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THE DEVELOPMENT AND EMPIRICAL ANALYSIS OF AN INFORMATION PROCESSING MODEL OF EXECUTIVE SCANNING AND INTERPRETATION

By

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ABSTRACT
THE DEVELOPMENT AND EMPIRICAL STUDY OF AN
INFORMATION PROCESSING MODEL
OF EXECUTIVE SCANNING AND INTERPRETATION

By

Felicia Williams Seaton

The purpose of this study was to develop a conceptual model of the antecedents, characteristics, and consequences of executive scanning and interpretation of the external environment. Scanning was defined as the activity of searching for and acquiring data about events in the external environment. Interpretation was defined as the process by which acquired data on the external environment are transformed into information useful to the executive for decision making and action. It was hypothesized that the scanning and interpretation strategies used by executives would be bounded by characteristics of the organization (formalization, policy on intrusiveness), the perceived external environment (analyzability, complexity), and executive role (function, hierarchy, experience). In addition, it was predicted that scanning strategies would have an impact on the effectiveness of the executive's subunit in securing resources from and satisfying the demands of the external environment. Questionnaire and interview responses of 131 executives from four public Midwestern research universities were analyzed to provide evidence of the validity of the conceptual model. Eight hypotheses were derived based on previous research and theoretical descriptions of relationships between the variables proposed by the model.

Results supported two of the proposed hypotheses. Frequency of use of multiple scanning sources was found to vary according to the function and hierarchical level of the executive, and was also found to be significantly related to perceived environmental complexity. A significant positive relationship was found between organizational policy on intrusiveness and executive scanning initiation. Structure did not, however, have the predicted moderator effect on the correlation between intrusiveness and initiation. No relationship was found between perceived analyzability of the external environment and source usage, intrusiveness or equivocality reduction mode. Scanning initiation strategy was not found to be significantly related to subunit performance.

The findings of the current study were interpreted in light of previous research on scanning and interpretation, and the theoretical and practical significance, as well as the limitations of the study were highlighted. Finally, implications for further research and conceptual development were discussed.

TO MY PARENTS

Who made this possible because they taught me as a child

to never think of myself as anything less

than everything that I could be.

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CHAPTER I

INTRODUCTION

In the last two decades, the dominant view of organization theorists and researchers has emphasized the nature of organizations as social systems. A major premise of the social systems perspective states that, in order to survive, an organization must have an effective interaction with the environment upon which it is dependent for inputs, acceptance of outputs, and legitimation. Given the nature of organizational dependence upon the environment, a major determinant of organizational effectiveness is the extent to which the organization accurately perceives the characteristics of the relevant external environment. Failure to pay attention to or serious misdiagnosis of environmental events can lead to organizational crisis or failure (Starbuck, Greven & Hedberg, 1978).

Early models proposed for the study of organization-environment interaction focused on the contingencies of organization-environment fit (e.g., Emery & Trist, 1965; Lawrence & Lorsch, 1967). The principle assumption of the contingency approach maintains that the design and structure of the organization must be matched to the characteristics of the external environment and technology. A major research interest in the contingency approach was the determination of the most appropriate organizational design and structure to fit the given characteristics of the external environment. These characteristics included uncertainty, instability, turbulence, complexity and heterogeneity (Dill, 1958; Emery & Trist, 1965; Pugh, Hickson, Hinings & Turner, 1969; Terreberry,

1968; Thompson, 1967).

Results of contingency research failed to substantiate the assumption that there is "one best way" to design all organizations which face a given type of environment. A major limitation of the contingency approach was the focus on a one-way adaptation of organization to environment (i.e., with the environment taken as the given, emphasis was placed on the appropriateness of the organization's response). The need for a more dynamic, mutual-adaptation perspective on the nature of organization-environment relations became apparent. This dynamic approach suggests that, given the rapidly changing characteristics of an organization's environment, organizations must not only respond to perceived characteristics of the environment, but can play an important role in shaping subsequent environmental responses to organizational actions. Thus, the nature of organization-environment interaction is characterized by interdependence, dynamic exchange, and mutual adaptation.

Recently, models have been developed which focus on the ways in which organizations both respond to and proactively shape the responses of their external environments (e.g., Daft & Weick,1984; Weick and Daft, 1983). A critical element in the process of responding to or manipulating the external environment is the acquisition of information on the needs, demands, and characteristics of the environment. Models which delineate the processes through which individuals in organizations acquire and use information on the external environment are referred to as information processing models.

From an information processing perspective, it is argued that organizational survival and adaptation are heavily dependent on the organization's ability to

accurately sense the relevant demands and changes in its external environment. Consistent with this view, it is assumed that organizations are heavily dependent upon their environments for a multitude of cues which suggest the need for ongoing organizational realignment. Data about trends, events, demands and changes in the environment therefore assume critical importance. Strategies for obtaining this type of data are considered important antecedents to both the process of long-range strategic planning and organizational performance outcomes (Hambrick, 1981; Culnan, 1983).

Scanning, or the search for and acquisition of data about events occuring outside the organization, is one strategy that an organization may employ to gain knowledge about its external environment. To be useful as a basis for strategic action and decision-making, however, the acquired data must be transformed, through a process of interpretation, to a language which is meaningful to organizational members (Daft & Weick, 1984). Interpreted information may then be used to define strategic actions that the organization should take to maintain or increase organizational performance and effectiveness.

Traditionally, it has been assumed that upper level management plays a key role in the scanning and interpretation of information on the external environment (Aguilar, 1967; Daft & Weick, 1984; Miller, Kets de Vries & Toulouse, 1982). Top level executives are supposed to have the best vantage point for viewing the entire organizational system, and are responsible for monitoring the environment, translating critical information, and formulating appropriate responses (Snow & Hrebiniak, 1980).

Research on environmental scanning has been largely descriptive of the

content and sources of information acquired by strategic managers (Aguilar, 1967; Thomas, 1980). Systems developed to classify the modes of individual scanning have looked at the intentionality and degree of active search involved in scanning, the routine versus non-routine nature of scanning activities, and the degree to which scanning is a formally assigned activity. (Aguilar, 1967; Fahey & King, 1977; Hambrick, 1981; Keegan, 1974).

The majority of research on environmental scanning has described the scanning practices of large, often multinational, profit making organizations. Little research has been encountered to date on the characteristics of scanning activities in non-profit or service-oriented institutions. An important question yet to be addressed involves the extent to which the findings of previous research are generalizable to different types of organizations.

Environmental scanning has also been considered an important component of the broader managerial activity labeled "boundary spanning". Emphasis in the boundary spanning literature has been on the identification of boundary spanning individuals (e.g., Miles, 1976; Tushman & Scanlan, 1981b), the role of the individual boundary spanner (Katz & Kahn, 1978; Organ, 1971), the pressures and conflicts experienced by individuals in boundary spanning roles (Keller & Holland, 1975; Keller, Szilagyi, & Holland, 1976; Wall & Adams, 1974), and the relative impact of role characteristics on scanning or "boundary spanning" activities (Adams, 1976; Leifer & Delbecq, 1978). Thus, the level of analysis in the boundary spanning research has most often been the individual boundary spanner, in most cases, the manager or executive. Few attempts have been made to link boundary spanning activities with the process of sense-making

or interpretation, and little is known about the impact of the organizational context on the strategies used by boundary spanners to acquire data on the external environment.

Less is known about the process through which acquired data is transformed to information which can impact organizational effectiveness. The literature on individual information processing has outlined the stages of cognitive processing and sought to define the conditions which govern the determination of individual cue selection. Although Unson, Braunstein and Hall (1981) identified the need to investigate the ways in which demands imposed by organizational structure provide the context for explaining the mechanisms and choice of interpretation strategy, until recently little interest has been devoted to establishing the linkage between individual interpretation and organizational characteristics.

Daft and Weick (1984) presented an interpretations system model which defines interpretation strategy as an organizational, rather than individual characteristic. These authors suggested that organizations, as social systems, have a definable pattern or mode of interpretation based on the organization's assumptions about its external environment and extent to which an organization is passive or active in dealing with its environment. No research has been encountered to date to substantiate the conceptual model which Daft and Weick proposed.

In sum, various models of scanning and/or interpretation processes have been suggested in the literatures on environmental scanning, boundary spanning, and information processing. The different perspectives on scanning

and interpretation which are offered by these distinct literatures have not been previously integrated. To more fully understand the nature of the scanning and interpretation processes which occur in organizations, an integrated theoretical model linking individual, organizational, and environmental characteristics relevant to these processes is needed.

The present research initiates an exploration of the linkages between organizational and environmental characteristics, scanning and interpretation processes, and organizational effectiveness. The major objectives of the current research are to: 1) develop a preliminary model of executive scanning and interpretation, 2) construct instrumentation and design a study to provide empirical evidence of the major relationships described in the model and, 3) describe the impact of scanning and interpretation activities on selected criteria of organizational effectiveness. In addition, the current study seeks to determine the extent to which the characteristics of scanning and interpretation activities which have been described in large, for- profit business firms are consistent for non-profit non-industrial organizations such as public universities.

The current study is organized in six chapters. Following the introduction presented in this chapter, Chapter II offers a detailed review of the relevant literature on environmental scanning, boundary spanning, information processing and interpretation systems. The second chapter concludes with the broad research questions which result from current gaps in our knowledge about the antecedents, consequences and characteristics of executive scanning and interpretation processes.

Chapter III presents a conceptual model of executive scanning and interpretation which is developed as a heuristic for the design of an empirical study. Chapter IV describes the methodology, process of instrument development and data analysis techniques used in the current study. A discussion of the results of the study is offered in Chapter V, followed in Chapter VI by conclusions on the theoretical and practical implications of the research.

CHAPTER II

LITERATURE REVIEW

Although the need for acquisition and accurate interpretation of information on the external environment has been frequently acknowledged in the study of organizations, empirical research on managerial scanning and interpretation has been scarce and fragmented. Conceptual models of scanning processes have been developed in the literature on environmental scanning, as well as under the title of boundary spanning activity. Interpretation processes, and to some extent the preceeding phase of data acquisition (scanning), have been studied from individual information processing and organization interpretation systems perspectives.

In this chapter the empirical and conceptual literature relevant to an understanding of the current status of theory on executive scanning and interpretation of the external environment is discussed. The literature specific to environmental scanning is first reviewed, followed by the review of relevant models and studies of boundary spanning, individual information processing, and interpretation systems.

Environmental Scanning

The earliest and now classic research on environmental scanning was performed by Aguilar (1967). In that study, environmental scanning was defined as the activity of acquiring "information about events and relationships in a company's outside environment, the knowledge of which would assist top

management in its task of charting the company's future course of action" (Aguilar, 1967, p. 1). Aguilar's study focused on the manner in which external strategic information is gained, and dealt with the recognition of, search for and internal communication of external information by organization managers. Specific questions addressed the content, source, and process used by managers to obtain external information.

The model proposed by Aguilar suggested a classification of scanning activities into four modes: 1) undirected viewing: the general exposure to information where the viewer has no specific purpose beyond exploration, 2) conditioned viewing: directed exposure, not involving active search, to a more or less clearly identified area or type of information, 3) informal search: the relatively limited and unstructured effort to obtain specific information, and 4) formal search: the deliberate effort, usually following a pre-established plan, to secure specific information.

