=64) was used in the analysis. The median for the 64 rank-ordered uncertainty scores was 3.59. This score was used as the basis for splitting the sample into two almost equal-sized groups. The sample was also split into two almost equal-sized groups on the basis of size or the number of people in the department. The median for size was 60. Hence this figure was used as a dividing point. The regression coefficients obtained as a result of such splits are reported below those obtained from the full sample and are designated accordingly.
Table 7: Stepwise Multiple Regression of Environmental Variables vs. Departmental Structure, Time Perspective Taken in Planning, and Frequency of Changes to Plans

<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>$R^2$</th>
<th>PLURALISM</th>
<th>INTERDEP.</th>
<th>ROUTINE</th>
<th>ORGANIZED</th>
<th>DIRECTLY</th>
<th>CHANGE RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (n = 64)</td>
<td>.48956</td>
<td>-.42246</td>
<td>-.08420</td>
<td>.25060</td>
<td>.02374</td>
<td>.09452</td>
<td>-.26112</td>
</tr>
<tr>
<td></td>
<td>(.4456)</td>
<td>(16.571)</td>
<td>(.705)</td>
<td>(6.157)</td>
<td>(.060)</td>
<td>(.928)</td>
<td>(5.872)</td>
</tr>
<tr>
<td>Uncertainty GE 3.6 (n = 33)</td>
<td>.38261</td>
<td>-.50698</td>
<td>-.10778</td>
<td>.30327</td>
<td>.05538</td>
<td>.09282</td>
<td>.30980</td>
</tr>
<tr>
<td></td>
<td>(.3294)</td>
<td>(9.487)</td>
<td>(.391)</td>
<td>(3.528)</td>
<td>(.104)</td>
<td>(.332)</td>
<td>(3.293)</td>
</tr>
<tr>
<td>Uncertainty LE 3.59 (n = 31)</td>
<td>.39321</td>
<td>-.44975</td>
<td>.09086</td>
<td>.24909</td>
<td>-.05911</td>
<td>.11936</td>
<td>-.19790</td>
</tr>
<tr>
<td></td>
<td>(.3409)</td>
<td>(6.644)</td>
<td>(.281)</td>
<td>(1.895)</td>
<td>(.123)</td>
<td>(.458)</td>
<td>(1.405)</td>
</tr>
<tr>
<td>Size GE 61 (n = 31)</td>
<td>.52697</td>
<td>-.43309</td>
<td>.05543</td>
<td>.25723</td>
<td>-.07985</td>
<td>-.06803</td>
<td>-.34256</td>
</tr>
<tr>
<td></td>
<td>(.4862)</td>
<td>(7.215)</td>
<td>(.126)</td>
<td>(2.997)</td>
<td>(.223)</td>
<td>(.224)</td>
<td>(3.433)</td>
</tr>
<tr>
<td>Size LE 60 (n = 33)</td>
<td>.62887</td>
<td>-.37345</td>
<td>-.16233</td>
<td>.21239</td>
<td>.11650</td>
<td>.24942</td>
<td>-.44774</td>
</tr>
<tr>
<td></td>
<td>(.5969)</td>
<td>(7.529)</td>
<td>(1.410)</td>
<td>(2.052)</td>
<td>(.792)</td>
<td>(3.579)</td>
<td>(9.050)</td>
</tr>
<tr>
<td>TIME PERS. Total</td>
<td>.22015</td>
<td>.06518</td>
<td>.14952</td>
<td>.17842</td>
<td>.11952</td>
<td>.06128</td>
<td>-.32707</td>
</tr>
<tr>
<td></td>
<td>(.1529)</td>
<td>(.258)</td>
<td>(1.454)</td>
<td>(2.043)</td>
<td>(.993)</td>
<td>(.255)</td>
<td>(6.030)</td>
</tr>
<tr>
<td>Uncertainty GE 3.6</td>
<td>.39334</td>
<td>-.21293</td>
<td>.50353</td>
<td>.08236</td>
<td>.11439</td>
<td>.13352</td>
<td>.32691</td>
</tr>
<tr>
<td></td>
<td>(.3411)</td>
<td>(1.703)</td>
<td>(8.677)</td>
<td>(.265)</td>
<td>(.453)</td>
<td>(.699)</td>
<td>(3.730)</td>
</tr>
<tr>
<td>Uncertainty LE 3.59</td>
<td>.08440</td>
<td>.08312</td>
<td>.22618</td>
<td>.12088</td>
<td>.04924</td>
<td>.06987</td>
<td>-.04434</td>
</tr>
<tr>
<td></td>
<td>(.0055)</td>
<td>(.150)</td>
<td>(1.155)</td>
<td>(.296)</td>
<td>(.056)</td>
<td>(.104)</td>
<td>(.047)</td>
</tr>
<tr>
<td>Size GE 61</td>
<td>.31082</td>
<td>.30550</td>
<td>-.04665</td>
<td>.18308</td>
<td>-.04735</td>
<td>.14250</td>
<td>-.50661</td>
</tr>
<tr>
<td></td>
<td>(.2514)</td>
<td>(2.464)</td>
<td>(.061)</td>
<td>(1.042)</td>
<td>(.054)</td>
<td>(.676)</td>
<td>(5.153)</td>
</tr>
<tr>
<td>Size LE 60</td>
<td>.44510</td>
<td>-.41316</td>
<td>.39320</td>
<td>-.11624</td>
<td>.11821</td>
<td>-.10740</td>
<td>-.33153</td>
</tr>
<tr>
<td></td>
<td>(.3973)</td>
<td>(6.163)</td>
<td>(5.534)</td>
<td>(.411)</td>
<td>(.545)</td>
<td>(.444)</td>
<td>(3.322)</td>
</tr>
</tbody>
</table>
Table 7 (continued)

<table>
<thead>
<tr>
<th>CHANGE</th>
<th>$R^2$</th>
<th>PLURALISM</th>
<th>INTERDEP.</th>
<th>ROUTINE</th>
<th>ORGANIZED</th>
<th>DIRECTLY</th>
<th>CHANGE RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>.66216</td>
<td>.25379</td>
<td>.10207</td>
<td>-.15866</td>
<td>-.05200</td>
<td>-.04339</td>
<td>.60824</td>
</tr>
<tr>
<td></td>
<td>(.6639)</td>
<td>(9.036)</td>
<td>(1.564)</td>
<td>(3.728)</td>
<td>(.434)</td>
<td>(.295)</td>
<td>(48.136)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.000</td>
<td>N.S.</td>
<td>.005</td>
<td>N.S.</td>
<td>N.S.</td>
<td>.000</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>.26794</td>
<td>.27364</td>
<td>.03144</td>
<td>-.23952</td>
<td>-.02638</td>
<td>.04522</td>
<td>.25364</td>
</tr>
<tr>
<td>GE 3.6</td>
<td>(.2049)</td>
<td>(2.330)</td>
<td>(.028)</td>
<td>(1.855)</td>
<td>(.020)</td>
<td>(.067)</td>
<td>(1.861)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.05</td>
<td>N.S.</td>
<td>.10</td>
<td>N.S.</td>
<td>N.S.</td>
<td>.10</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>.38488</td>
<td>.33785</td>
<td>.14259</td>
<td>-.16083</td>
<td>N.S.</td>
<td>N.S.</td>
<td>-.17768</td>
</tr>
<tr>
<td>LE 3.59</td>
<td>(.3319)</td>
<td>(3.853)</td>
<td>(.712)</td>
<td>(.874)</td>
<td>N.S.</td>
<td>N.S.</td>
<td>(1.053)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.005</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>(.000)</td>
</tr>
<tr>
<td>Size</td>
<td>.66081</td>
<td>.34972</td>
<td>.09040</td>
<td>-.25088</td>
<td>-.04795</td>
<td>-.10237</td>
<td>.44679</td>
</tr>
<tr>
<td>GE 61</td>
<td>(.6316)</td>
<td>(6.561)</td>
<td>(.469)</td>
<td>(3.976)</td>
<td>(.112)</td>
<td>(.709)</td>
<td>(8.144)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.000</td>
<td>N.S.</td>
<td>.005</td>
<td>N.S.</td>
<td>N.S.</td>
<td>.000</td>
</tr>
<tr>
<td>Size</td>
<td>.74727</td>
<td>.21835</td>
<td>.06701</td>
<td>.04709</td>
<td>-.13741</td>
<td>.03453</td>
<td>.81166</td>
</tr>
<tr>
<td>LE 60</td>
<td>(.7255)</td>
<td>(3.780)</td>
<td>(.353)</td>
<td>(.148)</td>
<td>(1.618)</td>
<td>(.101)</td>
<td>(43.717)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.005</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>N.S.</td>
<td>.000</td>
</tr>
</tbody>
</table>

N.S. = $p > .10$

Figures presented in brackets under $R^2$ column are $\hat{R}^2$
The correlations among the dependent variables under investigation were also examined to determine their degree of relationship. If they were highly related or correlated with each other, then multivariate regression analysis should be more appropriate because this procedure takes into consideration the relationships between the dependent variables as well. The correlations among these three variables are presented in Table 8 below.

<table>
<thead>
<tr>
<th></th>
<th>Structure</th>
<th>Time Perspective</th>
<th>Frequency of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>1.0000</td>
<td>(0.001)</td>
<td></td>
</tr>
<tr>
<td>Time Perspective</td>
<td>0.4880</td>
<td>1.0000 (0.001)</td>
<td></td>
</tr>
<tr>
<td>Frequency of Changes</td>
<td>-0.7493</td>
<td>-0.4618 (0.001)</td>
<td>1.0000 (0.001)</td>
</tr>
</tbody>
</table>

Given the above correlations among the dependent variables, multivariate regression was performed on the same set of dependent and independent variables as a check against the results obtained from stepwise multiple regression which were reported in Table 7. The standardized regression coefficients, t statistics with 6, 57 degrees of freedom and significance levels obtained from multivariate regression are presented in Table 9.
<table>
<thead>
<tr>
<th>Structure</th>
<th>Time Perspective</th>
<th>Frequency of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pluralism</td>
<td>-0.424 (4.06)</td>
<td>0.253</td>
</tr>
<tr>
<td></td>
<td>0.000</td>
<td>0.004</td>
</tr>
<tr>
<td>Interdep.</td>
<td>-0.081 (0.80)</td>
<td>0.103</td>
</tr>
<tr>
<td></td>
<td>0.427 (1.21)</td>
<td>0.214</td>
</tr>
<tr>
<td>Organized</td>
<td>0.022 (0.23)</td>
<td>-0.054</td>
</tr>
<tr>
<td></td>
<td>0.819 (1.01)</td>
<td>0.501</td>
</tr>
<tr>
<td>Directly</td>
<td>0.093 (0.94)</td>
<td>-0.042</td>
</tr>
<tr>
<td></td>
<td>0.350 (0.50)</td>
<td>0.598</td>
</tr>
<tr>
<td>Change Rate</td>
<td>-0.256 (2.37)</td>
<td>0.609</td>
</tr>
<tr>
<td></td>
<td>0.021 (2.48)</td>
<td>0.000</td>
</tr>
<tr>
<td>Routineness</td>
<td>0.250 (2.46)</td>
<td>-0.158</td>
</tr>
<tr>
<td></td>
<td>0.071 (1.38)</td>
<td>0.059</td>
</tr>
</tbody>
</table>

The results obtained from multivariate regression and stepwise multiple regression were fairly consistent. These results provided justification for the use of regression coefficients obtained from univariate regression to test the hypotheses investigated in the present study.

To further corroborate the results obtained under univariate and multivariate analyses of regression, canonical correlation was performed on these two sets of variables. The results obtained from canonical correlation are presented in Appendix 6. These results were consistent with those obtained from univariate and multivariate regression analyses.
Given the fact that certain organizational dimensions did not appear to be significant predictors of departmental structure, time perspective taken in planning, and frequency of changes to plans, ordinary multiple regression was performed with the objective of eliminating or excluding those variables that were not significant. Table 10 presents the results obtained from ordinary multiple regression. In Table 10, 11 sets of beta weights are reported for each function. These are designated accordingly on the left hand side of the Table.
Table 10: Ordinary Multiple Regression of Environmental Variables vs. Departmental Structural, Time Perspective Taken in Planning, and Frequency of Changes to Plans

<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>$R^2$</th>
<th>PLURALISM</th>
<th>INTERDEP.</th>
<th>ORGANIZED</th>
<th>DIRECTLY</th>
<th>CHANGE RATE</th>
<th>ROUTINE</th>
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N.S. = $p > .10$

Figures presented in brackets under $R^2$ column are $\hat{R}^2$.
The figures in brackets in column (1) indicate the number of independent variables that were used in the regression.
From Table 10, it could be observed that two dimensions, the Organized Sectors and Directly Related Sectors dimensions were least significant in explaining the variations in the dependent variables. The Degree of Interdependency dimension was a border-line case. It was significant in two of the functions using Time Perspective Taken in Planning as the dependent variable. This is understandable from a conceptual point of view. As defined in the study, the Degree of Interdependency dimension was measured by the number of joint programmes or efforts with outside companies. Thus, the organizational unit under consideration could not act independently. The time perspective that it takes has to coincide with that adopted by the groups or organizations with which it is collaborating; otherwise their efforts would appear disjointed and unsynchronized.