Aguilar suggested that the use of a particular mode is associated with specific information requirements, and stated that, due to the scarcity of resources available for continual scanning activities, the primordial rule for mode assignment is scanning efficiency. A second rule is that change in scanning mode occurs when previous modes are ineffective or inefficient.

Based upon interviews with 137 managers from 41 business and service organizations, Aguilar found that managers tended to collect information on five major content areas which he identified as market tidings, technical tidings, broad issues, acquisition leads and other tidings (suppliers, available resources, miscellaneous). The importance of each content area was found to be

dependent upon the functional specialty of the executive (e.g., marketing, general, technical), somewhat on organizational size, and only slightly on the manager's level of responsibility.

Information sources were classified as outside versus inside, and personal versus impersonal. Results showed that personal greatly exceeded impersonal sources in importance (non-members and customers were important personal sources), intra-organizational subordinates were the greatest single source of information, and use of both outside and inside sources varied with the functional specialty and level of responsibility of the executive.

The final question on how external information is acquired was defined in terms of the degree to which information was solicited or unsolicited by the executive. Results showed that information from outside sources was highly unsolicited while information from inside sources was largely solicited. In addition, large companies solicited more information from outsiders and tended to rely less on routinely transmitted information from insiders.

Following Aguilar's lead, several other studies have sought to describe the scanning practices of individual executives in different types of organizations. A study which examined the characteristics of information sources was conducted by Hambrick (1981). In a sample of 195 first- through third- level executives from 20 organizations in three industries, it was found that neither hierarchical level nor functional area of upper level managers were systematically related to either the focus or overall amount of scanning activity. Further analysis showed, however, that links between hierarchical level, functional specialty and scanning were significant in some cases, but only when the functional role was clearly

defined and associated with a particular environmental sector. A considerable amount of cross- functional scanning (i.e., scanning outside an executive's primary functional orientation) was also found to occur in the organizations studied.

Results indicated that environmental scanning was an "unassigned activity" (Hambrick, 1981, p. 316) and chief executive attitudes toward scanning were characterized as informal. Hambrick concluded that a rationalizing or articulation of scanning responsibility could result in more effective environmental scanning within an organization.

An additional study of the characteristic sources of external information was conducted by Culnan (1983). This field study investigated the extent to which the frequency of use of nine information sources was determined by perceived accessibility of source and task complexity. Completed questionaires were obtained from 362 professionals employed at the corporate headquarters of two large commercial organizations. The nine sources loaded on three factors: internal personal, internal impersonal, and external sources. Task complexity was measured by the extent to which eleven environmental elements were relevant to the conduct of each professional's job. These elements included the firms' customers, competitors, suppliers and labor supply; government regulation, public opinion, technology; and economic, political and social issues. Results supported the predicted positive correlation between source accessibility and source usage. Complexity was found largely unrelated to accessiblity of external sources, and for internal sources, the complexity-usage relationship was significant only when sources were perceived as less accessible.

A study conducted by Jain (1984), examined the scanning practices of 186 executives in Fortune 500 organizations across the U.S. Questionnaires were mailed to the chief executive officers to determine the pattern and characteristics of scanning activities in these firms. Results suggested that scanning may be characterized by four progressive phases. In phase 1 (primitive), the environment is assumed to be inevitable and random, information is rarely related to strategic decision making, and management assumes no direct reponsibility for scanning efforts. Phase 2 (ad hoc) is characterized by a definition by management of general areas to be monitored, but no formal system for scanning exists and scanning is not initiated by management. Managers in phase 3 (reactive) recognize the importance of scanning the environment, but activities are unplanned and unstructured. Scanning initiative occurs as a reaction to what major competitors are doing, and managers avoid active testing or risk taking in interactions with the external environment. Finally, managers in the fourth and most developed phase (proactive) employ scanning as a structured and deliberate effort to predict environmental states and establish a competitive advantage.

Phase of scanning was shown to be related to company sales volume. Only companies with annual sales of $1-5 billion or over were found to be in phases 3 and four, while the vast majority of those under $1 billion were characterized as phase 1. Phase of scanning was also related to the length of time the scanning system had been in place, suggesting that highly systematic scanning activity develops over a period of about five years, and only then given the instrumental support of top management.

Source of environmental information was also examined in Jain's study. Respondents were provided a list of 11 documentary information sources and were asked to rank the five most important sources. Daily newspapers were considered most important, followed by business periodicals, well-known consultant reports, and government publications.

In addition to the study of the characteristics of individual scanning practices, several researchers have sought to characterize the scanning practices of organizations. Keegan (1974) collected data on the scanning practices of 13 international corporations. Personal interviews with 50 executives focused on the source of external information received. Results revealed that human sources were much more important than documentary data or physical phenomena as sources for external information, and that external sources such as service organizations, competitors, and government agencies were much more widely used than previously recognized. Little systematization of scanning programs was found, however, in the industries studied. Keegan pointed to the need for additional studies of the influence of the few systematic scanning programs that have been developed and induced in other companies .

Fahey and King (1977) studied the level of environmental scanning undertaken in 12 large business organizations. Using Aguilar's (1967) definition of scanning, a survey was developed to identify scanning processes and to assess the relationship of scanning activities to corporate planning. Three scanning "models" were proposed: 1) irregular: unanticipated crisis-induced scanning for short run ends, 2) regular: decision or issue-oriented regular review of the environment, and 3) continuous: the persistent monitoring of various

environmental systems.

A structured interview was developed to measure the scanning model used in each organization, the relative perceived importance of various environmental subsystems to the firm, and the degree of integration of scanning and planning processes.

Results showed that environmental scanning in the vast majority (9/12) of firms was irregular, ad hoc, and externally initiated. Priority for the most important environmental system was found to vary by type of firm, and all of the surveyed firms reported poor integration of scanning and planning processes. Fahey and King (1977) concluded that "there is a significant gap between the conventional assumptions concerning environmental scanning and its implementation in large corporations" (p. 71).

A similar study by Thomas (1980) reviewed the presence, process, and content of scanning practices in nine leading corporate organizations. Data was gathered from published reports on large corporations, and results were based on a qualitative analysis of reported data.

Results suggested that the important dimensions of the scanning process in these corporate giants were permanence (continuity over time), periodicity (cyclicity), and pervasiveness (multi-level, multi-unit activity). Content dimensions included scope, range and futurity. The multiple phases of the scanning process were described as monitoring, abstraction, analysis, synthesis, and communication of environmental information.

Thomas (1980) concluded that the corporate giant does typically scan social, political, economic and technological conditions on a continuous, pre-planned

basis within a future-oriented perspective. He further stated that the composite picture of "sophisticated wide angle scanning gained in this study leads to the anticipation that scanning for corporate planning is on the threshold of rapid diffusion in the corporate world "(p.20). Results of Jain's (1984) study, however, would suggest that Thomas' prediction may hold true for only a subset of the corporate world--corporate giants who are typically large and have had systematic scanning programs already in place for several years.

In sum, the literature on environmental scanning has focused largely on the nature and pervasiveness of scanning activity in large organizations. Little consensus has been reached on an appropriate classification of types or phases of environmental scanning. Although several models do show considerable overlap, the dimensions used to define scanning modes vary from study to study. In general, three to four modes of scanning have been identified. Table 1 presents of summary of the principle classifications of scanning modes and the dimensions underlying each of the suggested schema.

Descriptions of the nature and pervasiveness of environmental scanning processes in diverse organizations have not been consistent across different studies, due largely to a lack of convergence on the conceptualization and operationalization of the scanning construct. In addition, the methodologies used (e.g., interviews versus archival review), and specific sample characteristics have varied widely. Studies of scanning at the organizational level of analysis have focused largely on corporate giants and Fortune 500 organizations, and have ignored the role of environmental scanning in other types of organizations.

Table 1

Summary of Modes of Environmental Scanning

	Modes or Phases				
Author	1	2	3	4	Dimensions
Aguilar (1967)	undirected viewing	conditioned viewing	informal search	formal search	intentionality formality of search
Fahey & King) (1977	irregular	regular	continuous		orientation (crisis vs. issue), continuity
Jain (1985)	primitive	ad hoc	reactive	proactive	degree of managerial initiation, formalization, purpose

A major contribution of the environmental scanning literature to the understanding of the processes of executive scanning has been the description of the content and most frequently used sources of external information, and the determination of the influence of functional specialty on scanning processes. An additional perspective on the information acquisition processes is provided by studies of the role of boundary spanning activities, which are reviewed next.

Boundary Spanning

The transactions which occur across the peripheries or boundaries of organizations have been found to be of vital importance for organizational functioning and maintained viability. (Allen & Cohen, 1969; Organ & Greene, 1972; Pruden, 1969; Pruden & Reese, 1972; Wren, 1967). These "boundary spanning activities" which link the focal organization with other organizations or social systems are considered to be critical elements of the effective monitoring of the environment and to the transfer of technology and information (Aiken & Hage, 1972).

Adams (1976) identified five general types of boundary spanning activity (BSA): 1) transacting, which involves the acquisition of inputs and disposal of outputs, 2) filtering inputs and outputs, 3)searching for and collecting information and intelligence, 4) representing the organization externally, and 5) protecting and buffering the organization from external threat. Environmental scanning may be subsumed under activity 3 (data search and acquisition). The research on the information processing activities of the boundary spanner are of particular relevance to the current study.

From the information processing perspective, boundary spanning activity (BSA) has been defined as "the interpersonal transfer of information across the organization's boundaries" (Keller et al., 1976, p. 700). Aldrich & Herker (1977) suggested that an organization's ability to adapt to environmental contingencies depends in part on the expertise of boundary role incumbents in selecting, transmitting, and interpreting information originating in the environment. These boundary spanners are exposed to large amounts of potentially important information on the external environment, and function to defend the organization against information overload by acting as both filters and facilitators in determining what information enters, is processed through, and acted upon in the organization.

Leifer and Delbecq (1978) argued that boundary spanners attend selectively to aspects of the external environment as a function of what they are told to pay attention to, their own needs, wants and personalities, past experience, the potential utility of information, and information redundancy cues. They proposed a typology of boundary spanning activity which specifies the relationship between the initiation (regulated, non-regulated) and process (routine, non-routine) of boundary spanning as a function of the regularity of information need and perceived environmental uncertainty.

Leifer and Delbecq suggested that BSA will be more likely to be non-routine when: 1) exchange with sectors of the environment is not predictable, 2) sources of information are diverse and changing, 3) people with whom the boundary spanner interacts are changing, and 4) environmental sources of information are non-cooperative. The implicit assumption is that routinization of boundary

spanning activities is highly dependent on environmental characteristics.

In addition, they maintained that boundary spanning activities will be initiated when: 1) members of the organization detect a discrepancy between organizational goals and organizational performance relative to the environment (e.g., poor sales performance), 2) organizational members are unable to make decisions based on available information, 3) the environment is perceived by organizational scanners as unstable or complex, 4) technology is non- routine and 5) the organization has a multiple goal structure.

Leifer and Delbecq described the most common type of boundary spanning activity in practice as regulated and routine, based on an anticipated information need in conditions of low perceived uncertainty. This type of BSA is exemplified by routine interactions between supplier and customer. The greatest disadvantage of this approach to BSA is the relative insensitivity to new or unexpected sources of external information.

Little research has been encountered to provide specific evidence of the validity of the propositions of the Leifer and Delbecq model, and the boundary spanning literature in general has not attempted to settle the issue of the most common types of boundary spanning activities. Other researchers have studied additional characteristics of the information transfer role of boundary spanners.

Tushman and Scanlan (1981a) studied the internal communication characteristics of the boundary spanner, the degree of specification of external communication to particular domains, and the degree of multiple-boundary spanning in a large R & D facility. Results showed that the characteristics and external orientation of high internal communicators were significantly different by

task area. Professional orientation and organizational experience were found to be higher for boundary spanners who spanned multiple boundaries, and spanners of organization-environment boundaries were typically linked very strongly to multiple (both internal and external) information areas associated with project task.

A more detailed analysis of the role of boundary spanners in information transfer was provided in a second article by Tushman and Scanlan (1981b). Informational boundary spanning was defined as a two-part process: 1) obtaining information from external areas and 2) disseminating that information to internal users. The definition of boundary spanner used in their study thus discriminated between internal communication stars (high only in intra-department communications), and external communication stars, to test the hypothesis that only individuals high in both intra and extra- organizational communication can effectively span organizational boundaries.

Employees from four R & D departments were interviewed to identify information transfer linkages, the perceived value of each type of linkage as a source of external information, and the perceived technical competence of the source. Results showed that boundary spanners (i.e., both internal and external communicators) were most frequently perceived as important sources of new and valuable ideas, and were perceived as more technically competent than the other two groups.

Dollinger (1984) proposed a study of the effects of boundary spanning and information processing on organizational performance. The study focused on the boundary spanning activities of small business entrepreneurs. The BSA's of the

entrepreneurs were presumed to have important implications for strategic management, sensitivity to external constituencies and organizational performance. A three-variable model was proposed which related individual information processing capability (integrative complexity and intolerance of ambiguity), boundary spanning activity (intensity and extensity) and organizational (financial) performance.

Data were collected from surveys received from 82 entrepreneurs, with organizational variables (type of business, age, number of employees and estimated total number of employee hours in BSA) also recorded. Results confirmed a positive relationship between information processing capability and both intensity and extensity (or range) of BSA, and found a positive relationship between BSA and financial performance.

Schwab, Ungson, and Brown (1985) examined the relationship between boundary spanning, organizational structure (influence, function, and hierarchical level) and external environment (importance, predictability and control). Questionnaires were obtained from 379 executive of 36 companies in the high-technology and wood products industries. Results showed that boundary spanning was significantly related to perceived importance of the environment, perceived influence and functional area in both industries, but was unrelated to hierarchical level in either industry. In the wood products firms, boundary spanning activity appeared to increase with the ability to predict the actions of task environmental sectors, but the relationship was weak and this was not true for high technology firms. Schwab et al. concluded that composite measures of the environment (including factors such as importance, predictability

and control) were necessary to test the relationship betweeen boundary spanning activity and environment.

In summary, research on the information processing role of organizational boundary spanners has suggested that boundary spanning is a two stage process of information acquisition and internal communication of information. This process is delimited by characteristics of the individual boundary spanner (professional orientation, personality, needs, previous experience, function, internal and external connectedness), organizational characteristics (information need, regulation of BSA, and goals), and perceived importance, predictability, complexity, and uncertainty of the external environment.

The one study which found a direct relationship between BSA and a limited measure of organizational performance is encouraging. Additional research is necessary, however, to incorporate other characteristics of the information acquisition and transfer processes which may affect this relationship. In particular, the boundary spanning literature has not considered the process through which data on the external environment is translated prior to its communication to other organizational members. To further comprehend this process, a more in-depth study is needed of the ways in which individuals select which cues to attend to and how they go about making sense of equivocal data. Suggestions on the characteristics of the interpretation process may be obtained from the information processing literature , which will be reviewed in the next section.

INFORMATION PROCESSING

The cognitive aspects of managerial information processing for problem-sensing, decision-making and strategy formulation have been the topic of several recent studies (Egelhoff, 1982; Kiesler & Sproull, 1982; Ungson et al., 1981). Information is defined as stimuli (or cues) capable of altering an individual's expectations and evaluation in problem-solving or decision-making. The specific cognitive processes through which information is selected, combined, weighted and altered are referred to as information processing strategies (Ungson et al., 1981). These strategies may take the form of explicit decision rules (e.g., Aguilar's,1967, efficiency rule) or as more implicit or tacit cognitive activities (causal maps, cognitive scripts). Theories of decision-making styles focus on how individuals and groups develop characteristic patterns of responding to information input.

Impetus for research in decision-making theory was provided by the works of Driver and his associates (e.g., Driver & Mock, 1975; Driver & Streufert, 1969; Schroder, Driver & Streufert, 1967) on the development of a human information processing systems (HIPS) model. The basic assumption for this model states that individuals and groups, as systems, develop different tendencies in the way in which they process information. These tendencies are presumed to be due primarily to learning based on previous experience.

Driver & Streufert (1969) postulated that there are at least two subsystems in an information processing system. The first is a perceptual subsystem which is concerned with data search (parallel to previous definitions of scanning behaviors), and intake, which is defined as that set of processes which code,

interrelate, evaluate and store input. This aspect of the subsystem is associated with the currently accepted notion of interpretation processes. Second, the executive subsystem translates input into action decisions and strategies.

Subsequent research led to the development of a more elaborate model of information processing described as Decision Style Theory (Driver & Mock, 1975). Decision Style Theory proposes that each person or system has one (or two) dominant styles which are learned over time. Research (reported in Driver & Mock, 1975) suggested that the style of individual and group decision-making is related to level of management, area of business specialization, and use of information search and screening. In addition, conceptual structure, degree of environmental complexity, and personality variables have been found to place important constraints on decision-making styles.

Additional research on the relevance of the information processing approaches for the development of models of managerial information systems has produced several conclusions. First, it has been suggested that, since problem settings in organizations are typically ill-structured, approaches which build decision-making aides based on the study of well-structured problems (often used in laboratory studies) may not be applicable (Connally, 1977). Braunstein (1976) suggested that, rather than maintaining a focus on prescribed analytical rational decision-making styles, it may be that more successful managers are those who have more flexible decision making styles that enable them to rapidly build and use models that fit their organization's immediate needs.

Secondly, research has shown that the role of the manager as an active filer and "pigeonholer" of information may be impeded or facilitated by characteristics of organizational structure such as favored communication channels, specialized vocabularies, communication checkpoints and standard operating procedures (Perrow, 1979). Ungson et al. (1981) proposed that attention to the ways in which individuals react to demands imposed by organizational structure will provide a context for explaining how individuals use information inputs.

A second line of research from the cognitive processing literature describes the characteristics of managerial problem-solving, which is defined as the cognitive processes of noticing and constructing meaning about environmental change so that organizations can take action (Kiesler & Sproull, 1982). Problem sensing, the first stage of problem-solving, is composed of three cognitive processes: noticing, interpreting, and incorporating stimuli.

In noticing stimuli, managers must distinguish potentially problematic stimuli from the multiple cues available to them. By this definition, noticing is the important element of the environmental scanning process involved in the choice of a relevant subset of external stimuli (Keegan, 1974).

When interpreting stimuli, managers construct or assign meaning to the stimuli, and this process is influenced by organizational goals, policies, and strategies (Kaufman, 1963) and response repetoires (March & Simon, 1958). The incorporation of stimuli involves remembering and retaining the interpreted stimuli and associating them with other relevant cognitions. Organizational variables such as size, age and institutionalization of control structure influence the difficulty or ease of information storage and organizational memory.

Research based on problem sensing models suggests that decision makers most likely incorporate information that is discrepant enough with existing cognitive schema to capture attention but not so discrepant as to seem irrelevant (Kiesler & Sproull, 1982). In sum, this research suggests that the noticing, interpretation, and incorporation of stimuli is highly biased toward consistency with existing cognitive schema built from the manager's past experience and constrained by organizational characteristics. True information --that which alters conceptions, tests attitudes or changes how data are used-- seems to require both some measure of inconsistency or incongruency and good concordance with existing expectations and cognitive organization (Kiesler & Sproull, 1982, p. 559).

The basic three-stage model of information processing described above is consistent (although specific terms and definitions vary somewhat) with previous literature on environmental scanning and boundary spanning. A major contribution of the cognitive processing literature to the understanding of executive scanning and interpretation modes is the attempt to delineate the tendencies or styles of individual information processing (which includes both scanning and interpretation), and the individual, organizational and environmental constraints which are predicted to have greatest impact on scanning and interpretation.

Although researchers have suggested the utility and applicability of the information processing models for groups as well as individuals, the focus of study in the information processing literature has been on the individual decision maker. A model which views the charateristics of scanning and interpretation as

an organizational phenomena will be reviewed next to complement the micro approaches of previous models.

Organizations as Interpretation Systems

In proposing a model of organizations, Weick & Daft (1983) suggest that, consistent with higher levels of system complexity (cf. Boulding, 1956; Pondy & Mitroff, 1979), organizations should be conceptualized as complex social systems which develop specialized information receptors that interact with and seek information about the environment in which they operate. Basic responsibility for interpretation of this information is assigned to strategic-level management, and as these authors stated, "it is the job of management to interpret" (Weick & Daft, 1983, p. 90-91).

Two additional assumptions serve as the basis for the organization interpretation systems model. It is assumed that organizations differ systematically in the modes or processes used to interpret the environment (e.g., an organization is characterized by a single interpretation style). These processes of interpretation are supposed to occur according to systematic variations resulting from organizational and environmental characteristics. This assumption is consistent with previous research on cognitive processing in individuals versus groups (e.g., Driver & Streufert, 1969).

The second assumption relates to the distinction between organizational and individual interpretation processes, and proposes that the organizational process is somewhat more than what occurs in the individual members of the organization. While it is recognized that individual organization members carry out the functions of interpreting for the organization, Weick and Daft argued that a

distinctive feature of organizational interpretation is the development of a shared cognitive map among managers who constitute the interpretation system. As the authors stated: "the thread of coherence among managers is what characterizes organizational interpretations" (Daft & Weick, 1984).

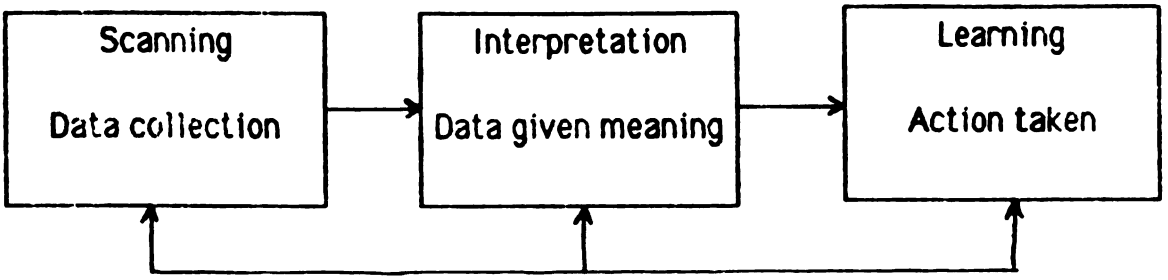
Daft & Weick suggested that three stages constitute the process through which an organization goes about knowing its environment: scanning, interpretation and learning. Similar to previous definitions, (e.g., Aguilar, 1967; Fahey & King, 1977) scanning is defined as the process of monitoring and collecting data about events and relationships in an organization's environment. Interpretation occurs at a second stage when the collected data are given meaning, and is defined as the process of translating events and developing shared understanding and conceptual schemes among members of upper management.