Given the respective contributions of each environmental dimension, it was concluded that a 64-cell typology may be unduly rich or over-expanded. Based on the data collected in this study, it was decided that a 16- or 8-cell typology* was quite capable of explaining the variations in departmental structure, time perspective taken in planning, and frequency of changes to plans. However, this decision should not be construed as final and conclusive.

* If only the Organized Sectors and Directly Related Sectors dimensions are deleted from the typology, we end up with a 16-cell typology. If the Degree of Interdependency dimension is also eliminated, then we end up with an 8-cell typology.
The adequacy of an 8- or 16-cell typology could very well be a feature of the limited sample size. If a much larger sample were available (e.g., 400 to 500), it might be necessary to utilize a more expanded typology. The reasoning behind this speculation is two-fold:-

(1) When the environmental characteristics were regressed against perceived environmental uncertainty, five out of the six dimensions were statistically significant at the .05 level or less.

(2) Where environmental characteristics were regressed against organizational variables, relatively high multiple R squared values were obtained in most of the regression functions.

5.3 Hypotheses Testing

For the following reasons, only the results of analysis of covariance and discriminant analysis performed on 16- and 8-cell typologies are presented here. The results obtained from a 64-cell typology are presented in Appendix 7.*

(1) Given the fact that only 64 organizational units were studied, it would be impossible to fill up all 64 cells with sufficient number of units in each cell to render meaningful comparison on a statistical basis.

* Under a 64-cell typology, certain of the cells remained empty and a sizeable portion of them did not have enough units in each cell to render comparison meaningful and valid on a statistical basis. However, in light of the reasons for speculating that the adequacy of a 16- or 8-cell typology could very well be a feature of the limited sample size, analysis was performed on a 64-cell matrix and the results are reported so that they may be compared against future results obtained from much larger and more varied samples. These results should be read and interpreted with these limitations in mind.
Based on the data obtained in this study, it was found that an 8- or 16-cell typology was quite capable of explaining the variations in the three organizational variables investigated in this study.

Hypotheses 1 through 8 sought to determine whether the perceived environmental uncertainty, departmental structure, time perspective taken in planning, and frequency of changes to plans of organizational units located in different cells varied significantly in a statistical sense. A series of univariate analysis of covariance was performed. The researcher would like to use multivariate analysis of covariance as a check against the results obtained from univariate analysis. However, this was not technically feasible. The programmes that are currently available at this institution are not capable of handling the number of cell designs that would be called for in such a study. Since the relationships between the three dependent variables were not so strong as to render the use of univariate analysis inapplicable (as can be seen from the section on regression analysis), it was believed that the results obtained under univariate analysis should be equally as interpretable.

When analysis of covariance was performed on a 16-cell design (i.e., a typology consisting of the following four dimensions: Pluralism, Degree of Interdependency, Routineness, and Change Rate), the significance levels associated with uncertainty and each of the dependent variables were as follows: uncertainty ($S = .001$), structure ($S = .001$), time perspective taken in planning ($S = .004$), and frequency of changes to plans ($S = .001$). The means scores for perceived environmental uncertainty, depart-
mental structure, time perspective taken in planning, and frequency of changes to plans are presented in Table 11 (p. 136). It should be noted that there are three empty cells in the 16-cell typology and six of the cells had under 5 cases in each of them. These limitations should be taken into consideration when interpreting the results.

When analysis of covariance was performed on an 8-cell design (i.e. a typology consisting of the following three dimensions: Pluralism, Routineness, and Change Rate), the significance levels associated with uncertainty and each of the dependent variables were as follows: uncertainty (S = .001), structure (S = .001), time perspective taken in planning (S = .031) and frequency of changes to plans (S = .001). The significance level associated with time perspective taken in planning is greater than that obtained in a 16-cell design. This is understandable because the Degree of Interdependency dimension was observed to be a significant contributor in the time perspective function. The mean scores for perceived environmental uncertainty, departmental structure, time perspective taken in planning, and frequency of changes to plans are presented in Table 12 (p. 137).
Table 11: Mean Scores for Dependent Variables in a 16-cell design

<table>
<thead>
<tr>
<th>Low Pluralism</th>
<th></th>
<th></th>
<th></th>
<th>High Pluralism</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Interdependency</td>
<td></td>
<td></td>
<td>High Interdependency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Routine</td>
<td>Non-Routine</td>
<td>Routine</td>
<td>Non-Routine</td>
<td>Routine</td>
<td>Non-Routine</td>
<td>Routine</td>
</tr>
<tr>
<td>Low Change Rate</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>n = 5</td>
<td>n = 1</td>
<td>n = 16</td>
<td>n = 5</td>
<td>n = 2</td>
<td>n = 3</td>
<td>n = 2</td>
<td></td>
</tr>
<tr>
<td>S = 4.75</td>
<td>S = 4.05</td>
<td>S = 4.31</td>
<td>S = 4.05</td>
<td>S = 3.8</td>
<td>S = 3.30</td>
<td>S = 2.78</td>
<td></td>
</tr>
<tr>
<td>T = 3.5</td>
<td>T = 2.0</td>
<td>T = 4.5</td>
<td>T = 4.5</td>
<td>T = 3.25</td>
<td>T = 3.66</td>
<td>T = 2.0</td>
<td></td>
</tr>
<tr>
<td>C = 1.8</td>
<td>C = 1.5</td>
<td>C = 1.26</td>
<td>C = 1.6</td>
<td>C = 1.75</td>
<td>C = 2.66</td>
<td>C = 2.0</td>
<td></td>
</tr>
</tbody>
</table>

| Low Change Rate | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| n = 1 | n = 11 | n = 3 | n = 10 | n = 5 | n = 10 | n = 5 |
| S = 3.95 | S = 3.78 | S = 3.33 | S = 2.64 | S = 2.305 | S = 2.64 | S = 2.305 |
| T = 4.5 | T = 2.22 | T = 3.66 | T = 3.25 | T = 3.0 | T = 3.25 | T = 3.0 |
| C = 3.5 | C = 2.89 | C = 2.93 | C = 3.86 | C = 4.2 | C = 3.86 | C = 4.2 |
| U = 3.633 | U = 3.3358 | U = 3.4106 | U = 2.3598 | U = 1.8518 | U = 2.3598 | U = 1.8518 |

n = number of cases in the cell;
S = Structure. A high score indicates mechanistic structure;
T = Time Perspective Taken in Planning. A high score indicates long-range planning perspective;
C = Frequency of Changes to Plans. A high score indicates frequent changes;
U = Perceived Environmental Uncertainty. A high score indicates high certainty.
<table>
<thead>
<tr>
<th></th>
<th>Low Pluralism</th>
<th></th>
<th>High Pluralism</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Routineness</td>
<td>Non-Routineness</td>
<td>Routineness</td>
<td>Non-Routineness</td>
</tr>
<tr>
<td>Low Change Rate</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>n = 21</td>
<td>n = 6</td>
<td>n = 5</td>
<td>n = 2</td>
<td></td>
</tr>
<tr>
<td>S = 4.42</td>
<td>S = 4.05</td>
<td>S = 3.50</td>
<td>S = 2.78</td>
<td></td>
</tr>
<tr>
<td>T = 4.26</td>
<td>T = 4.08</td>
<td>T = 3.5</td>
<td>T = 2.0</td>
<td></td>
</tr>
<tr>
<td>C = 1.24</td>
<td>C = 1.58</td>
<td>C = 2.0</td>
<td>C = 2.0</td>
<td></td>
</tr>
<tr>
<td>U = 4.287</td>
<td>U = 4.1661</td>
<td>U = 3.7852</td>
<td>U = 3.33</td>
<td></td>
</tr>
<tr>
<td>High Change Rate</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>n = 12</td>
<td>n = 3</td>
<td>n = 10</td>
<td>n = 5</td>
<td></td>
</tr>
<tr>
<td>S = 3.8</td>
<td>S = 3.33</td>
<td>S = 2.64</td>
<td>S = 2.305</td>
<td></td>
</tr>
<tr>
<td>T = 2.41</td>
<td>T = 3.66</td>
<td>T = 3.25</td>
<td>T = 3.0</td>
<td></td>
</tr>
<tr>
<td>C = 2.94</td>
<td>C = 2.95</td>
<td>C = 3.86</td>
<td>C = 4.2</td>
<td></td>
</tr>
<tr>
<td>U = 3.3605</td>
<td>U = 3.4106</td>
<td>U = 2.3598</td>
<td>U = 1.8518</td>
<td></td>
</tr>
</tbody>
</table>
As further evidence to corroborate the findings obtained from univariate analysis of covariance, discriminant analysis was performed on the 16- and 8-cell designs respectively. The purpose here was to determine whether one could allocate respondents or organizational units to cells based on their scores on uncertainty, departmental structure, time perspective taken in planning, and frequency of changes to plans. These four variables were hypothesized to be related to environmental characteristics.

Under a 16-cell design, four discriminant functions were obtained. These were uncertainty ($S = .000$), structure ($S = .000$), time perspective taken in planning ($S = .180$), and frequency of changes to plans ($S = .848$). The percent of "grouped" cases correctly classified was 64.06%.

Under the 8-cell design, four discriminant functions were obtained. These were uncertainty ($S = .000$), structure ($S = .001$), time perspective taken in planning ($S = .210$), and frequency of changes to plans ($S = .626$). The percent of "grouped" cases correctly classified rose to 73.44%.

Given the relationships between environmental characteristics and the dependent variables under investigation are not perfect, it would not possible to obtain one hundred percent accuracy in classifications on the basis of scores on uncertainty, structure, time perspective taken in planning, and frequency of changes to plans. However, a proportion of correctly classified cases of almost 75% shows that there is a very definite relationship between environmental characteristics and uncertainty,
structure, time perspective taken in planning, and frequency of changes to plans.

The first set of hypotheses which sought to relate environmental characteristics to perceived environmental uncertainty were strongly supported. The results of analysis of covariance showed that the degree of perceived environmental uncertainty experienced by organizational units located in different cells varied significantly from each other ($S = .001$). An examination of the mean scores on uncertainty for the different cells in Tables 11 and 12 show that the scores on uncertainty varied in the predicted fashion. Organizational units located in the extreme north-west corner cell enjoyed the lowest degree of perceived environmental uncertainty; while organizational units located in the extreme south-east corner cell received the highest mean score on perceived environmental uncertainty. The scores on perceived environmental uncertainty for organizational units located in the other cells varied in the predicted fashion.

Hypotheses 5 through 8 were concerned with the relationships between environmental characteristics and organizational variables. The results of analysis of covariance showed that departmental structure, time perspective taken in planning, and frequency of changes to plans varied significantly from each other ($p < .031$). An examination of the mean scores on the three organizational variables for the different cells in Tables 11 and 12 show that the scores on departmental structure, and frequency of changes to plans varied in the predicted fashion.
The mean scores on Time Perspective taken in Planning deviated from the predicted fashion in certain cells, most noticeably in the extreme north-east corner cell in both the 16- and 8-cell typologies and the extreme south-west corner cell in the 16-cell design. These deviations could be attributed to one of several reasons:

(1) small number of cases in each of these two cells. Under the 16-cell typology when there was only one case in cell 9, the time perspective taken in planning was 4.5. When the number of cases was increased to 12 for the extreme south-west corner cell in the 8-cell typology, the mean score on Time Perspective Taken in Planning dropped to 2.41 (or shorter-range planning perspective). The latter was consistent with the hypothesized direction. The same is true for the north-west corner cell. The Time Perspective increased from 3.5 under a 16-cell typology with an n of 5 to 4.26 under an 8-cell design with an n of 21.

(2) although the organizational units studied were autonomous in their functions and activities, departmental plans, more specifically "formalized" departmental plans* were usually coordinated at the corporate level.

(3) those departments which engaged in a multitude of joint programmes and efforts with other companies had to coordinate their planning perspective with those with whom they were collaborating. Otherwise their efforts would appear disjointed.

* The question designed to tap this dimension (Schedule II, Part E, Question 1, Appendix 1) specifically asks if these plans were "formalized in writing and ... reviewed and approved at top management level."
Hypothesis 9 examined the conditions under which the original relationships between environmental characteristics, on the one hand, and departmental structure, time perspective taken in planning, and frequency of changes to plans, on the other, would be more pronounced than originally observed. Size was found to be an important test factor. When the sample was split into two approximately equal groups on the basis of size, the relationships between environmental characteristics and organizational variables became more pronounced as evidenced by the increased multiple R squared values. Departmental size, as measured by the number of people in the department, changed the influence of environmental characteristics on the three organizational variables examined in this study. This is understandable from a conceptual point of view. The larger the departmental size, the more difficult it would be for the department to adopt an organic type of structure.

Hypothesis 10 was also sustained in general. When perceived environmental uncertainty was held constant by splitting the sample into two approximately equal groups on the basis of their scores on perceived environmental uncertainty, the partial relationships between environmental characteristics and organizational variables decreased. It was only when uncertainty was perceived and recognized by the decision maker that there would be subsequent changes in the departmental structure, time perspective taken in planning, and frequency of changes to plans to respond to such environmental uncertainty. Although the partial relationships decreased when perceived environmental
uncertainty was held constant, they did not drop to zero. This would occur only if perceived environmental uncertainty were able to interpret in full the relationships between environmental characteristics and organizational variables. However, there are other exogenous variables -- to cite only two: technology (which was examined in detail by Woodward, 1965; and Perrow, 1970), history (which was looked into by the Aston group, 1968) -- which could influence the organizational variables that were investigated in this study. In fact, the studies by Woodward and the Aston group showed that these variables did have an impact upon the way the organization was structured.

5.4 Summary

The environmental dimensions obtained after inter-item analysis and computations of correlations were subjected to factor analysis. The factor pattern obtained when 6 factors were specified was clear-cut and these 6 factors were used as the independent variables in all subsequent analysis.

The results of regression analyses showed that based on the data collected in this study, a 64-cell matrix may be unduly rich or over-expanded, and that an 8- or 16-cell typology was quite capable of explaining the variations in perceived environmental uncertainty, departmental structure, time perspective taken in planning, and frequency of changes to plans without too much loss of explanatory power.
Hypotheses 1 through 4 were strongly supported. The scores on perceived environmental uncertainty for organizational units located in different cells varied significantly and in the predicted fashion. Hypotheses 5 through 8 were also sustained. The scores on departmental structure, time perspective taken in planning and frequency of changes to plans varied significantly across cells; and in the predicted fashion for departmental structure and frequency of changes to plans.

Hypotheses 9 and 10 also were sustained. When size was held constant, the relationships between environmental characteristics and organizational variables became more pronounced than originally observed. When perceived environmental uncertainty was held constant, the partial relationships between environmental characteristics and organizational variables decreased.
CHAPTER SIX
SUMMARY AND IMPLICATIONS

6.1 Summary of Findings

The primary objectives of this study were two-fold:-
(1) to verify, on an empirical basis, Jurkovich's core typology for analyzing organizational environments; and
(2) to examine the relationships between environmental characteristics, perceived environmental uncertainty, departmental structure, time perspective taken in planning, and frequency of changes to plans.

In the first instance, an attempt was made to test the viability of Jurkovich's core typology for analyzing and interpreting organizational environments. Jurkovich identified six environmental characteristics which formed a 64-cell matrix. An instrument was developed to identify and measure these environmental characteristics. Data on these environmental characteristics were collected from 64 organizational units located in 21 different industrial organizations engaged in varied types of business activities. By means of inter-item analysis, it was demonstrated that the items measuring a single variable were indeed homogeneous. Correlation coefficients were then computed for variables constituting a sub-dimension. These sub-dimensions were then subjected to factor analysis. Six discrete dimensions were obtained. However, these were not identical to the six theoretical dimensions
identified by Jurkovich. The six dimensions that were derived on an empirical basis were Pluralism, Degree of Interdependency, Routineness of Problem/Opportunity States, Organized Sectors, Directly Related Sectors, and Change Rate.

Once these dimensions were derived and measured, it was possible to examine the relationships between environmental characteristics and organizational variables.

By means of regression analyses (both multiple stepwise and multivariate), it was found that some of the environmental characteristics were not able to account, in a statistically significant sense, for much of the variations in departmental structure, time perspective taken in planning, and frequency of changes to plans. These were the Organized Sectors, Directly Related Sectors, and Degree of Interdependency dimensions. However the latter was able to account for certain variations in the "time perspective taken in planning". Based on the data collected in this study, it was decided that a 64-cell typology may be unduly rich or over-expanded. The Organized Sectors, Directly Related Sectors, and Degree of Interdependency dimensions could be deleted from the typology without much loss of explanatory power. However it was noted that this deletion should not be construed as final and conclusive. The adequacy of an 8- or 16-cell typology could very well be a feature of the limited sample size. This speculation was based on the overall high multiple R squared values obtained when environmental characteristics were regressed against perceived environmental uncertainty and
the three organizational variables investigated in this study.

Given that only 64 organizational units were studied, it would be impossible to fill all 64 cells with a sufficient number of units in each cell to permit meaningful comparison on a statistical basis. With a larger sample size, however, it might be possible to fill all of the 64 cells in Jurkovich's matrix with a large enough number of cases in each cell to test if there were indeed statistically significant differences across all 64 cells. Future studies that are based on larger samples which consist of organizational units engaged in more diverse activities (not merely business and industrial), should collect information on all six dimensions. The results obtained from such future studies will help to confirm or refute this speculation.

The first set of hypotheses sought to investigate the relationships between environmental characteristics and perceived environmental uncertainty. Specifically, it was hypothesized that organizational units which were confronted with low environmental complexity, low degree of interdependency with environmental sectors, high degree of routineness in problem-solving activities, low change rate and whose transactions were primarily with organized sectors on a directly related basis, would experience a low degree of perceived environmental uncertainty in decision making. Conversely, organizational units that operated in an environment characterized by high complexity, high degree of interdependency, low degree of routineness in problem-solving activities, high change rate
and whose transactions were primarily with unorganized sectors on an indirectly related basis, would be confronted with a high degree of uncertainty in decision making. The four hypotheses that were specifically designed to investigate these relationships were strongly supported in the analysis. It was found that the degree of perceived environmental uncertainty experienced by organizational units located in different cells varied significantly from each other and in the predicted fashion. The Change Rate dimension was the single greatest contributor to the variation in Perceived Environmental Uncertainty. All environmental dimensions, with the exception of the Degree of Interdependency, were statistically significant at the .05 level or less.

The second set of hypotheses was concerned with the relationships between environmental properties and departmental structure, time perspective taken in planning, and frequency of changes to plans. Specifically, it was hypothesized that organizational units which were confronted with low environmental complexity, low degree of interdependency with environmental sectors, high degree of routineness in problem-solving activities, low change rate and whose transactions were primarily with organized sectors on a directly related basis, would be most likely to adopt a mechanistic structure, and engage in long-range planning with few modifications to such plans. Conversely, organizational units that operated in an environment characterized by high complexity, high degree of interdependency, low degree of routineness in problem-solving
activities, high change rate and whose transactions were primarily with unorganized sectors on an indirectly related basis, would be most likely to adopt an organic structure, and engage in shorter range planning with frequent and major modifications and adjustments to such plans along the way. It was found that departmental structure, time perspective taken in planning, and frequency of changes to plans varied significantly between organizational units located in different cells.

Structure and frequency of changes to plans varied across cells in the predicted fashion, i.e. organizational units located in the extreme north-west corner cell possessed the most mechanistic structure and had the lowest frequency of changes to plans over the life-time of such plans and policies. Organizational units located in the extreme south-east corner cell, on the other hand, possessed the most flexible structure and experienced the highest incidence of changes to plans and policies.

Size was found to be an important test factor. When it was held constant, the relationships between environmental characteristics and organizational variables became more pronounced.

Uncertainty was also found to be an important intervening variable. When perceived environmental uncertainty was held constant, the partial relationships between environmental characteristics and organizational variables decreased.
6.2 Implications of Research Findings

(1) The most important finding of the present study is that it is possible to both conceptualize and operationalize organizational environments in terms of more than two dimensions. Previous researchers in the field of organization-environment interaction have not moved beyond four-cell typologies. In this study, it has been shown that it is indeed possible to define and analyze the environment in terms of six dimensions. Five of these six dimensions were able to account for variations in the amount of perceived environmental uncertainty experienced by an organizational unit in its decision making activities. (p < .05). Three of the six environmental dimensions were shown to be significant predictors of variations in departmental structure, time perspective taken in planning, and frequency of changes to plans.

Based on these findings, it is believed that a 16- or 8-cell typology is quite capable of explaining the variations in departmental structure, time perspective taken in planning, and frequency of changes to plans without too much loss of explanatory power. However, as was stressed earlier, it may be necessary to adopt a more expanded typology after analysis of a much larger sample. It is believed that the results of this research provide a significant improvement over the four-cell typologies heretofore available. A more elaborate typology of organizational environments can assist organizational theorists, researchers and practitioners to more clearly distinguish and
identify the problems confronting organizational units operating in different environments. Once a clearer diagnosis can be made, prognosis would be facilitated. Under a more refined and expanded typology, prognosis would be more detailed and more accurate than that possible if the diagnosis were based only on more broad and general guidelines. As was pointed out earlier, a more refined and elaborate typology could assist in the generation of more specific and sophisticated hypotheses concerning the relationships between environmental and organizational variables, which could subsequently be tested in the field. This study has examined merely the impact of environmental characteristics on uncertainty, departmental structure, time perspective taken in planning, and frequency of changes to plans. Although these are undoubtedly very important variables, they are by no means the only ones that should be investigated in subsequent studies. In fact, the research reported here is just a step toward a series of more detailed investigations and analyses of styles and patterns of people interaction, organization-people interaction, and organization-organization interaction. Results of such analyses could revolutionize the whole area of thinking in organizational theory and behavioural research.

(2) Further, a more refined basis for differentiating between organizational environments can lead to the development of a better core typology of organizations.

Two important questions immediately come to mind:-
(a) is a typology of organizations necessary or are such efforts merely an academic exercise?

(b) how could a better and more thorough conceptualization of environmental characteristics contribute to the development of a better core typology of organizations?

With respect to the first question, Richard Hall (1972) pointed to the need for developing typologies or frameworks to assist us in understanding and giving order to phenomena and stimuli that surround us.

Discussion of typologies can seem entirely academic. As a matter of fact they are not. Man must classify phenomena in order to be able to think about them. He must have some framework by which to view the world around him, or else he is surrounded by an unordered kaleidoscope of stimuli, rendering him unable to function at all. (Hall, 1972, pp. 39-40)

Man is limited in his cognitive abilities. There are limits to man's abilities to grasp and comprehend complex phenomena in their natural and unordered states. A satisfactory typology would provide a framework whereby he could give order to such complex phenomena and draw cognitive maps of the relations between groups or classes. This is the reason why in any major field of inquiry, either in the physical or social sciences, man has sought to classify or rank-order the phenomena under investigation. And organizational analysis should be no exception. The ramifications of any improvement or development of a better core typology of organizations would be far-reaching. After all, developed societies are made up of organizations of one sort or another. An improved typology of organizations
would provide a better basis to identify or differentiate the points of similarity or dissimilarity between categories. Any clarifications in this respect would facilitate the free flow and interchange of formulae and ideas developed in one or two organizations within a given category to the other members of the group.

A satisfactory answer to the second question requires at least a cursory survey of the work that has been done in the area of classificatory schemes for differentiating organizations.

Most previous typologies of organizations have sought to classify organizations on the basis of one key variable. Talcott Parsons (1960), for instance, attempted to classify organizations on the basis of type of function or goal served by the organization. Etzioni (1961, pp. 23-67) used "compliance" as the major source of differentiation between organizations. Blau and Scott (1962, pp. 40-58), on the other hand, used the "prime beneficiary of the organization's actions" as the key variable for distinguishing organizations.