Learning is distinguished from interpretation by the concept of action, and involves a new response (e.g., decision-making, strategy formulation, structural modifications) based on the interpretation. Finally, feedback from the results of organizational actions may provide new data for subsequent scanning and interpretation processes. This general model is illustrated in Figure 1.

Based on these assumptions, Daft & Weick (1984) proposed a model of organizational interpretation which seeks to describe the major differences in the ways in which organizations go about interpreting their environments. Two major dimensions were used to categorize organizations according to four modes of interpretation behavior. These dimensions, and the resulting modes, are described below.

Figure 1

Relationship among Organizational Scanning, Interpretation and Learning.



From "Toward a model of organizations as interpretation systems" by R. L. Daft and K. E Weick (1984), Academy of Management Journal, 9, p. 286.

Environmental analyzability, the first dimension, is based upon the organization's assumptions about the analyzability of its environment. It is suggested that the way in which an organization enacts or reacts to its environment will depend to a great extent on whether the organization assumes that the environment is analyzable, concrete and subject to discernible, predictable changes, or is unanalyzable, subjective and unpredictable. It is hypothesized that differences in organizational beliefs about the environment are based on perceived characteristics of the environment and the previous interpretation experience of the managerial group.

Organizational intrusiveness, the second dimension of the model, is defined as the extent to which organizations actively intrude into the environment. Levels of organizational intrusiveness may be classified according to the degree of organization-initiated search and manipulation of their environments. Passive organizations characteristically accept whatever information the environment gives to them, develop interpretations which are informal and unsystematic, and search actively only in response to a crisis. At the opposite extreme, active organizations search the environment on a continuous basis, test and manipulate critical factors in the environment (Pfeffer, 1976), and may attempt to coerce a favorable interpretation from the environment.

The two dimensions of analyzability of environment and organizational intrusiveness permit the categorization of organizations into four modes of interpretation behavior: enacting, discovering, conditioned viewing, and undirected viewing. Enacting organizations are characterized by both an active, intrusive strategy and the assumption that the environment is unanalyzable.

These organizations "leap before they look" (Weick, 1979), and in other ways take initiative to create and construct their environments.

The discovering mode of organizational interpretation is characterized by organizational intrusiveness into the environment in search of a "correct" answer, and assumes analyzability of the environment. Organizational interpretations are based on formal data about environmental characteristics and expectations, and search procedures are likely to be through formal procedures such as questionaires and surveys.

Consistent with Aguilar's (1967) conceptualization, the conditioned viewing mode assumes an unintrusive approach to an analyzable environment. Interpretations are based on review of limited documents, reports, and traditional information systems. Data collection will tend to be routinized and based on past experience, and few resources are assigned to the process of external scanning.

Organizations which use an undirected viewing mode of interpretation are characterized by the lack of formal scanning structure, irregular scanning sequences, and little use of formal management information systems. Sources of environmental information are most frequently informal and search procedures rely on informal information channels, personal contacts, and available subjective cues. Daft & Weick suggested that interpretation consensus is achieved in these organizations through extensive intra-organizational discussion to reduce information equivocality.

An example serves to illustrate the organizational strategies for acquiring and interpreting information on the external environment. An organization in an enacting mode, in defining the needs and demands of relevant shareholders,

might anticipate these needs by initiating periodic reports to shareholders aimed at shaping their attitudes in a light which favors the organization. A discovering organization might conduct a survey of shareholder attitudes, while in the conditioned viewing mode, an organization would obtain relevant information through routine but systematic transactions with shareholders (e.g., dividend checks, voting). Finally, in the undirected viewing mode, an organization could gain information on shareholder perceptions through informal, personal contacts and chance encounters with shareholders.

Due to the recency with which it has been proposed, no empirical research reported substantiates the descriptive relationships suggested in the interpretation systems model. A major difficulty anticipated in the operationalization of the model, however, would be the large sample size required for the organization- level analysis of interpretation mode. Simple aggregation of managerial interpretations (as used in previous research on environmental scanning) would provide only partial evidence of organization mode. An examination of the process of developing a shared cognitive map for interpretations would have to be included to fit the conceptual definition of the Daft and Weick model.

A similar difficulty arises in the testing of the proposed relationships between the scanning, interpretation, and strategy or action processes. The implicit assumption of the Daft and Weick model is that scanning, interpretation, and decision-making strategies will be consistent within a given mode. Several of the examples given to illustrate a particular interpretation mode involve a major element of search procedure, which has formerly been described and defined as

part of the scanning process (Aguilar, 1967). Thus, to determine the proposed consistency of scanning and interpretation modes, it would be necessary to remove all references to scanning from the definition of interpretation mode.

The model of interpretation systems adds a level of integration to the literature relevant to scanning, interpretation and decision- making processes by suggesting the variables at the organization level of analysis which provide the major determinants and context for these processes. Although the four interpretation modes are quite similar to the scanning modes proposed by Aguilar (1967) and to some extent, Fahey & King (1977), the development and description of the characteristics of each mode is much more elaborate in the interpretation systems model. In addition, the insistence on the need to look at the process through which a consensual definition of reality is sought is consistent with a more phenomenological approach ignored in previous models (Seaton, 1985). Finally, the descriptions of interpretation processes at the macro level may be used to compliment insights gained from the micro perspective of cognitive processes.

Summary and Research Questions

The literature from four major areas of research has been reviewed for relevant assumptions, definitions, conceptual models, and empirical research pertinent to the understanding of the process and impact of executive scanning and interpretation of the external environment. Although there has been considerable overlap in the processes described, each has made a unique contribution to the understanding of the scanning and interpretation activities which occur within organizations. A notable limitation of previous research has

been the lack of breadth and variety in the types of organizations upon which descriptive results are based. In particular, the majority of previous studies have focused on large, private profit-making organizations.

Taken as a whole, the literature reviewed appears to substantiate the importance of environmental scanning and interpretation activities as a critical precondition to organizational adaptation and effectiveness. Although no overall consensus exists on the most critical antecedents to effective scanning and interpretation, research and theory broadly suggest that important contextual factors for these processes include characteristics of the environment, the organization, and the individual scanner-interpreter. In light of the findings and limitations of the reviewed literature, the following general questions are proposed for the current research:

1. How do executives in non-profit organizations (e.g.,universities, service organizations) scan and/or interpret their institution's external environment?
2. What effects do differences in individual, organizational and perceived environmental characteristics have on the ways in which executives scan and/or interpret their external environment?
3. What impact does the scanning and/or interpretation strategies used by executives have on the effectiveness of their organizations?

To comprehend the nature of specific executive activities relevant to the acquistion and interpretation of information on the external environment, a model is needed to integrate the insights gained from previous research. The following chapter suggests a preliminary model of executive scanning and interpretation.

CHAPTER III

A MODEL OF SCANNING AND INTERPRETATION

The previous review of the theory on scanning and interpretation revealed a lack of a consensual and coherent model to explain the antecedents and organizational consequences of scanning and interpretation activities. In addition, the lack of compelling empirical evidence suggests the need for a conceptual framework which specifies the nature and relationship of additional variables which are likely to lead to an improved understanding of an executive's environmental scanning and interpretation activities.

The present research seeks to develop a descriptive model of executive scanning and interpretation which can be used as a heuristic for research development. In the following sections, the assumptions of the model are given, a general description of the principle relationships is offered, and each of the major variables is defined. Subsequently, an inventory of specific propositions to be tested in this study is presented.

Assumptions

Consistent with previous conceptual schemes (Aguilar, 1967; Daft & Weick, 1984; Driver & Moch, 1975), the current model assumes that scanning and interpretation processes are key antecedents to organizational action, and are important determinants of organizational effectiveness (Dollinger, 1984; Pickle & Friedlander, 1967; Schneider, 1983; Weick & Daft, 1983). In addition, it is assumed that both micro (i.e., individual) as well as macro (i.e., system-relevant)

characteristics provide the context for scanning and interpretation processes (Thomas, 1980).

The current model takes an individual level of analysis for understanding the context and consequences of executive scanning and interpretation. Executives are chosen as the focus of study due to their critical role as boundary spanners, environmental scanners and interpreters of external information. Furthermore, since organizations, as social creations, have no ability to act except through human agents (Zammuto, 1982), the direct focus on the scanning and interpretation activities of executives avoids a potential problem of reification of the organization (cf. Silverman, 1971).

The information processing approach maintains that the process of scanning requires a conscious or unconscious choice on the part of the executive among multiple cues emanating from the external environment which demand his/her attention. The choices made by the executive are delimited by, and reflect those factors in the environment which are perceived as relevant to the executive's task (Weick, 1969).

Characteristics of the organizational system provide an important context for the processes and activities of individual members (Nadler, Hackman, & Lawler, 1979). Particularly for top-level executives who are held accountable for the actions and outcomes of the organization, the formal policies, strategies and "typical ways of doing things" in their specific organization will have a great impact on their selected strategies of scanning and interpretation (Kaufman, 1963; Ungson et al., 1981). Even at lower executive levels, organizational characteristics like policy and structure have been seen to place a significant

constraint on individual initiative (Kerr & Jermier, 1978).

Finally, previous research has suggested that executive role characteristics provide an important determinant of the amount and focus of environmental scanning and boundary spanning activity (Aguilar, 1967; Dollinger, 1984; Kefalas & Schoderbek, 1973; Schwab, et. al, 1985). The current model suggests that executive role characteristics will also impact executive strategies of interpretation of environmental data.

Overview

The proposed model is illustrated in Figure 2. This model suggests that the scanning and interpretation strategies developed by a given executive are bounded by three types of antecedent variables: 1) characteristics of the perceived external environment, 2) organizational characteristics, and 3) the individual role characteristics of the executive. The strategies of executive scanning, in turn, are presumed to have important consequences for organizational effectiveness and subunit performance. Characteristics of the organization are proposed moderators of the relationship between scanning and performance.