These formulations based on a single principle have been criticized by other theorists and researchers in the field. Burns (1967), for instance, argued that the Etzioni typology was over-simplified and "leaves too many things unexplained and utilizes some unwarranted assumptions." Based on a study of 75 organizations, Hall, Haas and Johnson (1967) found that the Etzioni and the Blau and Scott formulations did not hold up empirically.
The typology advanced by Katz and Kahn (1966) was more elaborate. These investigators sought to classify organizations on the basis of first and second order characteristics. "Although the organizational characteristics that Katz and Kahn discuss are quite relevant dimensions along which organizations vary, the goals-and-function approach does not seem to be a sufficiently discriminating classificatory basis." (Hall, 1972, p. 45).

Based on a critical review of existing typologies and the results of his own empirical research (Haas, Hall and Johnson, 1966), Hall arrived at the conclusion that:

The essence of the typological effort really lies in the determination of the critical variables for differentiating the phenomena under investigation. Since organizations are highly complex entities, classificatory schemes must represent this complexity. An adequate overall classification would have to take into account the array of external conditions (emphasis mine), the total spectrum of actions and interactions within an organization, and the outcome of organizational behaviors. (1972, p. 41).

In short, investigation of one single variable or dimension would not provide an adequate scheme for analyzing organizations.

Since organizations do not operate in a vacuum, any comprehensive scheme for classifying organizations would have to take into consideration the "array of external conditions" under which the organization operates. Although Hall did not develop a typology that would provide a satisfactory basis for classifying organizations, he did identify some of the major and critical elements that were necessary for organizational
analysis. A comprehensive classificatory scheme

... should treat the organization as both a dependent and independent variable. It is a dependent variable when we consider factors such as technology, the general environment, and the nature of the personnel coming into the organization.... The organization becomes the independent variable in relation to the impact of its outputs, the compliance structure, employee morale and satisfaction, or patterns of internal conflict. The adequate typology should be empirically based. Relationships that have been demonstrated should serve as the basis for classification and the demonstration of further relationships.

Although a typology of organizations is not available, many empirical relationships have been demonstrated and others have been hypothesized and proposed. As these are tested, the typological effort will advance, and it may be possible at some future time to state than an organization with an x environmental configuration will have a y structural and processual system with a z set of output relationships. (Hall, 1972, pp. 77-78)

As stated previously, this study did not attempt to examine all possible relationships between environmental characteristics and "structural and processual systems", nor did it look into the "z set of output relationships" discussed by Hall. Nevertheless, the study did investigate one of the key sets of variables which should be encompassed in any comprehensive scheme for classifying organizations. Given a better understanding of organizations based on environmental differences and the development of an instrument for measuring such differences, theorists and researchers would be better equipped to rethink and refine existing typologies of organizations.
(3) In addition, a more comprehensive typology of organizational environments could lead to the development of a more satisfactory framework for analyzing or assessing organizational effectiveness. In Chapter One, it was pointed out that theorists and researchers are becoming increasingly aware of the necessity of incorporating organizational environments into any framework for analyzing organizational effectiveness.

In a recent and comprehensive study of organizational effectiveness, Steers (1976) pointed to the futility of any approach which tried to view "the concept (of organizational effectiveness) within a unidimensional framework, focusing on only one evaluation criterion (e.g. productivity)." (Steers, 1976, Chapter 3, p. 2) He argued instead for the use of "multivariate effectiveness measures" to analyze and assess a concept as complex as organizational effectiveness.

These models (multivariate ones) have a distinct advantage over univariate techniques in that they generally represent attempts to study in a more comprehensive fashion the major sets of variables involved in the effectiveness construct and to demonstrate or at least suggest how such variables fit together. (Steers, 1976, Chapter 3, p. 7).

He specified environmental characteristics as one of the major sets of variables in his framework for analyzing organizational effectiveness. Hence, any improvement in identifying and measuring environmental characteristics would make definite and positive contributions towards the assessment of the organizational effectiveness construct.
In a world of munificence and plenty, effectiveness was one of the most important criteria for justifying the existence of an organization. It has become increasingly apparent that the traditional basis of organizational theory must be questioned in view of the fact that resources are indeed finite. (Scott, 1974). In a world of diminishing resources where "scarcity" is rapidly becoming a frequently-encountered terminology and topic of discussion, the whole question of effectiveness presents itself with greater urgency.

The Club of Rome studies of world resources are well-known. They conclude that world resources will not sustain present levels of population, growth and consumption. These studies project resource crises by 1990. Similar projections are also made by the English study, Blueprint for Survival. Recently, the U.S. Geological Survey added the weight of its authority to the impending crises by identifying American deficiencies in its natural resources base. (Scott, 1974, p. 247)

Unless some revolutionary discoveries are made soon, "scarcity" or at least a concern for conservation and effective utilization of diminishing resources will influence organizations increasingly during the years to come. In the area of organizational theory, theorists have already begun to study the implications that "scarcity" would have upon principles of organization and management that were based on assumptions of growth and plenty. (Scott, 1974; Moudgill, 1975). Thus the need for more comprehensive models for analyzing and assessing effectiveness that incorporate increased understanding of the organizational environment is likely to grow in the years ahead.
(4) It will be recalled that in the present investigation, departments were used as the units of analysis rather than the total organization. It was found that environmental characteristics confronting different departments in an organization do vary. In light of these findings, we should re-examine the findings of much earlier research that was based on total organizations. We should ask whether certain principles or prescriptions are indeed applicable across the organization or whether they can be applied with any degree of accuracy only to particular departments or organizational units.

In this same vein, I would like to question the common practice of applying certain principles and prescriptions across groups of organizations that perform similar functional activities. This practice is really a function of existing classificatory schemes for differentiating organizations. As pointed out previously, several of these utilize "goals or functions" as the major criterion for differentiating organizations. As Charles Perrow pointed out:--

... types of organizations -- in terms of their functions in society -- will vary as much within each type as between types. Thus, some schools, hospitals, banks and steel companies may have more in common, because of their routine character, than routine and nonroutine schools, routine and nonroutine hospitals, and so forth. (1967, p. 203)

There can be, and possibly is, as much if not more organizational variation within categories based on functional
activities, as between them.* Again, the need is shown for organizational typological schemes that incorporate environmental characteristics as one of the major areas to be investigated, as well as the need to recognize that the environment confronting different departments in a given organization (and for that matter, organizations performing the same functional activities) do vary. Hence, any principles or prescriptions that are applied across organizations primarily because the latter perform the same broad functions, should be suspect and re-examined in that light.

(5) Findings reported in the literature about the influence of size on organizational characteristics are diverse and far from conclusive.

One possible reason for such diverse findings could be attributed to the fact that size was often used as a predictor variable in previous research. For example, Pugh et al (1969a) used size as a predictor of the manner in which activities were structured, authority concentrated, and work flow controlled. After a critical review of the literature pertaining to size, Hall (1972) was of the opinion that:

... size has a variable impact on the organization and that it cannot be taken as a simple predictor, as it often is... The size factor is greatly modified by the technology or technologies employed by

* Analysis of covariance of the data in the present research was conducted using structure, time perspective taken in planning, and frequency of changes to plans as the dependent variables; functional activity as the major factor, and environmental characteristics as the covariates. The significance levels associated with the dependent variables were structure (.621), time perspective taken in planning (.358), and frequency of changes to plans (.786). These significance levels indicate that there were no significant differences based on type of activity (continued on bottom of next page).
the organization... Further modifications of the impact of size are caused by environmental factors and the presence of particular kinds of personnel, such as professionals. As an explanatory tool, size must be utilized in conjunction with these other characteristics... When size... is taken in conjunction with technological and environmental factors, prediction regarding organizational structures and processes can be made. (1972, pp. 137-139)

In this study, size was utilized as a test factor to elaborate the relationships between environmental characteristics and organizational variables. When size was held constant by splitting the sample into two approximately equal groups on the basis of departmental size, the relationships between environmental characteristics and organizational variables became more pronounced than those originally observed. Thus this study lends support to the contention that size, when taken in conjunction with other variables such as environmental characteristics, does have an impact upon organizational structure and processes. The case is strengthened for the argument that prescriptions for the "best way" to organize given certain environmental properties cannot be made without due recognition of the "departmental size" factor.

(6) The last but by no means least important finding of this study has to do with the relationships between environmental and organizational characteristics. The present findings are in line with those obtained by other researchers of organization-environment interaction (Lawrence and Lorsch, 1967;

(continued from footnote on previous page) performed by the company. In other words, Perrow's assertion is supported that variations within categories based on functional activity could be as marked as variations between categories.
Duncan, 1970). It was shown that Change Rate has the single greatest effect upon the variation in Perceived Environmental Uncertainty; and that the departmental structure, time perspective taken in planning, and frequency of changes to plans of organizational units located in different environments do vary. Thus, this study points to the importance of achieving "fits" between environmental and organizational variables to ensure the long-run survival of the organizational unit under study. It points to the need for organizations, or more specifically organizational units, to correctly identify the environment they are operating in, and the importance of gathering intelligence on any changes that may take place in the environment, in order to develop strategies and techniques to effectively cope and deal with such environmental demands and constraints.

6.3 LIMITATIONS OF THE RESEARCH

Despite the important implications of the present study for organizational theory and research, the study suffers from several limitations. These are related to time constraints, lack of availability of subjects and the present state of our knowledge about the relationships between certain variables in our field. Readers should take these limitations into consideration when they are interpreting the results of this study. The limitations of this research are:-

(1) Limited sample size. The sample consisted of 64 organi-
zational units from 21 different companies engaged in 7 different business/industrial activities. As pointed out previously, the locus of the research limited the number of business and industrial firms that met the criteria for inclusion in the study. Fortunately, the sample size obtained was not so small as to preclude the application of a variety of sophisticated statistical procedures. In addition, the author adjusted for the sample size by calculating the "unbiased estimate of population multiple correlation" ($\hat{R}^2$) to estimate the shrinkage in going from a sample of a given size to an infinitely large sample.

(2) One of the problems that researchers must contend with in research design is the problem of internal versus external validities. Campbell and Stanley (1973) have shown that these two kinds of validities are not always compatible in a given research design since the researcher often has to make a trade-off of one against the other.

Both types of criteria are obviously important, even though they are frequently at odds in that features increasing one may jeopardize the other. (Campbell and Stanley, 1973, p. 5)

Unless the researcher has unlimited time, facilities and funds at his disposal, it is not always possible to maximize both types of validities in a given research study.

Since this study was of an exploratory nature and the researcher was more interested in developing and validating an instrument for measuring dimensions of a rather expanded typology, more attention was devoted to features of design that would maximize internal validity. The sample was confined to
business and industrial firms located in the Lower Mainland area of British Columbia. The cultural environment was assumed to be homogeneous and the firms were profit-seeking business organizations. Hence, it is not clear whether the typology and instrument developed for measuring dimensions of this typology could be applied to industrial organizations located in other geographic areas, and whether they could be applied to non-profit organizations. If the typology and instrument are not applicable to such situations, the modifications that would be required remain as an empirical question.

(3) As pointed out in Chapter One, it was beyond the scope of this research to examine what impact the "fit" between organization environmental characteristics and organization structural variables would have upon the effectiveness of the organization. It has been noted that effectiveness is a very important area of investigation. Hence, this study could make statements only about the probability of finding a given type of structure within a department confronted with a given type of environment, but the effectiveness of this structure in facilitating the department's adaptation to environmental constraints could not be assessed.

Although effectiveness was not explicitly investigated, it was implicit in selection of the sample. All the organizations selected for study were high performers in terms of return on investment. In fact, a number of the firms covered in this study were among the ten largest firms in British Columbia.
(4) A fourth and final weakness of this study is the failure to investigate the exact relationship between environmental characteristics and organization structural variables. Given the present state of our understanding about the relationships between environmental characteristics, uncertainty and organizational structure, and the fact that this study was only correlational in nature, it was difficult, if not impossible, to make clear and definitive statements about the direction of causality.

6.4 Topics for Future Research

Throughout the study, both implications and specific needs for future research have been alluded to or noted. At this point, it seems appropriate to briefly summarize these.

(1) Examine what impact the "fit" between environmental characteristics and organizational variables has upon the effectiveness and long-run survival of the company.

(2) This study only examined three organizational variables. There are a whole multitude of variables relating to interpersonal behaviour, which could be investigated as a function of environmental characteristics.