The dotted line which connects scanning and interpretation characteristics indicates the potential linkage between these variables. It is suggested that the scanning and interpretation processes are connected both logically and sequentially; that is, it is the data which is acquired through scanning strategies that form the subsequent content for interpretation. As previously noted, however, no empirical research to date has explicitly studied the relationship between scanning and interpretation. The conceptual model which proposed a

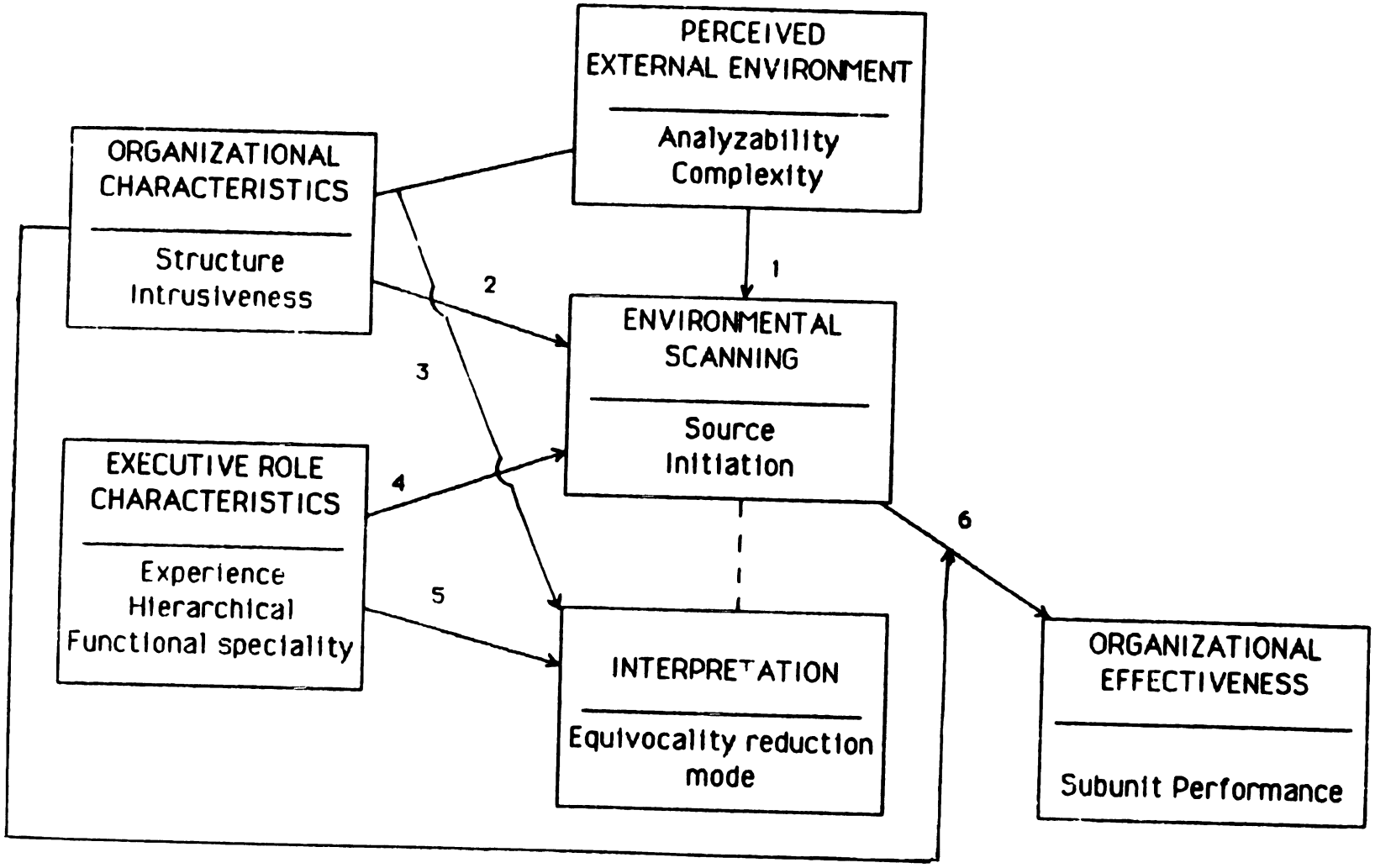


Figure 2 A Conceptual Model of Executive Scanning and Interpretation of the External Environment.

general consistency of scanning and interpretation modes (Daft & Weick, 1984) failed to successfully maintain a clear and consistent differentiation of the data acquisition versus sense-making characteristic of these processes. The confounding of the essential distinction between these variables does not, as a result, allow predictions concerning the nature of the relationship between scanning and interpretation. Because the focus of the current model is on the characteristics of scanning strategies and interpretation modes (rather than on general characteristics of the scanning and interpretation processes), no a priori rationale exists to justify predictions about linkages between scanning and interpretation. Therefore, although the conceptual model recognizes the potential relationship between scanning and interpretation, this linkage will not be directly addressed in the current study.

The arrows in Figure 2 represent the best a priori model of the antecedents and consequences of scanning and interpretation. Lines have been drawn to represent the major relationships between sets of variables. More complex relationships among these variables may exist. For example, two potential moderator effects are noted below. The remainder of this chapter presents a rationale for the causal relationships suggested by the directionality of these arrows, and elaborates on additional factors which may effect of some of the suggested linkages. While it is recognized that correlational data of the type presented in this study do not "prove" causality, the absence of hypothesized correlations would provide substantial evidence for rejection of causal hypotheses.

The model presented in Figure 2 suggests a general framework for understanding executive scanning and interpretation. Before presenting and defending the various linkages, definitions for each of the major variables will be provided.

Definitions and Major Relationships

Executive Scanning and Interpretation. The distinction between scanning and interpretation activities has frequently been difficult to maintain for, as Aguilar (1967) suggests, "we are dealing with two interacting halves of the same loop" (p.17). In the current model, however, a distinction will be drawn by focusing scanning on the activities of information search and acquisition, and by defining interpretation as the translating and sense-making process. The specific conceptual definitions of these variables are described in detail below.

Scanning Characteristics. Scanning is defined as the activity of searching for and acquiring data about events and relationships in an organization's external environment. Scanning source and scanning initiation are two particularly relevant aspects of scanning revealed by a review of the scanning literature.

Source of information is a characteristic of scanning that defines the point of origin from which data on the external environment is acquired. Sources have been classified as personal-impersonal and as internal-external to the organization (Aguilar, 1967; Culnan, 1983; Hambrick, 1979). Internal sources include subordinates, superiors, other organizational members, organizational documents and data banks; external sources include both objective documents and members of the external environment. Personal sources (also described as

"human" by Keegan, 1974) refer to data acquired through communication with other individuals (subordinates, peers, clients). Examples of impersonal sources include written documents, reports, and journals.

A second dimension along which scanning activities may be defined is the degree of scanning initiation, or the degree of active search which leads to data acquisition. As a dimension of scanning strategy, scanning initiation may be defined as the extent to which data search requires a direct request or action on the part of the executive. The principle component of this dimension reflects the extent to which an executive actively initiates the search for relevant data on the external environment when routinely acquired data proves inadequate. Thus, similar to the solicited versus unsolicited dimension used by Aguilar (1967), scanning initiation focuses on the strategies used by the executive for data search. Examples of high initiation include developing surveys to test the external environment, setting up committees to obtain information, and directly contacting members of the external environment to request information. Low initiation might include the review of routinely published reports, or, at an extreme, the total failure to search for information.

Interpretation characteristics. Interpretation is defined as the process by which acquired data on the external environment is translated into information useful to the executive and his/her organization for decision making and action. The current research focuses on the strategies used by the executive to process and make sense of data acquired through the scanning process.

A major component of the interpretation process has been identified as equivocality reduction (Daft & Weick, 1974). Equivocality of data acquired

through scanning procedures is experienced to the extent that data about the environment are subject to multiple interpretations. As a contextual factor, the amount of equivocality, or extent to which equivocality is perceived to exist in the acquired data, is predicted to set limits on the equivocation reduction strategies which an executive uses.

Strategies for reducing equivocality are aimed at achieving a single interpretation of the data. Little previous research exists to describe the specific modes used by executives for interpretation of strategic information, but an attempt will be made to suggest a tentative schema for modes of interpretation.

Borrowing from the notion of autocratic versus consultative decision-making styles described by Vroom & Yetton (1973), the current model suggests that an executive engaged in interpretation may exhibit a preference for individual versus consultative sense making strategies. An "autocratic" mode might involve a preference or general tendency toward intra-executive analyses (i.e., those in which the executive-scanner reaches an acceptable interpretation without help from anyone else). In contrast, an executive may exhibit a preference for equivocality reduction through a "consultative" mode, which involves discussion with other executives or subordinates to reach a common interpretation. Given that previous research does not exist to suggest the conditions under which one style of interpretation will be preferred over another, a tentative hypothesis is derived from the conceptual models proposed in the information processing and interpretation systems literature.

Perceived Environment. Traditional definitions of the construct of external environment have relied heavily on a limited set of critical characteristics of the

environment which are perceived by organizational members. Perceived environmental uncertainty has been the most frequently studied characteristic of external environment in past research (Duncan, 1972; Lawrence & Lorsch, 1967; Neghandi & Reiman, 1972). Other dimensions of perceived environment included in previous research are turbulence, complexity, instability and heterogeneity (Dill, 1958; Emery & Trist, 1965; Pugh, Hickson, Hinings & Turner, 1969; Terreberry, 1968; Thompson, 1967). Rather than relying solely on previous research, however, the dimensions of external environment used in the current study were selected for consistency with the information processing assumptions of the proposed model.

From an information processing perspective, the organization's external environment represents a collection of highly complex and equivocal stimuli that emanate from multiple constituent groups that interact with and constrain the organization (Weick, 1979). Each constituency sends equivocal cues to the organization on the nature of its demands and preferences for organizational performance, and is biased in its assessment of the organization's activities based on the degree of satisfaction of these demands (Connally, Conlon, & Deutsch, 1980).

Due to information processing limitations, individuals in organizations are only able to attend to a small subset of the total number of cues available in the external environment. A major dimension which may affect the degree to which an executive will search for and/or be receptive to given environmental cues involves the level of perceived analyzability of the environment.

Daft and Weick (1984) suggested that assumptions about the analyzability of the environment are derived from the perceived characteristics of the environment combined with management's previous interpretation experience. Characteristics of the environment which help to shape these assumptions include the degree and rate of change and predictability of external constituent demands, difficulty or ease of penetration, and accessiblity of external sources of information. No empirical research exists to date that suggests the extent to which these constitute separate (i.e., independent) dimensions or equivalent measures of the construct of analyzability. Daft and Weick's discussion emphasizes the need to investigate the contribution of each characteristic to our understanding of perceived analyzability. The current research attempts to operationalize and incorporate the notion of analyzability as an important component of perceived environment. This component has been omitted from prior research on scanning and interpretation.

Previous research on organization-environment interaction has shown that when the environment is subjective, difficult to penetrate or changing (Duncan, 1972), managers will see it as less analyzable (Perrow, 1967; Tung, 1979). A highly analyzable environment is seen as rationalized, that is, subject to discernible, predictable uniformities in relationships among significant objects. Major differences have been found in the extent to which environments were seen as analyzable versus unanalyzable (Aguilar, 1967; Wilensky, 1967).

Complexity is a second dimension of the external environment which is relevant to managerial scanning and interpretation strategies. As environments become more complex or heterogeneous, requirements for information about the

environment increase (Gifford, Bobbitt, & Slocum, 1979; Tushman & Nadler, 1978). Leifer and Delbecq (1978) suggested that increased information need is a key antecedent to increased boundary spanning activity. It has also been suggested that managers pay greater attention to cues which are relevant to their specific tasks and that environmental complexity affects individual decision making and information processing (Driver & Streufert, 1969).

Environmental complexity is defined by the nature and number of external constituencies which are relevant to a given executive's task. At the executive level, this may include both the number of different constituency groups (e.g., the number of different types of industries) a given executive is responsible for monitoring, as well as the number of members within each constituent group (e.g., one versus multiple organizations within each industry). A third component of the construct of complexity focuses on the nature of interactions with the external environment (similar to Culnan's, 1983, notion of task complexity). This component can be defined in terms of the number of different types of modes of interaction (e.g., types of services or products provided to the external environment) required by the executive's task.