(3) This study treated the organization or department as a passive entity which seeks to respond or adapt to environmental demands and constraints. As Child (1972, p.4) noted: "Organizations also determine the environment to a certain extent, particularly larger ones." This is clearly in line with Miles,
Pfeffer and Snow's (1974, p. 251) assertion that "while organizations are clearly influenced by forces in their domain, they also have a wealth of available means for altering their environments to make them conform more closely to what the organization can change." Thus, future studies should also study the strategies adopted by organizations to modify the environment.

(4) Longitudinal studies pertaining to organizational adaptation to the environment. As Miles et al (1974, p. 259) pointed out: "cross-sectional studies utilizing static models cannot possibly capture the richness of the responses which organizations make to ensure their survival and foster growth."

(5) In this study, perceived environmental uncertainty was used as an intervening variable to interpret the relationships between environmental characteristics and organizational variables. All the possible sources of variability in perceptions were not examined. Downey and Slocum (1975) suggested four sources of variability: perceived environmental characteristics, individual cognitive processes, behavioral response repertoire and social expectations. Those sources of variability that were not looked into in the present study should be investigated in future research.
6.5 **Some Concluding Remarks**

Future research on organization-environment interaction should capitalize on the strengths and seek to minimize the weaknesses of the present research.

Specifically, the instrument for measuring environmental characteristics should be applied to much broader samples consisting of organizational units located in different geographic areas and engaged in very diverse activities. Results of such research would assist in further refining and validating the instrument. In addition, future research designs should examine what implications the "fit" between environmental and organizational characteristics would have on organizational effectiveness.

In conclusion, this study has extended our understanding of organization-environment interaction beyond the four-cell typologies used in earlier research. It has shown that it is indeed feasible and desirable to analyze organizational environments in terms of more than two dimensions. Finally, a path has been blazed for more detailed and thorough investigation of the whole area of organization-environment interaction and related areas of inquiry.
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APPENDIX ONE

INSTRUMENT FOR MEASURING
ORGANIZATIONAL VARIABLES
## SCHEDULE 1: INTERVIEW SCHEDULE FOR MEASURING DEPARTMENTAL AUTONOMY

Below is a list of the things on which departmental heads may or may not have to make decisions. Let us call these decision issues or decision items. Some of these things may not apply to your department. For each of those decision items that do apply, please indicate whether or not the "authority to decide" on that particular issue rests within your department (but not necessarily with you as an individual) by circling "yes" or "no". For those decision items that do not apply, please make a circle in the column "Not Relevant".

(Note: "Authority to Decide" on a decision issue means that in most instances, action can be taken on the decision without waiting for confirmation from above, even if the decision is later ratified at a higher level.)

<table>
<thead>
<tr>
<th>DECISION ISSUES</th>
<th>IS AUTHORITY INSIDE YOUR DEPARTMENT?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changing the internal patterns of supervision</td>
<td>Yes       No   Not Relevant</td>
</tr>
<tr>
<td>Appointment of Supervisory staff from outside the organization (external recruitment)</td>
<td>Yes       No   Not Relevant</td>
</tr>
<tr>
<td>Promotion of Supervisory Staff</td>
<td>Yes       No   Not Relevant</td>
</tr>
<tr>
<td>Dismissing a Supervisor</td>
<td>Yes       No   Not Relevant</td>
</tr>
<tr>
<td>Setting Salaries of Supervisory staff within broad company guidelines</td>
<td>Yes       No   Not Relevant</td>
</tr>
<tr>
<td>Determining a New Product or Service or Major line of effort</td>
<td>Yes       No   Not Relevant</td>
</tr>
<tr>
<td>Determining Marketing territories covered (where new or existing outputs are to be marketed)</td>
<td>Yes       No   Not Relevant</td>
</tr>
<tr>
<td>The Extent and Type of Market to be aimed for</td>
<td>Yes       No   Not Relevant</td>
</tr>
<tr>
<td>Pricing of the Output or Service</td>
<td>Yes       No   Not Relevant</td>
</tr>
<tr>
<td>Training Methods to be used (how training should be done)</td>
<td>Yes       No   Not Relevant</td>
</tr>
</tbody>
</table>
## DECISION ISSUES

<table>
<thead>
<tr>
<th>DECISION ISSUES</th>
<th>IS AUTHORITY INSIDE YOUR DEPARTMENT?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spending unbudgeted or unallocated money on capital items (using money not previously ear-marked for a particular purpose for what would be classed as capital expenditure)</td>
<td>Yes</td>
</tr>
<tr>
<td>Altering Responsibilities/areas of work</td>
<td>Yes</td>
</tr>
<tr>
<td>Creating a new job (functional, specialist or line, of any status, probably signified by a new job title)</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Number of full-time employees in your department =  
Number of part-time employees in your department =
SCHEDULE II: INTERVIEW SCHEDULE FOR DEPARTMENTAL STRUCTURAL VARIABLES

Part A
Instructions:

This part of the questionnaire seeks to identify the division of labour within your department. The following is a list of activities which may or may not be performed by your department. Where the activity is relevant, please indicate whether or not the function is performed by at least one person on a full-time basis.

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>YES</th>
<th>NO</th>
<th>NOT RELEVANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities to obtain and control Non-human inputs: materials, equipment,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>stocks</td>
<td></td>
<td></td>
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<tr>
<td>Activities to record and control financial resources</td>
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<tr>
<td>Activities to maintain and develop non-human resources: buildings,</td>
<td></td>
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<tr>
<td>equipment, etc.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Activities to carry outputs and resources from place to place</td>
<td></td>
<td></td>
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<tr>
<td>Activities to maintain and identify human resources: medical, welfare,</td>
<td></td>
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<tr>
<td>safety</td>
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<tr>
<td>Activities to control and regulate the quality of non-human inputs and</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>outputs</td>
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</tr>
<tr>
<td>Activities to regulate and coordinate the workflow</td>
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<td></td>
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<tr>
<td>Activities to dispose of, distribute and service the output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activities to devise new outputs and processes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activities to acquire human resources</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Activities to regulate and record administrative procedures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activities to develop and transform human resources, e.g. training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activities to meet legal requirements affecting your department</td>
<td></td>
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</tbody>
</table>
Part B

Instructions:

This part of the questionnaire seeks to identify the amount of standardization within your department, i.e. the extent to which activities and people are subject to procedural rules.

Please answer the following set of questions by filling in the number representing the response category in the blank spaces provided in the right-hand column.

1 means Definitely True
2 means More True than False
3 means More False than True
4 means Definitely False

1. Employees enjoy considerable latitude in performing their duties within broad guidelines laid down by their superiors.

2. A person can make his own decisions without checking with anybody else as long as he gets the job done to the satisfaction of his superiors.

3. How things are done in this department is left up to the person doing the work.

4. People here are allowed to do almost as they please in most instances.

5. Most people here make their own rules on the job provided they get the work done.

6. The employees are constantly checked upon for rule violations.

7. People here feel as though they are constantly being watched to see that they obey all the rules.

8. In this department, most people recognize that their work/decisions are only checked on major issues/problems, i.e. the end products or outcomes are subject to scrutiny rather than the means to the ends.

9. You don't find many people here who complain of excessive supervision.

10. People here feel that they are virtually never checked upon for adherence to "procedural rules" as long as they get the work done.
### Part C

**Instructions:**

This part of the questionnaire is designed to identify the degree of formalization in your department, i.e. the extent to which communications and procedures are written down and adhered to.

Please indicate by means of a check mark on the "yes" or "no" columns whether your department possesses documents on the following.

A document is defined as at least a single piece of paper with printed, typed or otherwise reproduced content - not handwritten.

<table>
<thead>
<tr>
<th>DOCUMENTS</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written contracts of employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information booklets on employment, conditions, safety, pensions, etc.</td>
<td></td>
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<tr>
<td>Organization Chart</td>
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<tr>
<td>Written operating instructions available to the rank and file employees (including instructions attached to equipment)</td>
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<tr>
<td>Written terms of reference or job descriptions for rank and file employees</td>
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<td></td>
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<tr>
<td>Written terms of reference or job descriptions for supervisors</td>
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<tr>
<td>Manual of procedures (or standing orders)</td>
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<tr>
<td>Written statement of policies (excluding minutes of committees)</td>
<td></td>
<td></td>
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<tr>
<td>Written production schedules or sales programmes</td>
<td></td>
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<tr>
<td>Written research programme (listing intended research work) and/or research reports (reporting work done)</td>
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</tbody>
</table>
For the next set of questions, please indicate whether your department has written records that are filed away somewhere on the following activities.

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>YES</th>
<th>NO</th>
<th>NOT RELEVANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notification of employment of rank and file employees</td>
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<tr>
<td>Minutes for senior executive meetings</td>
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<tr>
<td>Conference reports</td>
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<tr>
<td>Agendas for senior executive meetings</td>
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<tr>
<td>Agendas for meetings such as production planning, manpower planning or sales promotions</td>
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<tr>
<td>Minutes for meetings such as production planning, manpower planning or sales promotions</td>
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<tr>
<td>Dismissal forms or reports recording or communicating the dismissal of rank and file employees</td>
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<tr>
<td>House journals or newspapers</td>
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<tr>
<td>Records of inspections performed (e.g. reports, certificates, quality cards, etc. recording both positive and negative results, not merely a rejection slip)</td>
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<tr>
<td>Performance appraisal reports of rank and file employees</td>
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<tr>
<td>Records of rank and file employees' time, i.e. number of hours, days or weeks worked</td>
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<tr>
<td>Petty cash vouchers, authorizing and recording petty expenditure</td>
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<tr>
<td>Requisitions for employment of rank and file employees</td>
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<tr>
<td>Application or employment forms for rank and file employees</td>
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<tr>
<td>Grievance forms</td>
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<tr>
<td>Appeal forms against Dismissal</td>
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</tr>
<tr>
<td>ACTIVITIES</td>
<td>YES</td>
<td>NO</td>
<td>NOT RELEVANT</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Documents identifying units of output (e.g. work orders, work tickets, sales checks or tickets in a retail store, insurance policies in an insurance office)</td>
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<tr>
<td>Shipping tickets communicating dispatch of unit of output</td>
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<td></td>
<td></td>
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<tr>
<td>Written trade union contracts</td>
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<tr>
<td>Written history of the organization</td>
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</tbody>
</table>
Part D

Instructions:
This part of the questionnaire is designed to identify the extent of participation in decision making that is actually allowed in your department.

For each of the following questions, please circle the appropriate response category.

\[ T = \text{True in most instances} \]
\[ F = \text{False in most instances} \]

1. How are objectives set in your department?

(a) Objectives are announced with no opportunity to ask questions or make comments. \[ T \ F \]

(b) Objectives are announced and explained, and an opportunity is then given to ask questions. \[ T \ F \]

(c) Objectives are drawn up, but are discussed with subordinates and sometimes modified before being used. \[ T \ F \]

(d) Specific alternative objectives are drawn up by supervisors, and subordinates are asked to discuss them and indicate the one which they think is best. \[ T \ F \]

(e) Problems are presented to those persons who are involved, and the objectives felt to be best are then set by the subordinates and the supervisor jointly, by group participation and discussion. \[ T \ F \]
Instructions:
Please answer the following set of questions by filling in the number representing the response category in the blank spaces provided in the right-hand column.

1 means **To a Very Little Extent**
2 means **To a Little Extent**
3 means **To Some Extent**
4 means **To a Great Extent**
5 means **To a Very Great Extent**

2. In this department, to what extent are decisions made at levels **above** those levels where the most adequate and accurate information is available, i.e. to what extent are decisions made at a higher level than is appropriate?  

3. When decisions are being made, to what extent are the persons affected asked for their ideas?  

4. People at all levels in a department may have information about how to do things better. To what extent do you feel such information from all levels is used?  

5. To what extent are the persons who make decisions unaware of relevant problems at lower levels in the department?
Part E
Instructions:

This part of the questionnaire is concerned with the time perspective adopted by your department in planning future activities and policies to be pursued by your department.

Please answer the following questions by filling in the number representing the response category in the blank spaces provided in the right-hand column.

1. In general, how would you characterise the time perspective adopted by your department in planning future policies and goals to be pursued by your department?
   
   1 means Short-range Planning: less than 1 year
   2 means Medium-range Planning: between 1 to 3 years
   3 means Long-range Planning: over 3 years

   If you checked response category (3), are these long-range plans formalized in writing and are they reviewed and approved at top management level?