An overall measure of perceived environmental complexity is defined as the number of constituent groups and nature of interactions relevant to the executive's task. As an example, a highly complex environment for a university might be typified as involving the provision of multiple services (e.g., teaching, research, extension services) to many members of multiple constituent groups (undergraduate students, research funding institutions, community service agencies).

It is suggested that complexity is a characteristics of perceived environment distinguishable from analyzability. For example, a university executive may provide a basic service for one constituent group (e.g., an alumni director solicits funds from alumni). The environment will be perceived as highly analyzable if the executive is able to comprehend and anticipate the dynamics of the interactions with this constituent. On the other hand, an executive's task may require a very specific and direct relationships with only one constituent (e.g., automotive parts suppliers--General Motors) yet the executive may find it impossible to predict changes in the demands of the constituent. Thus, the current model suggests that complexity and analyzability are separate dimensions of perceived external environment.

Organizational Characteristics

In addition to the perceived characteristics of the external environment, characteristics of the organization as a system provide a context for the development of individual behavior and strategy (Katz & Kahn, 1978). Organizational characteristics are defined as the distinguishing properties of the formal structure and policy on the acquisition and interpretation of data on the external environment. Traditional measures of organizational context include size, age and line (or type) of business (James & Jones, 1978). In the scanning and boundary spanning literature, size, industry and formalization are characteristics included in previous research (Aguilar, 1967; Hambrick, 1981; Keegan, 1974; Schwab et al., 1985).

Consistent with the information processing perspective, it is assumed that structural characteristics provide a particularly important context for executive

scanning and interpretation. Two frequently measured characteristics of organizational structure are formalization and inflexibility (Keegan, 1974; Kerr & Jermier, 1978; Thomas, 1980). Organizational formalization has been characterized by the existence of written work goals, guidelines and ground rules. Inflexibility has been defined in terms of the rigidity of organizational rules and operating procedures. The lack of decision-making autonomy associated with a more formalized, inflexible organizational structure is predicted to affect the extent to which executive scanning and interpretation strategies deviate from established organizational policy. Similarly, formalization and inflexibility are expected to influence the extent to which an executive's practices will have an impact on the performance of his/her subunit.

A second organizational characteristic predicted to affect executive scanning and interpretation is organizational policy regarding data acquisition and interpretation strategies. The essence of this characteristic is captured in the notion of "organizational intrusiveness" discussed in Daft and Weick (1984). Intrusiveness is defined as the extent to which organizational policy supports the active monitoring, search and/or manipulation of the external environment. Structural indicators of organizational intrusiveness include the presence of planning, forecasting, and/or research departments, the relevance or impact of these types of activities to the overall objective and strategy of the organization, the formality and routinization of planning structure, and the allocation of resources to search activities (Daft and Weick, 1984). Additionally, the attitudes of key executive officers on the importance and appropriate procedures for scanning and interpretation may be important indicators of organizational

intrusiveness.

Beyond the direct effects of assumptions about the external environment and organizational instrusiveness on executive scanning strategies, the current model suggests that these variables may jointly affect executive interpretation, i.e., equivocality reduction. Specific propositions on this relationship are developed based on interpretation systems theory.

Individual Characteristics

Little is known about the individual attributes associated with the motivation to attend to the organization's larger environment or the ability to accurately comprehend it (Schneider, 1983). A few studies have suggested that personality characteristics, such as locus of control, affect strategy and innovation (Brockhous, 1975; Driver & Streufer, 1969; Miller et al., 1982), but empirical evidence relative to executive scanning behavior has been inconclusive.

More persistent in the literature on boundary spanning and environmental scanning has been the study of the characteristics associated with the executive's role. Executive role characteristics are defined as attributes of the executive which are associated with the performance of the executive's principle tasks. Consistent with past research, the current model suggests that use of information sources will be in part determined by the functional specialty, level of hierarchy, and previous experience of the executive (Aguilar, 1967; Hambrick, 1982; Kiesler and Sproull, 1982). Functional specialty is defined as the area of specialization to which the executive's role responsibilities and major tasks adhere. Examples of functional specialty in universities include business, medicine, and agriculture. Hierarchical level is defined by the position the

executive holds in the organizational chain of command, and is usally delimited in the organizational chart. Previous experience is defined as the number of years/ months of formal occupancy of the executive role. The current model suggests that these characteristics, found to be important in studies of profit-making organizations, will also be relevant for the study of universities.

Organizational Effectiveness

The construct of organizational effectiveness has been frequently used in previous research as an "ultimate dependent variable" (Campbell, 1977), bottom-line measure of performance (Nord, 1983), and major criterion for organizational assessment (Pfeffer, 1977). Given the recent criticisms leveled by several authors of the lack of theory-guided research on organizational effectiveness, and the failure of researchers to specify the rationale for choice of effectiveness criteria (Cameron & Whetton, 1983; Seaton, 1985), the current research sought to define the effectiveness construct consistent with the perspective of organizations taken in the proposed conceptual model.

The information processing model emphasizes the role of scanning and interpretation processing in increasing the ability of the organization to respond to or enact the external environment. The ultimate criteria for effectiveness is seen as organizational survival, which is heavily dependent on appropriate organizational adaptation to the external environment.

An important indicator of appropriate adaptation is the organization's success in securing critical resources (Pfeffer & Salancik, 1978). Organizational effectiveness has been defined as the ability of the organization to exploit its environment in the acquisition of scarce and valued resources (Yuchtman &

Seashore, 1967). Consistent with the information processing model described in the current chapter, this definition of organizational effectiveness emphasizes the importance of organization-environment exchange processes, and the function of the environment as receiver of outputs and source of inputs required for organizational survival.

A second indicator of organizational effectiveness consistent with the multiple-constituent definition of the environment is the extent to which the organization satisfies the demands of a subset of critical constituents. The conceptual model developed in this chapter suggests that a comprehensive consideration of the effectiveness of a given organization involves, foremost, the determination of the subset of constituents which are perceived by organizational members as most critical to organizational survival (Zammuto, 1982). Once this subset is determined, effectiveness can be measured as the extent to which the varying and perhaps conflicting needs of each member of this critical subset are met. Such an exhaustive consideration, while conceptually relevant, is beyond the scope of the current research. In the present study, an intermediate approach is used which focuses directly on the satisfaction of the needs of a single environmental constituent whose relevance to organizational survival has been suggested by previous research.

Given the complex and often political nature of modern social organizations, the contributions of individual behavior to overall effectiveness are frequently weighted by a multitude of intervening considerations (e.g., the interdependence of subunits, subunit power, organizational structure). As a result, the strategies and actions of an executive are likely to have the most detectable impact on the

performance of the executive's subunit. Therefore, in the current research, it is suggested that, while executive scanning strategies may ultimately impact the overall effectiveness of the organization, the most immediate effect will be on the performance of the executive's subunit. Thus, the dependent variable measured in the current research was subunit performance, as defined in terms of resource acquisition and satisfaction of constituent demands.

Even at the subunit level, characteristics of the organization may have an impact on the relationship between individual behavior and subunit outcomes. The current model suggests that the characteristics of organizational structure constrain the impact of executive scanning strategies on subunit performance.

Summary:

Based on the above definitions and general relationships among the variables in the scanning and interpretation model, the present study seeks to further refine the research questions presented in Chapter II. These questions, and their relationships to the linkages in the model (Figure 2) are summarized below.

1. How do executives scan and/or interpret their external environment?
    - 1.1 How do they get information on a relevant constituent in the external environment? Are they proactive in searching for information, or does it most frequently come to them, unsolicited, through routine procedures?
    - 1.2 What sources are most frequently used?

1.3 How do they make sense of equivocal information? Do they, for example, base interpretations on their own knowledge, past experience, opinions of subordinates or peers?

2. What effects do differences in executive role, organizational and perceived environmental characteristics have on the ways in which executives scan and/or interpret their external environments?

2.1 Is there a consistent relationship between the assumptions the executive makes about the external environment and the ways in which he/she approaches the tasks of scanning and/or interpretation? (Links 1,3).

2.2 Do organizational structure and policy significantly impact scanning and/or interpretation strategies? (Links 2,3).

2.3 Do scanning and/or interpretation strategies vary as a function of the executive's amount of previous experience, hierarchical position, or functional specialty? (Links 4,5).

3. Is there a significant relationship between the scanning strategies used by executives and the effectiveness of their subunits?

3.1 Do organizational characteristics act as moderators of the relationship between scanning strategies and subunit effectiveness? (Link 6).

Hypotheses

In an attempt to further specify the expected direction of the relationships suggested by the general model, a list of tentative propositions has been derived from the limited empirical evidence available. In the absence of specific empirical evidence, certain hypotheses have also been added based on previously proposed conceptual descriptions of the variables in the model.

Link 1. Perceived External Environment/Scanning. Some support exists for the relationship between analyzability of the environment and scanning activities. Keegan (1974), in a study of 13 international corporations, found that managers in less analyzable environments relied more heavily on information obtained from colleagues in the environment (i.e., external personal sources). Daft and Weick (1984) suggested that the less analyzable the perceived external environment, the greater the tendency for managers to acquire data from personal contact with other managers. When the environment is assumed analyzable, a larger portion of data will be acquired through formal, impersonal sources. This suggests the following hypothesis:

H_1: The use of personal versus impersonal sources is correlated with the level of perceived analyzability of the environment.

H_1a: Executives will use personal sources more frequently than impersonal sources when the environment is unanalyzable.

Research on the relationship between environmental complexity and source usage has been scarce, and no studies have been found in the scanning literature which approach the construct of complexity from a multiple constituent or an information processing perspective. Only one study directly measured the relationship between task complexity and source usage. Culnan (1983) found that the frequency of use of information sources was positively related to the perceived complexity of the task environment. An attempt is made in the current research to test the generalizability of this result, thus suggesting:

H_2: There is a positive relationship between environmental complexity and the frequency of scanning source usage.

Link 2: Organizational Characteristics-Scanning. Although the effect of organizational intrusiveness on executive scanning strategy has not been studied, the literature reviewed suggests that executives, as key agents of organizational action, would be influenced by organizational policy on intrusiveness into the external environment. To actively scan the external environment, executives depend on appropriate resources (e.g., funds for travel) which are frequently allocated from the overall organizational budget. In addition, executives require the approval of and support from upper management to include scanning as a part of their role and function. Organizations which actively intrude into the environment, according to Daft and Weick (1984), allocate resources to search activities, build planning, forecasting or special research departments, and may send agents into the field to gather intelligence data. It is expected, then, that executives in intrusive organizations

will be encouraged by organizational policy to more actively scan their environments. Therefore, a positive relationship is predicted between organizational intrusiveness and frequency of executive initation of search for external data.

Results of research by Kerr and Jermier (1978) suggest some caution relevant to this prediction. In that study, it was found that organizational formalization and organizational inflexibility were two structural characteristics which to some extent moderated the impact of leadership mode on subordinate performance. Translated to the above proposition, this finding suggests that, in the transition from organizational policy to individual action (executive scanning), the degree to which the organization is characterized by written work goals, guidelines and rigid rules and operation procedures may be a relevant consideration. This relationship is illustrated in Figure 3 and a rationale for the expected linkage is discussed below.

It may be reasoned that, in highly formalized and inflexible organizations, consistency with organizational policy is demanded. Hence, if organizational policy supports and rewards active intrusivness into the environment, executives will more frequently initiate search for external data. In organizations characterized by less formalization and greater flexibility in the range of acceptable ways of interacting with the environment, there will be a weaker relationship between organizational policy and executive scanning. Consistent with this view, Egelhoff (1982) found that both the type and level of individual information processing varied according to organizational structure.

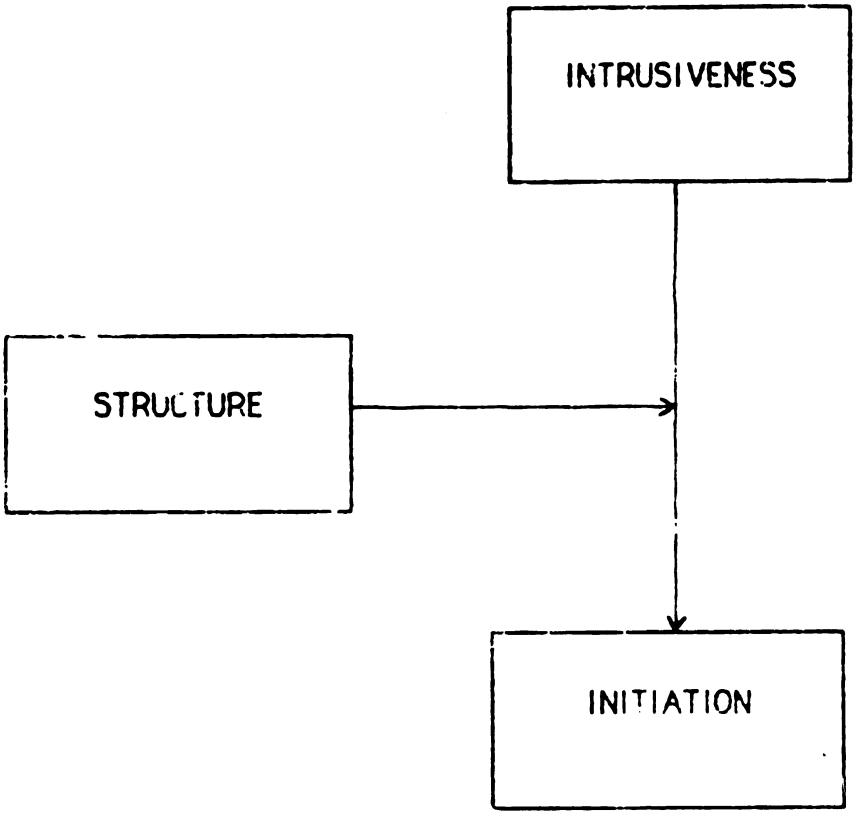


Figure 3 Relationship Between Structure, Intrusiveness and Scanning Initiation.

Thus, it is proposed that:

H_3: The degree of relationship between policies of organizational intrusiveness and executive initiation of search will vary with the characteristics of organizational structure.

H_{3a}: When organizational structure is highly formalized, organizational intrusiveness and initiation of search will be correlated positively.

H_{3b}: When organizational structure is low (not formalized), organizational intrusiveness and initiation of search will not be correlated.

Link 3: Perceived Environment and Organizational Characteristics/ Interpretation. In general, it has been suggested that, when the environment is perceived as hostile or threatening, more resources will be allocated to information acquisition activities (i.e., intrusiveness will increase) (Wilensky, 1967). Hedberg, (1981) also suggested that when the environment is perceived as benevolent, organizations have weaker incentives to be intrusive. Thus, one might expect a naturally occuring negative relationship between perceived analyzability of the external environment and organizational intrusiveness, so that the greater the degree of analyzability of the environment, the less emphasis the organization will place on supporting the environmental scanning activities of the executive.

Daft and Weick (1984), however, suggested a more complex interaction between analyzability and organizational intrusiveness as it relates to subsequent interpretations of data on the external environment. They proposed that equivocality reduction will be greatest in organizations characterized as undirected viewing (unanalyzable environment, low organizational intrusiveness). Because data acquisition in undirected viewing organizations is irregular and acquired through personal contacts, the acquired external data will be subject to multiple interpretations. Under these conditions, it is assumed that executives will reduce equivocality through extensive discussion with other executives to achieve a common interpretation (Weick, 1979). In conditioned viewing and discovering organizations (analyzable environment), equivocality will be reduced primarily through routinization and systematic analyses of data, and less discussion is needed to interpret environmental cues.

The proposed relationships between organizational intrusiveness, perceived analyzability of the environment, and interpretation have not been systematically investigated. Hence, based on the conceptual propositions established by Daft and Weick (1984), the current model proposes that:

H_4: Both perceived analyzability of the environment and organizational intrusiveness will signficantly effect equivocality reduction mode.

H_{4a}: When the perceived environment is unanalyzable and organizational intrusiveness is low, equivocality reduction will most frequently be achieved through the

consultation mode.

H_{4b}: When the environment is assumed analyzable and organizational intrusiveness is high, perceived equivocality will be low and consultation will be less frequently used.

Link 4: Executive Role Characteristics-Scanning. Several researchers have investigated the impact of executive role on scanning amount and initiation. Aguilar (1967) found that experienced managers received significantly more solicited (i.e., manager-initiated) information than did less experienced managers. It is predicted that this relationship will be stable across different types of organizations, thus suggesting:

H_5: More experienced executives will actively initiate search procedures more often than less experienced executives.

The relationship between functional specialty, and hierarchical level and frequency of scanning source usage has been suggested in previous research, but support has not been consistent across studies. Thus, these relationships will be considered in the current study, which proposes that:

H_6: The frequency of use of specific information sources is related to the functional specialty and hierarchical level of the executive.

Link 5: Executive role/Interpretation. Several authors have suggested that experience is a major determinant of interpretation (Daft & Weick, 1984; Driver & Mock, 1975; Schroder et al., 1967). No predictions were found, however, on the nature or direction of this relationship. In general the literature on organizational

behavior suggests that individuals with less experience in their roles may depend more on others within the organization for assistance in interpreting task-relevant data. Based on this general rationale, the current model seeks to explore the relationship between executive experience and equivocality reduction mode, and suggests the following tentative hypothesis:

H_7: Less experienced executives will use consultative modes for equivocality reduction more often than more experienced executives.

Link 6: Scanning and Subunit Performance. While not ignoring the role of many intervening organizational process variables, the current model seeks to explore the relationships between characteristics of executive scanning activities and subunit performance. Initial support for the existence of the scanning/ performance relationship was provided by Dollinger (1984) who found a positive relationship between the intensity and extensity of boundary spanning activities and an organization's financial performance.

Research by Kerr and Jermier (1978) suggests, however, that the extent to which executive practices will affect organizational outcomes will be in part dependent upon organizational formalization and inflexibility of rules and policy. Therefore, it is suggested that:

H8: The relationship between executive scanning strategies and subunit performance will be dependent upon the level of organizational structure

H_{8a}: When organizational structure is low, scanning and performance will be positively correlated.

H_{8b}: When organizational structure is high, scanning and performance will not be correlated.

Table 2 summarizes the predicted relationships between the variables described by the conceptual model developed in the current study. The next chapter provides a description of the method and procedures used to test the suggested hypotheses.

Table 2

Conceptual Links and Hypotheses

Link	Hypothesis
1	H_1: The use of personal versus impersonal sources is correlated with the level of perceived analyzability of the environment.
	H_1a: Executives will use personal sources more frequently than impersonal sources when the environment is unanalyzable.
1	H_2: There is a positive relationship between environmental complexity and the frequency of scanning source usage.
2	H_3: The degree of relationship between organizational intrusiveness and executive initiation of search will vary with the level of organizational structure.
	H_{3a}: When organizational structure is highly formalized, organizational intrusiveness and initiation of search will be correlated positively.
	H_{3b}: When organizational structure is low (not formalized), organizational intrusiveness and initiation of search will not be correlated.
3	H_4: Both perceived analyzability of the environment and organizational intrusiveness will signficantly effect equivocality reduction mode.
	H_{4a}: When the perceived environment is unanalyzable and organizational intrusiveness is low, equivocality reduction will most frequently be achieved through the consultation mode.
	H_{4b}: When the environment is assumed analyzable and organizational intrusiveness is high, perceived equivocality will be low and consultation will be less frequently used.
4	H_5: More experienced executives will initiate active search procedures more often than less experienced executives.
4	H_6: The frequency of use of specific information sources is related to the functional specialty and hierarchical level of the executive.
5	H_7: Less experienced executives will use consultative modes for equivocality reduction more often than more experienced executives.

Table 2 (cont'd)

6	H8:	The relationship between executive scanning strategies and subunit performance will be dependent upon the level of organizational structure
	H_{8a}:	When organizational structure is low, scanning and performance will be correlated.
	H_{8b}:	When organizational structure is low, scanning and performance will not be correlated.

CHAPTER IV

METHOD

Sample

One of the questions of interest in the current research concerned the extent to which descriptive findings on scanning practices of profit-making business firms were relevant to the scanning and interpretation activities of other types of organizations. To answer this question, public universities were selected as the population for the current research. Universities were considered a relevant target of study for several reasons. First , data on their activities, budgets and policies is accessible to the public. Secondly, recent changes in the economic structure surrounding public universities suggested an appropriate context for the study of strategies of data acquisition and interpretation of information on the external environment.

The current environment of American Universities has been characterized as one of tightening finances, declining enrollments and rapid change (Keller, 1983). One approach taken by public universities to combat declining levels of funding from state and federal governments (traditionally, the most powerful environmental constituents and suppliers of resources) has been to develop and explore ties to organizations in the private business sector. Prior to the development of the current study, a study was conducted to determine the status and nature of linkages between universities and business firms in the given geographical region. The current research was designed in conjunction with that

study to provide specific indications of the scanning and interpretation strategies of executives of the participating universities.

Subjects. Participants in this study were executives from four midwestern research universities. The total sample included 142 executives in four major administrative positions: deans and assistant deans (16%), directors and assistant directors (25%), department chairs (50%), and coordinators and supervisors (8%). Average previous experience in the executive position was 10.6 years.

Procedure

The presidents of four large public Midwestern research universities were contacted and agreed to participate in a project designed to study the levels of interaction between public institutions of higher education and business firms. A preliminary study was conducted at each of the four participating institutions to determine the existence and extent of university-industry linkage, and to identify university subunits with an established history of contact with private business firms. Since it may be argued that not all functional units within a given university would consider the business environment an appropriate constituent, it was important to determine the extent to which specific subunits defined the private business firm as a relevant environmental constituent (i.e., having some impact on the unit as a source of resources, receiver of services or output, etc.)

Telephone interviews with unit heads (e.g., deans, program directors) were used to determine the general nature and extent of contact with the business environment. The results of the preliminary study provided a list of 9 functional units which, across the four universities, had definable levels of contact with the

business environment. These units were included in the current study: Agriculture and Natural Resources, Business, Computer Services, Education, Engineering, Liberal Arts , Lifelong Learning, Medicine, and Natural Science.