2. Over the life-time of a plan or programme of action, changes may occur in both the internal and external environments which necessitate changes to existing plans and programmes of action. Now think about the plans and programmes that your department has been engaged in over the course of the past 3 or 4 years. How often were changes (both formal and informal, major and minor) made to existing departmental plans and programmes?

   Please choose one of the following response categories and fill out the number representing the category in the blank space provided to the right.

   1 means Very Seldom (changes to less than 20% of the original plans)
   2 means Seldom (changes to 20 - 40% of the original plans)
   3 means Sometimes (changes to 40 - 60% of the original plans)
   4 means Frequently (changes to 60 - 80% of the original plans)
   5 means Very Often (changes to more than 80% of the original plans)
APPENDIX TWO

PRE-TEST INSTRUMENT FOR MEASURING ENVIRONMENTAL CHARACTERISTICS
### INTRA-DEPARTMENTAL ENVIRONMENT = WITHIN THE DEPARTMENT ITSELF

1. Intra-departmental personnel component, i.e. concerning people in your department:
   - (a) Educational background of your employees, including technical expertise, etc.
   - (b) Previous work experience of your employees currently employed in your department
   - (c) Individual member's involvement and commitment to attaining departmental goals
   - (d) Interpersonal behaviour styles
   - (e) Availability of manpower for utilization within the department

### INTER-DEPARTMENTAL ENVIRONMENT = WITHIN THE COMPANY ITSELF

2. Inter-departmental personnel component, i.e. concerning people in your company:
   - (a) Educational background of employees, including technical expertise, etc.
   - (b) Previous work experience of people currently employed in your organization as a whole
   - (c) Individual member's (across departments) involvement and commitment to attaining company's goals
   - (d) Interpersonal behaviour styles of individuals employed across departments
   - (e) Availability of manpower for utilization within the organization

3. Functional and Staff Units in other Departments:
   - (a) Technological characteristics of other departments
   - (b) Dependence on other departments in meeting my objectives
### INTER-DEPARTMENTAL ENVIRONMENT (cont'd)

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<thead>
<tr>
<th>(1) Take into Consideration</th>
<th>(2) Level of Certainty</th>
<th>(3) Range</th>
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<tbody>
<tr>
<td><strong>4. Organizational Level Component:</strong></td>
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<tr>
<td>(a) Broad company objectives and goals</td>
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<td>(b) Mechanisms and processes adopted by your organization to communicate ideas and get employees to work towards company's goals</td>
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<tr>
<td>(c) Nature of the organization's products and/or services</td>
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**EXTERNAL ENVIRONMENT = OUTSIDE THE COMPANY**

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<th>(1) Take into Consideration</th>
<th>(2) Level of Certainty</th>
<th>(3) Range</th>
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<tr>
<td><strong>5. Customers:</strong></td>
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<tr>
<td>(a) Distributors of product or service</td>
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<td>(b) Actual users of product or service</td>
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<td><strong>6. Suppliers:</strong></td>
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<tr>
<td>(a) Materials Supplier</td>
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<tr>
<td>(b) Labour Supply</td>
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<tr>
<td><strong>7. Competitors:</strong></td>
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<td></td>
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<tr>
<td>(a) Competitors for Suppliers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Competitors for Customers</td>
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<td></td>
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<tr>
<td><strong>8. Governments:</strong></td>
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<tr>
<td>(a) Government Regulatory Control over the industry</td>
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<tr>
<td>(b) Public political attitude toward industry and its particular product</td>
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<tr>
<td><strong>9. Trade Unions:</strong></td>
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<tr>
<td>Relationship with trade unions with jurisdiction in the company</td>
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<tr>
<td><strong>10. Technology:</strong></td>
<td></td>
<td></td>
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<tr>
<td>(a) Meeting new technological requirements of own industry and related industries in production of product or service</td>
<td></td>
<td></td>
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<tr>
<td>(b) Improving and developing new Products by implementing new technological advances in the industry</td>
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</tbody>
</table>
Part A: Responses to this section (i.e. Questions 1 through 15) are to be made with reference to Worksheet #1.

Instructions:

We are trying in this study to gain a better understanding about jobs like yours and the activities you go through in making decisions on your job. As you know, in making decisions people have to take into consideration certain factors within the department (intra-departmental environment), others within the organization as a whole (inter-departmental environment), or still others outside the organization (external environment).

For example, in making decisions about how he does his job, a production manager may have to take into consideration whether the individuals within his own department possess the skill to perform the job (intra-departmental environment); and such factors within the organization as whether the Parts Department will have the necessary supplies ready and available when they are needed (inter-departmental environment). He might also have to take into consideration such factors outside the organization as market demand for the product in question (external environment).

1. Let us look at Worksheet #1. In Column (1) of the Worksheet, please identify by means of a check mark those factors, components, groups or individuals that you have to take directly into consideration in making decisions (of all kinds and magnitudes) in your position. The term "directly" is used here in a very immediate sense, i.e. the factors that have a direct bearing on or are affected by your decision.

   Briefly explain why you have to take each of these into consideration in decision making.

2. Instructions:

As I go through the items on Worksheet #1 that you have identified as being taken into consideration in decision making, please tell me the approximate frequency with which each of these items directly restrict your department's activities, i.e. how often does your department have to take that particular factor into consideration in decision making, goal setting, goal attainment, etc. For example, a production department that requires a particular material for all its production processes is said to be "very often restricted" by the supplier(s) of that material.

(Note: "restrict" is used here in a very immediate sense, i.e. to refer to short-term effects as opposed to medium-, long-term and/or indirect effects).

Please phrase your response in terms of:-

1 = Very Seldom
2 = Seldom
3 = Occasionally
4 = Fairly Often
5 = Very Often
3. Instructions:

As I go through each of the items you have identified on the Worksheet, please tell me how serious is the restraint imposed by each of these items upon your department's operations.

Please select one of the points on the following scale:

1 2 3 4 • 5

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<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Serious At All</td>
<td>Very Serious</td>
<td></td>
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</table>

1 = Not Serious at all = may be annoying but does not incur any financial loss whatsoever.

5 = Very Serious = disrupting organizational goals and plans completely; has the effect of halting operations altogether, even on a temporary basis.

Instructions:

The next two questions (4 and 5) are concerned with the extent to which you feel that you can exert some influence over each of these various items you have identified as affecting decision making in your department.

4. Please indicate to what extent do you always have to deal with this particular factor because you have no alternatives?

Please phrase your response in terms of:

1 = To a Very Little Extent
2 = To a Little Extent
3 = To Some Extent
4 = To a Considerable Extent
5 = To a Very Great Extent

5. Please indicate to what extent you feel that you have control over how this factor affects your department?

Please phrase your response in terms of:

1 = To a Very Little Extent
2 = To a Little Extent
3 = To Some Extent
4 = To a Considerable Extent
5 = To a Very Great Extent
Instructions:

The next set of questions (6 through 8) concerns joint programmes that your department may have engaged in.

Over the course of the past 3 or 4 years, your department may have engaged in joint programmes with another department or division within your company or another company. A joint programme is defined as (1) any effort or undertaking between your department and another department(s) or company(ies); (2) that was set up for a specific purpose to accomplish a specific goal; and (3) which involved mutual pooling of financial, technical and/or personnel resources. Remember, a joint programme is not one which involves just your department.

Where relevant, please specify the number of joint programmes that your department has been engaged in over the course of the past 3 or 4 years. For each of these joint programmes, please tell me whether they were with a department or division within your company, or whether it was with another company.

For each of these joint programmes, briefly specify the goal of such undertakings.

For each of these joint programmes, briefly indicate the approximate number of staff shared (in terms of number of people or man-hours) and the approximate proportion of funds contributed by your department, on the one hand, and the other partner(s).

Instructions:

For each of the items that your department has to take into consideration in decision making and functioning, please indicate whether it is predominantly organized or predominantly unorganized.

1 = Predominantly Organized Sector = sector that is capable of imposing real and direct threats and restraints on your department's activities, i.e. the sector possesses sufficient "bargaining clout" in its dealings with your department that it can ensure that its views and well-being will be taken into consideration. An example of a predominantly organized sector would be a labour union.

2 = Predominantly Unorganized Sector = opposite of organized sector, i.e. any relevant sector that is not organized will be classified as unorganized. Examples of unorganized sectors would be non-unionized employees, consumers, customers and travelling public.
We have been talking about organized sectors such as other companies or government agencies, on the one hand, and unorganized sectors, such as customers or non-unionized employees, on the other. Now we never really know what impact things and events and groups in the environment are going to have on us, or in your case, your department. We speak of these as uncertainty about the future. Now what I really want here is your opinion as to which category, organized or unorganized, presents you with more uncertainty.

10. Instructions:

This next question seeks to identify whether the items you have checked on the Worksheet are directly or indirectly related to your department.

1 = Indirectly Related means that your exchanges with this sector are performed through an intermediary. An intermediary is a middle-man -- a third party or person who is not a direct partner in the exchange relationship. For example, a trading agency that markets the goods of smaller manufacturers (who do not sell direct to the consumers) is an intermediary.

2 = Directly Related means that exchanges with this sector are performed without an intermediary. For example, if a department purchases its raw materials supply directly from the producer of that raw material, and not a trading agency, then the exchange relationship is direct.

As I read out each of the items checked on the Worksheet, please tell me whether it is direct or indirect. If your dealings with a particular sector are indirect, do you have any idea whether there is one or more than one intermediary involved?

Instructions:

This next set of questions (11 and 12) deals with change in the items you have checked on Worksheet #1.

11. How often does each of those items that you have checked on the Worksheet change in the course of a year?

"Changes" refer to goal, policy and programme changes (where they are known) plus any kinds of "ongoing changes" in each of these sectors which you see as affecting your department's operations and activities. "Ongoing changes" would include such things as consumers' preferences or the general rise in standard of living.

Please phrase your response in terms of:

1 = Very Seldom
2 = Seldom
3 = Sometimes
4 = Frequently
5 = Very Often
12. Please estimate the magnitude of each change in terms of the seriousness of the impact it has upon your department's operations.

Please select one of the points on the following scale:

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<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>Not Serious at All</td>
<td></td>
<td></td>
<td></td>
<td>Very Serious</td>
</tr>
</tbody>
</table>

1 = Not Serious at All = may be annoying but does not require any reorientation or modification to existing departmental goals, policies or courses of action pursued by your department.

5 = Very Serious = disrupting existing departmental goals and plans very seriously. Major reorientation or modifications to existing goals and plans are required as a result of the change.

Instructions:

Not only may the things indicated above change but also new and different ones may appear both within the organization and outside it. You may have to take these new or different things into consideration in decision making, while those that you previously considered will no longer be relevant. In other words, the make-up of your environment may change.

For example, members in a marketing department at one time may have to take into consideration in decision making a certain group of customers in introducing a new product or service and whether the materials department can deliver the new parts when required. In a different instance, this same marketing department may in developing a new product have to focus on whether suppliers outside the organization can provide cheap raw materials for the product. So the things that the marketing department considers in decision making change somewhat, i.e. the make-up of its environment changes.

On the other hand, a different type of department, say a production department, might over time continually consider in its decision making behaviour only whether it has the necessary parts with which to produce its given product. We say that the make-up of the department's environment remains the same.

13. Now thinking again about your decision making activities and the decisions that are made in your department ... how often do new and different things have to be considered by you in decision making and the decisions that are made in your department? In other words, how often does the make-up of your environment change over the course of a year? Please phrase your response in terms of:

1 = Very Often
2 = Frequently
3 = Sometimes
4 = Seldom
5 = Very Seldom
14. Given that the make-up of your environment changes, please tell me to what extent your department knows what to expect from each of the items on the checklist after the change takes place? For example, to what extent would a Purchasing Department know that a newly selected supplier will be likely to deliver as contracted. The emphasis here is on knowledge about events. Please phrase your response in terms of one of the following:

1 = Very Little Knowledge
2 = Little Knowledge
3 = Some Knowledge
4 = High Knowledge
5 = Very High Knowledge

15. Instructions:

All organizations face changing environments to a certain extent. Whether an organization can successfully adapt to a change depends to a large extent on adequate warning or lead time so that your department can plan for the adaptation.

For changes in each of the relevant sectors in the Worksheet, would you say that the length of the warning period preceding the onset of the change was adequate or inadequate? Please select one of the points on the following scale:-

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<th>5</th>
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<tbody>
<tr>
<td>Inadequate</td>
<td>Adequate</td>
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1 = Inadequate = there was some advance notice about the change. However, the warning period was so short that your department was not able to gather sufficient information to deal with the change.

5 = Adequate = sufficient for gathering adequate information to deal with the change.
WORKSHEET # 2

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<thead>
<tr>
<th>TECHNOLOGICAL KNOW-HOW (SPECIFY)</th>
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<th>MARKET INFORMATION (SPECIFY)</th>
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<tr>
<th>PERSONNEL (SPECIFY)</th>
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<th>OTHERS (SPECIFY)</th>
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Part B: Responses to this section (i.e. Questions 1 through 11) are to be made with reference to Worksheet #2.

Instructions:

In the past, situations originating in the environment may have arisen which presented themselves as opportunities which your department can take advantage of. At the same time, other situations may have arisen which posed threats or problems to your department's functioning. The intent here is to examine the extent to which you could treat either the problem or opportunity situations as routine or non-routine.

1. Please try to recall the problem and/or opportunity situations that have arisen for your department in the course of the past year or so. Then describe briefly the major kinds of difficulties in each of the following areas that your department experienced in the blank spaces under each of the headings on Worksheet #2.

2. For each of the problem/opportunity situations indicated in the Worksheet, please indicate the extent to which you believe your department measured up to each of these demands in terms of knowledge, capital and other physical/material resources, including personnel. Please select one of the points on the following scale:

   1 2 3 4 5

   | Completely Unable              | Completely Able            |
   | To meet demands               | To meet demands            |

3. For each of the problem/opportunity situations identified on the Worksheet, please indicate the difficulty of achieving effective solutions to each of them. Please select one of the points on the following scale:

   1 2 3 4 5

   | Very                        | Very                      |
   | Difficult                   | Easy                      |

4. For each of the problem/opportunity situations identified on the Worksheet, please indicate the approximate number of times problems of a similar nature have arisen in the course of the past year.

5. In your opinion, what is the probability that problem/opportunity situations of a similar nature will arise again in the future? Please select one of the points on the following scale:

   1 2 3 4 5

   | Very                        | Very                      |
   | Unlikely                    | Likely                    |

1 = Very Unlikely = 0.0 to 0.2 probability
5 = Very Likely = 0.8 to 1.0 probability
6. **Instructions:**

   For each of the problem/opportunity situations identified, please indicate which of the following decision procedures you used to arrive at the decision or recommendation. If you used more than one procedures, please split up the percentages accordingly.

   As I go through each of the items, please tell me which procedure you used and the percentage of time you used that procedure.

   The four decision procedures are:-

   A means Relied on routine/standardized procedures which had been used successfully in the past.

   B means Made step-by-step modifications to existing procedures easily (with minimal amount of search effort).

   C means Made step-by-step modifications to existing procedures with difficulty.

   D means No cut-and-dried method for dealing with the problem. Considerable search for alternative (i.e. new) ways of approaching/solving the problem.

7. For each of the problem/opportunity situations identified, please estimate how much time was invested by your department (in terms of man-hours, weeks or months) in an attempt to obtain critical information to clarify the problem. Please indicate your response in quantified terms.

8. Was there any task force set up for the purpose? Please say "yes" or "no" as I read out each of the problem areas you have identified.

9. If the answer to the previous question is "yes", briefly describe the nature of each task force.

10. Was outside help (i.e. consultants, etc.) brought in to assist in solving each of the problem/opportunity states? Please say "yes" or "no" as I read out each of the problem areas you have identified.

11. Please indicate the degree of trust that you could place in a significant portion of the information acquired for each problem/opportunity area. Please select one of the points on the following scale:-

    
    |    |    |    |    |      |
    |----|----|----|----|-------|
    | 1  | 2  | 3  | 4  | 5     |
    | Not Confident | At All | | | Completely Confident |
Appendix Three

Revised Instrument for Measuring Environmental Characteristics
Part A: Responses to this section are to be made with reference to Worksheet #1.

Instructions:

We are trying in this study to gain a better understanding about jobs like yours and the activities you go through in making decisions on your job. As you know, in making decisions people have to take into consideration certain factors within the organization as a whole (inter-departmental environment), and/or others outside the organization (external environment).

For example, in making decisions about how he does his job, a production manager may have to take into consideration whether the Parts Department will have the necessary supplies ready and available when they are needed (inter-departmental environment). He might also have to take into consideration such factors outside the organization as market demand for the product in question (external environment).

1. Let us look at Worksheet #1. In Column (1) of the Worksheet, please indicate by means of a check mark those factors, components, groups or individuals that you have to take directly into consideration in making decisions (of all kinds and magnitudes) in your position. The term "directly" is used here in a very immediate sense, i.e. the factors that have a direct bearing on or are affected by your decision.

   Briefly explain why you have to take each of these into consideration in decision making.

2. Instructions:

   As I go through the items on Worksheet #1 that you have identified as being taken into consideration in decision making, please indicate the extent to which you depend on each of them to accomplish your department's objectives. Please phrase your response in terms of:

   1 = To a Very Little Extent
   2 = To a Little Extent
   3 = To Some Extent
   4 = To a Great Extent
   5 = To a Very Great Extent
3. **Instructions:**

As I go through each of the items you have identified on the Worksheet, please estimate how serious is the restraint imposed by each of them, i.e. please estimate the seriousness of that variable (upon your department's operations) when it comes into play. Please select one of the points on the following scale:-

1  2  3  4  5

Not Serious  Very
At All  Serious

1 = Not Serious At All = may be annoying but does not incur any financial loss whatsoever

5 = Very Serious = disrupting organizational goals and plans completely; has the effect of halting operations altogether, even on a temporary basis.

4. **Instructions:**

This question is concerned with the extent to which you feel that you can exert some influence over each of these various items you have identified as affecting decision making in your department. Please phrase your response in terms of:-

1 = Very Great Influence
2 = Great Influence
3 = Some Influence
4 = Little Influence
5 = Very Little Influence

5. **Instructions:**

The next question concerns joint programmes that your department may have engaged in.

Over the course of the past 3 or 4 years, your department may have engaged in joint programmes with another department or division within your company or another company. A joint programme is defined as (1) any effort or undertaking between your department and another department(s) or company(ies); (2) that was set up for a specific purpose to accomplish a specific goal; and (3) which involved mutual pooling of financial, technical and/or personnel resources. Remember, a joint programme is not one which involves just your department.

Where relevant, please specify the number of joint programmes that your department has been engaged in over the course of the past 3 or 4 years. For each of these joint programmes, please tell me whether they were with a department or division within your company, or whether it was with another company.

For each of these joint programmes, briefly specify the goal of such undertakings:

For each of these joint programmes, briefly indicate the approximate number of staff shared (in terms of number of people
or man-hours) and the approximate proportion of funds contributed by your department, on the one hand, and the other partner(s).

6. For each of the following groups or sectors that your department has to take into consideration in decision making and functioning, please indicate whether it is predominantly organized or predominantly unorganized:

Supervisory personnel:
(a) in your department
(b) in your company

Rank and file employees:
(a) in your department
(b) in your company

Customers:
(a) Distributors of product or service
(b) Actual users of product or service

Materials Suppliers

Labour Suppliers

1 = Predominantly Organized Sector = sector that is capable of imposing real and direct threats and restraints on your department's activities, i.e. the sector possesses sufficient "bargaining clout" in its dealings with your department that it can ensure that its views and well-being will be taken into consideration. An example of a predominantly organized sector would be a labour union.

2 = Predominantly Unorganized Sector = opposite of organized sector, i.e. any relevant sector that is not organized will be classified as unorganized. Examples of unorganized sectors would be non-unionized employees, consumers, customers and travelling public.

We have been talking about organized sectors such as other companies or government agencies, on the one hand, and unorganized sectors, such as customers or non-unionized employees, on the other. Now we never really know what impact things and events and groups in the environment are going to have on us, or in your case, your department. We speak of these as uncertainty about the future. Now what I really want here is your opinion as to which category, organized or unorganized, presents you with more uncertainty.
7. For each of the factors or groups in the external environment that you identified as being taken into consideration in decision making, could you tell me whether your department's transactions with each of them are predominantly on a direct or indirect basis.

1 = Indirectly Related means that your exchanges with this sector are performed through an intermediary. An intermediary is a middle-man -- a third party or person who is not a direct partner in the exchange relationship. For example, a trading agency that markets the goods of smaller manufacturers (who do not sell direct to the consumers) is an intermediary.

2 = Directly Related means that exchanges with this sector are performed without an intermediary. For example, if a department purchases its raw materials supply directly from the producer of that raw material, and not a trading agency, then the exchange relationship is direct.

If your dealings with a particular sector are indirect, do you have any idea whether there is only one or more than one intermediary involved? Please indicate.

Instructions:

The next two questions deal with change in the items you have checked on Worksheet #1.

8. How often does each of those items that you have checked on the Worksheet change in the course of a year?

"Changes" refer to goal, policy and programme changes (where they are known) plus any kinds of "ongoing changes" in each of these sectors which you see as affecting your department's operations and activities. "Ongoing changes" would include such things as consumers' preferences or the general rise in standard of living. Please phrase your response in terms of:

1 = Very Seldom
2 = Seldom
3 = Sometimes
4 = Frequently
5 = Very Often

9. If changes do occur, please estimate the magnitude of each change in terms of the seriousness of the impact it has upon your department's operations. Please select one of the points on the following scale:

1 2 3 4 5
Not Serious At All Very Serious

1 = Not Serious at All = may be annoying but does not require any reorientation or modification to existing departmental goals, policies or courses of action pursued by the department.
5 = Very Serious = disrupting existing departmental goals and plans very seriously. Major reorientation or modifications to existing goals and plans are required as a result of the change.
Not only may the things indicated above change but also new and different factors, groups or individuals may appear both within the organization and outside it. You may have to take these new and/or different things into consideration in decision making, while those that you previously considered will no longer be relevant. In other words, the make-up of your environment may change.

For example, members in a marketing department at one time may have to take into consideration in decision making a certain group of customers in introducing a new product or service and whether the materials department can deliver the new parts when required. In a different instance this same marketing department may in developing a new product have to focus on whether suppliers outside the organization can provide cheap raw materials for the product. So the things that the marketing department considers in decision making change somewhat, i.e. the make-up of its environment changes.

On the other hand, a different type of department, say a production department, might over time continually consider in its decision making behaviour only whether it has the necessary parts with which to produce its given product. We say that the make-up of the department's environment remains the same.

Now thinking again about your decision making activities and the decisions that are made in your department ... how often do new and/or different things have to be considered by you in decision making and the decisions that are made in your department? For example, over the course of a year, your department may have to deal with a whole new set of suppliers of materials, a new trade union or customer. In other words, how often does the make-up of your environment change over the course of a year?

Please phrase your response in terms of:

1 = Very Often
2 = Frequently
3 = Sometimes
4 = Seldom
5 = Very Seldom
11. All organizations face changing environments to a certain extent. Whether an organization can successfully adapt to a change depends to a large extent on adequate warning or lead time so that your department can plan for the adaptation.

For changes in each of the relevant items in the Worksheet, would you say that the length of the warning period preceding the onset of the change was adequate or inadequate? Please select one of the points on the following scale:

1 2 3 4 5

Inadequate Adequate

1 = Inadequate = there was some advance notice about the change. However, the warning period was so short that your department was not able to gather sufficient information to deal with the change.

5 = Adequate = sufficient for gathering adequate information to deal with the change.

12. If changes do occur, tell me to what extent your department knows what to expect after the change takes place? For example, to what extent would a Purchasing Department know that a newly selected supplier will be likely to deliver as contracted. The emphasis here is on knowledge about events. Please phrase your response in terms of:

1 = Very Little Knowledge
2 = Little Knowledge
3 = Some Knowledge
4 = High Knowledge
5 = Very High Knowledge
Part B:
Instructions:

The problems that arise in a particular department may fall into one of two broad categories: routine or non-routine. "Routine" problems refer to those situations which have arisen before in the past and for which your department has developed fairly standardized procedures for handling and disposing of them. "Non-routine" problems, on the other hand, refer to those situations which are unique to a large extent, and for which there are no cut-and-dried procedures for dealing with them.

1. Now thinking about the problems that confront your department (not only those that are actually referred to you for recommendation or decision), could you please indicate which of the following decision procedures your department used to arrive at decisions or recommendations, and the approximate frequency with which your department resort to that particular decision procedure in the day-to-day operations. For example, if your department used Procedure B 75% of the time and Procedure C 25% of the time, you would say B/75 and C/25.

The four decision procedures are:

A means Relied on routine/standardized procedures which had been used successfully in the past
B means Made step-by-step modifications to existing procedures easily (with minimal amount of search effort)
C means Made step-by-step modifications to existing procedures with difficulty
D means No cut-and-dried method for dealing with the problem. Considerable search for alternative (i.e. new) ways of approaching/solving the problem.

2. For solving problems of a non-routine nature, could you briefly expand on the ways in which you seek to resolve the issue, i.e. did you set up a task force for the purpose? Did you seek outside held (i.e. consultants, etc.)? Roughly how much time was invested by your department (in terms of man-hours, weeks or months) in an attempt to obtain critical information to clarify the problem?

3. Please indicate the degree of trust that you could place in a significant portion of the information acquired for such non-routine problem situations. Please phrase your response in terms of a probability figure - 1.0 means that you are "completely confident", and 0.0 means that you are "not confident at all."
4. In general, how well would you say that your department measures up to the demands made by routine problems, in terms of knowledge, capital and other physical/material resources, including personnel. Please select one of the points on the following scale:

1 2 3 4 5

Completely Unable to meet Demands Completely Able to meet Demands

1 = Completely Unable to meet Demands, i.e. your department is totally unable to meet the demands posed by these routine problems.

5 = Completely Able to meet Demands, i.e. your department possesses the knowledge, capital and other physical/material resources, including personnel to meet the demands posed by routine problems.

5. In general, how well would you say that your department measures up to the demands made by non-routine problems, in terms of knowledge, capital and other physical/material resources, including personnel. Please select one of the points on the following scale:

1 2 3 4 5

Completely Unable to meet Demands Completely Able to meet Demands

1 = Completely Unable to Meet Demands, i.e. your department is totally unable to meet the demands posed by these non-routine problems.

5 = Completely Able to Meet Demands, i.e. your department possesses the knowledge, capital and other physical/material resources, including personnel to meet the demands posed by non-routine problems.

6. For non-routine problem situations, please indicate the difficulty of achieving effective solutions. Please select one of the points on the following scale:

1 2 3 4 5

Very Difficult Very Easy
APPENDIX FOUR

INSTRUMENT FOR MEASURING
PERCEIVED ENVIRONMENTAL
UNCERTAINTY
SCHEDULE IV: INTERVIEW SCHEDULE FOR MEASURING PERCEIVED ENVIRONMENTAL UNCERTAINTY

Instructions:

The next set of questions deals with the factors which you have described as being taken into consideration in making decisions in this department (refer to Worksheet #1). Could you think a moment about the information you have or need with respect to each of these factors when you make decisions. The emphasis here is on the way you see the situation(s).

For the next two questions, please phrase your response in terms of:-

1 = Very Seldom
2 = Seldom
3 = Sometimes
4 = Frequently
5 = Very Often

II) 1. Please indicate how often you feel that you are able to predict how each of those items identified on Worksheet #1 is going to react to decisions made in your department.

(I) 2. Please indicate how often you feel that the information you have about each of these factors is adequate for decision making.

(I) 3. Please indicate how difficult it is for you to collect information about each of these factors which you feel is adequate for decision making? Please select one of the points on the following scale:-

1 2 3 4 5

Very Difficult Very Easy

Instructions:

We have talked about the various factors that you have indicated you consider in making decisions and the information or lack of information about them and how this affects your decision making.

In summarizing your beliefs about each of these factors, please tell me two things as I repeat each of the factors you have identified. Please fill your responses in columns (2) and (3) of Worksheet #1 respectively.

III) 4. First, how sure are you of how each of these factors is going to affect the success or failure of your department in performing its function? Please put one of the numbers from 0.0 to 1.0 after each factor to indicate your level of certainty.

0.0=completely unsure
1.0= completely sure
(III) 5. Second, after you indicate how sure you are about a factor, please describe also the range of numbers between 0.0 and 1.0 which you were considering before indicating a specific level of certainty? For example, if a person answered by indicating he was .3 sure, what was the range he was considering in giving the answer - was it between .2 and .4, or .1 and .7, or 0.0 and 1.0? Please write down the range in column (3) of Worksheet #1.

Instructions:

In the next four questions (6 through 9), we are asking about your decision making over time.

For the next three questions (6 through 8), please phrase your response in terms of:

1 = Very Seldom
2 = Seldom
3 = Sometimes
4 = Frequently
5 = Very Often

(II) 6. How often do you feel that you can effectively consider and then evaluate the existing alternative courses of action before you choose among them, i.e. before you select a specific course of action?

(II) 7. How often do you feel that you can accurately anticipate the results of a decision, i.e. how good is your betting average?

(II) 8. At the time you make decisions, how often do you feel able to predict with any degree of confidence whether these decisions will have a positive or negative effect on the company's overall performance?

(I) 9. Please circle the alternative below which most nearly describes the typical length of time involved before you obtain feedback -- information concerning the success of your department in doing its job. For example, a sales department may be able to tell at the end of each day how successful their selling effort was by examining the total sales reported for that day. In contrast, a production department may not know whether their production meets required specifications until the results of several performance tests are available which often may take a period of several days from the time the department completes the product.

1 = Two years or more
2 = One Year
3 = Six Months
4 = One Month
5 = One Week
6 = Three Days
7 = One Day
APPENDIX FIVE

Scoring Procedures for Perceived Environmental Uncertainty
Duncan (1970) defined uncertainty in terms of three components:

1. 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 was incorrect.
3. Not being able to assign probabilities with regard to how environmental factors are going to affect the success or failure of the decision unit in performing its function. (1970, p. 64)

The questions in Schedule IV, Appendix 4 are adapted from Duncan's Organizational Decision Unit Questionnaire (ODUQ).

Each question is denoted by either a (I), (II) or (III) beside it to indicate which of the above components of uncertainty it is designed to measure.

Questions 1 through 3 were scored by means of the following formula:

\[
\text{Total score on a given question (1-3)} = \frac{\text{Number of Factors taken into consideration}}{\text{ Degree of Ability to Assign Probabilities (sureness of effects factor) \times (1 - range of sureness estimate)}}
\]

Questions 4 and 5 were designed to measure the third component.

For each factor the individual has indicated he takes into consideration in decision making, he received a score measuring his degree of ability to assign probabilities as to the effect of that factor on the decision unit's performance. This score was derived by weighting his "sureness" about the effects of a given factor (question 4) by the range between 0 and 1.0 he considered in making his assessment (question 5). The specific formula is as follows with larger scores indicating greater ability to assign probabilities.

Degree of Ability to Assign Probabilities = (sureness of effects factor) \times (1 - range of sureness estimate)

For example, if a person responded by indicating he was .3 sure about the effects of Factor A on the performance of his work group and the range he was considering in
giving this answer was between 0 and .5, his Degree of Ability to Assign Probabilities Score for this factor would be \( .3 \times (1 - .5) = .15 \).

The respondents total score for (questions 4 and 5) was then normed for the number of factors taken into consideration in decision making ...

<p>| Sum of Degree of Ability to Assign Probabilities Scores for All Factors Identified |</p>
<table>
<thead>
<tr>
<th>Number of Factors Identified</th>
</tr>
</thead>
</table>

(Duncan, 1970, pp. 67-68)

Questions 6 through 9 required only one single answer each. The scores on questions comprising a component were subjected to inter-item analysis. Where the reliability coefficient was high, the scores were combined. The correlations between the three components of uncertainty were also computed. Given the high correlations, the scores on all three components were summed and then averaged to arrive at an overall uncertainty score for the focal unit. The score ranged from 1 to 5. 5 indicated high certainty or low uncertainty.
APPENDIX SIX

Canonical Correlation Between Environmental Characteristics and Organizational Variables
To corroborate the findings of the relationships between environmental characteristics and organizational variables obtained from multivariate regression, multiple stepwise regression and discriminant analysis, canonical correlation was performed. The results obtained from running the full sample appear below:

<table>
<thead>
<tr>
<th>Number</th>
<th>Eigenvalue</th>
<th>Canonical Correlation</th>
<th>Wilks' Lambda</th>
<th>Chi-Square</th>
<th>D.F.</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.66452</td>
<td>0.81518</td>
<td>0.23844</td>
<td>84.58439</td>
<td>18</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>0.21980</td>
<td>0.46882</td>
<td>0.71075</td>
<td>20.14465</td>
<td>10</td>
<td>0.028</td>
</tr>
</tbody>
</table>

Coefficients for Canonical Variables of the First Set

<table>
<thead>
<tr>
<th></th>
<th>Canvar 1</th>
<th>Canvar 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pluralism</td>
<td>0.32595</td>
<td>-0.73087</td>
</tr>
<tr>
<td>Interdep.</td>
<td>0.17615</td>
<td>-0.31536</td>
</tr>
<tr>
<td>Organized Directly</td>
<td>-0.06139</td>
<td>-0.16953</td>
</tr>
<tr>
<td>Change Rate</td>
<td>0.74197</td>
<td>0.79668</td>
</tr>
<tr>
<td>Routineness</td>
<td>-0.33117</td>
<td>0.44463</td>
</tr>
</tbody>
</table>

Coefficients for Canonical Variables of the Second Set

<table>
<thead>
<tr>
<th></th>
<th>Canvar 1</th>
<th>Canvar 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>-0.12552</td>
<td>1.69337</td>
</tr>
<tr>
<td>Time Perspective</td>
<td>0.01222</td>
<td>-0.40827</td>
</tr>
<tr>
<td>Frequency of Change</td>
<td>0.75279</td>
<td>0.78198</td>
</tr>
</tbody>
</table>
APPENDIX SEVEN

RESULTS OF ANALYSIS OF COVARIANCE & DISCRIMINANT ANALYSIS OBTAINED UNDER A 64-CELL DESIGN
As pointed out in the footnote on page 133, under a 64-cell design, certain of the cells remained empty and a sizeable portion of them did not have enough units in each cell to render comparison meaningful and valid on a statistical basis. However, in light of the reasons for speculating that the adequacy of a 16- or 8-cell typology could very well be a feature of the limited sample size (p. 133), analyses was performed on a 64-cell matrix and the results are presented below so that they may be compared against future results obtained from much larger and more varied samples. The analyses presented here, however, should be read and interpreted with these limitations in mind.

The mean scores for perceived environmental uncertainty, departmental structure, time perspective taken in planning, and frequency of changes to plans in the four extreme corner cells under a 64-cell design are:-

<table>
<thead>
<tr>
<th>Cell # 1</th>
<th>Cell # 31*</th>
<th>Cell # 33</th>
<th>Cell # 63*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainty = 4.9</td>
<td>Uncertainty = 3.5</td>
<td>Uncertainty = 3.633</td>
<td>Uncertainty = 1.89</td>
</tr>
<tr>
<td>Structure = 4.9375</td>
<td>Structure = 2.925</td>
<td>Structure = 4.9</td>
<td>Structure = 2.475</td>
</tr>
<tr>
<td>Time Pers. = 3.25</td>
<td>Time Pers. = 2.0</td>
<td>Time Pers. = 4.5</td>
<td>Time Pers. = 3.25</td>
</tr>
<tr>
<td>Frequency = 1.0</td>
<td>Frequency = 2.0</td>
<td>Frequency = 3.5</td>
<td>Frequency = 4.25</td>
</tr>
</tbody>
</table>

* Cells 32 and 64 were empty. Consequently, the mean scores for cells 31 and 63 are presented instead.
A score of 5 on "uncertainty" indicates high certainty.
Analysis of Covariance:

When analysis of covariance was performed on a 64-cell design (i.e. a typology consisting of the following six dimensions: Pluralism, Degree of Interdependency, Routineness, Organized Sectors, Directly Related Sectors and Change Rate), using structure, time perspective taken in planning and frequency of changes to plans as the dependent variables, and the environmental characteristics as covariates, the significance levels associated with the dependent variables were as follows: structure (S = .007), time perspective taken in planning (S = .130), and frequency of changes to plans (S = .010).

Discriminant Analysis:

Under the 64-cell design, three discriminant functions were obtained. These were uncertainty (S = .000), structure (S = .013), and time perspective taken in planning (S = .305). The percent of "grouped" cases correctly classified was 53.15%.