A questionnaire and cover sheet explaining the purpose of the present study were mailed to 142 executives in the identified subunits at each university. Included with the questionnaire was an addressed stamped envelope for returning the questionnaire directly to the researcher, thus assuring the confidentiality of the responses. A follow-up letter was mailed to all subjects two weeks later to encourage them to complete and return the questionnaire.

In addition, 23 personal interviews were scheduled with higher ranking university officials (Vice Presidents, Deans) to gain qualitative data on organizational context variables and data on the official's scanning and interpretation activities. For these executives, the same items covered in the mailed questionnaire were used in an individual interview protocol, and responses were recorded by a team of two interviewers. Interview and questionnaire data were examined for evidence of systematic differences in response. No differences were found, and interview and questionnaire data were therefore combined for the purpose of data analysis.

Research Instruments.

Given the descriptive nature of the majority of research on environmental scanning, most of the instruments used to measure these processes have been designed by the researcher for the specific organizations/industries included in the sample (e.g., Hambrick, 1979). As a result, no standardized instrumentation was available to measure scanning, and instruments which would be appropriate

for measurement of the analyzability and intrusiveness constructs, in particular, have not been developed to date. The first task of the current study, therefore, was to construct an instrument to measure the variables described in the conceptual model.

A questionnaire was developed to measure the dimensions of perceived environment, executive role characteristics, organizational characteristics and scanning and interpretation activities described in the conceptual model. Indicators for each of these variables are listed in Appendix A, and a sample questionnaire is provided in Appendix B.

Content validity of survey items was assessed through the use of academic experts and practicing administrators in the four universities. In a pilot study, the questionnaire was administered in a structured interview format to 30 university administrators and 10 organizational researchers. In addition to giving specific responses to questionnaire items, participants were asked to make editorial suggestions to improve the clarity and relevance of each item. The final scales are described below.

Scanning Variables: The major dimensions of scanning are scanning source and scanning initiation. Scanning source was assessed by asking subjects to indicate the frequency (on a seven point scale ranging from "not at all" to "daily or more often") with which they routinely received information about business firms from each of ten different sources. The list of sources was narrowed from lists used by previous researchers and through pilot interviews with executives in the four universities. Sources were distinguished as personal (e.g., those requiring face-to-face or verbal contact) and impersonal

(e.g.,documents, data bases, periodicals). Respondents' estimates of their use of each type of source were summed to obtain an overall score which represented the total frequency with which they regularly received external information from all sources. In addition, a separate score was calculated for the total frequency of use of personal and impersonal sources.

Scanning initiation was measured on a seven point scale which asked respondents to indicate how often they used any of 12 different approaches to actively search for information (i.e, go beyond that which they routinely receive) about business firms. Examples of approaches ranged from "review routinely published reports" to ""call someone in the relevant business firm", "send surveys to business firms" (A complete list of items for this dimension appears in Appendix C).

Interpretation Variables. The major dimension of executive interpretation considered in this study was equivocality reduction mode. The degree of equivocality was also considered to provide the context for understanding equivocality reduction mode. For degree of equivocality, respondents were asked to indicate on a five point scale the frequency ("never" to "almost always") with which they receive unclear data on business firms. The single equivocality reduction mode item asked respondents to describe the approaches taken to reduce ambiguity. Responses were independently coded by two raters to represent autocratic versus consultative modes. Intercoder reliability was .93.

Perceived Environment Characteristics. Two dimensions of perceived environment considered in this study were environmental complexity and analyzability. Complexity was measured in three ways: 1) Frequency of

participation in each of 10 different cooperative activities with business firms (interaction modes); 2) total number of industries with which the unit had cooperated (e.g., provided courses, research or training programs) in the previous two year period, and 3) total number of firms with which the unit had cooperated in the last two years. A total complexity scale was formed by combining the three indicators of complexity.

A four item scale was designed to measure the construct of analyzability as defined by Daft & Weick (1984). Two items referred to the existence or frequency of change in business firm's requests for services from the unit, while the other two items asked respondents: To what extent were changes in business firm's requests predictable? ("Not at all" to "extremely predictable"); and, How easy is it to get information about the needs which business firms have for services from your unit? The three indicators of analyzability were labeled change, predictability, and accessibility, respectively.

Organizational Characteristics. Two major organizational variables predicted to impact executive scanning and interpretation were structure and intrusiveness. Organizational structure was measured using four items adapted from Kerr & Jermier's (1978) scale of formalization and inflexibility (see Appendix C). These items tapped the extent to which formal guidelines, written goals and objectives, and formal and consistent policies exist to govern cooperation between the university and industry.

A scale was constructed to measure the construct of organizational intrusiveness, drawing from the conceptual descriptions of Daft and Weick (1984). Accordingly, three components included in the construct were resource

allocations for scanning activities, organizational policies which encourage or discourage active involvement with industry, and the existence and relevance of formal planning units within the university which take into account trends in the business sector. These components were labeled resource allocation, policy and planning, respectively. As a supportive indicator of formalization, copies of existing written policies relevant to extramural activity were solicited from each of the participating universities.

Resource allocation was measured by the percent of the unit's total discretionary budget allocated to support scanning activities. Policy was assessed as the extent to which each of 8 university policies encouraged or discouraged active participation in industry-university interactions (on a five point scale which ranged from "strongly discourages" through "strongly encourages"). Examples of policies included consulting for pay, overhead, proprietary research, and copyright. In addition, respondents were asked to indicate whether the university had, to their knowledge, a unit for long-range, formal planning, and to indicate the extent ("not at all" to "to a very great extent") to which formal planning took into account trends and events in the business environment.

Executive Role Characteristics. To assess the relationships described by the conceptual model, three executive role characteristics were measured in the current study. Hierarchical level was measured by asking the respondents to identify their current positions from a list which included dean, assistant/ associate dean, director, assistant/associate director, chair, coordinator and supervisor. Similarly, functional speciality was determined by the unit for which the administrator was directly responsible (e.g., business, computer science), as

reported on the survey and verified by the mailing list. Finally, experience was assessed based on the respondent's answer to two questions: "How many years have you held this position at this university? How many years have you held an administrative position (at any university) prior to taking your current position?". Total administrative experience was computed (in whole years) as the sum of the two experience items.

Subunit Performance. Respondents were contacted two months after completing the questionnaire to gather data on subunit performance relevant to cooperative interaction with business firms. Performance criteria were chosen based on a previous study of most frequent university-business firm interaction modes in the same sample of universities (Pelz, 1985). Results of Pelz's study suggested that two consequences of university-industry interaction which are valued by both university and business are research grants and contracts obtained by subunits from business firms, and courses provided by the subunit to industry.

Data were obtained from archival records (when available) on the total dollars for research grants and contracts received by each subunit from industry for the 1982-83, and 1983-84 academic years. A second measure of subunit performance was the total number of courses (including training programs, in-house courses, and those offered at the university where 50% or more of the participants were sponsored by industry) offered by the subunit for industry during the same two academic years. When no written data were found for these variables, respondents were contacted by telephone, and asked to provide a reasonable estimate of these values. Since there was no a priori rationale for

assumed dependence of research grant dollars and course offerings, these measures were used as independent indicators of subunit performance. Total dollars in grants were combined for the two year period, and total number of courses for the same time period was used as the second criterion of subunit performance.

Data Analysis.

The psychometic properties of the scales measured by the questionnaire were examined. Coefficient alphas were computed to determine the internal consistency reliability of each of the scales, and the intercorrelations among the scales were examined. Table 3 summarizes the data analysis techniques used to test the suggested research questions, corresponding linkages and hypotheses.

Question 1: Description of executive scanning and interpretation of the external environment. Descriptive analyses (means, percentages, frequencies) were used to determine the relative frequency of routine versus active search, the most commonly used sources for routine and active search, level of formalization of scanning activity and the most frequently used interpretation modes.

Question 2: Effects of individual, organizational and perceived environmental charateristics on scanning and interpretation. Data analysis for Hypotheses 1 and 2 required a test of the significance of zero order correlations between analyzability and frequency of source usage (H_1) and complexity and source usage (H_2). Hypothesis 3 suggested the moderator effect of structure on the relationship between organizational intrusiveness and scanning initiation,

Table 3

Summary of Relationships For Hypothesis Testing and Data Analysis

Link	Independent Variable(s)	Dependent Variable	Data Analysis (Statistic)
1 (H1)	Analyzability	frequency: source usage ratio personal/ impersonal	zero-order correlation (Pearson)
1(H2)	Complexity	frequency of source usage	zero-order correlation (Pearson)
2 (H3)	Structure (moderator) Org. intrusiveness	scanning initiation	Subgroup Analysis
3 (H4)	Analyzability org. intrusiveness	Reduction mode	Multiple Regression
4 (H5)	Experience	Scanning initiation	Pearson corr
($H6_a$)	Functional specialty	scanning source	ANOVA
($H6_b$)	Hierarchical level	scanning source	ANOVA
5 (H7)	Experience	reduction mode	CHI SQUARE
6 (H_8)	Structure (moderator) scanning initiation	subunit performance	Subgroup Analysis

and was assessed by examining the significance of the difference of the correlations between intrusiveness and initiation for high versus low structure subgroups. The median value for the combined structure items was used to dichotomize the continuous scale. Hypothesis 4 addressed the joint effects of analyzability and organizational intrusiveness on reduction mode, and was assessed using multiple regression of the three measures of analyzability, and organizational instrusiveness on reduction mode.

The relationship assumed in Hypothesis 5 was tested by the significance of the zero-order Pearson correlation between experience and scanning initiation. Anaysis of variance was used to examine Hypothesis 6 (source usage by functional specialty and hierarchical level) , and a chi square test was used to determine differences in equivocality reduction determined by experience (Hypothesis 7). Subgroup analysis was used to test Hypothesis 8 which suggested that structure moderated the relationship between organizational performance and scanning initiation. The structure scale was dichotomized at the median, and a test of the significance of difference in correlation betweem performance and initiation for each structure subgroup was applied.

Response Rate

Of the 142 questionnaires mailed to executives at the four universities, 108 were returned in usable form, for a 76% response rate. Twenty-three of the twenty-four scheduled personal interviews were completed, yielding a total sample size of 131 respondents, and an overall response rate of 79%. No systematic difference was detected in the response rates of subsamples of executives by university.

Psychometric Properties of the Survey Scales

Before testing the hypotheses suggested by the model of scanning and interpretation, the psychometric properties of the each of the scales assessed by the questionnaire were examined. Inter-item correlations and Cronbach Alpha reliability coeficients were calculated for each of the multiple-item scales.

Reliability. Table 4 contains the coefficient alphas for each of the multiple-item scales measured in the questionnaire. With the exception of the analyzability and structure scales, coefficient alphas ranged from .79 to .85, well above the .50 to .60 level suggested by Nunnally (1967) as satisfactory for exploratory research of this type.

Inter-item correlations. A closer analysis of the properties of the analyzability and structure scales suggested the need for revision and/or refinement of these scales. For the three items which presumably measured analyzability (predictability, rate of change, and accessibility of information), inter-item correlations were -.41 (change-predictability), .00, (predictability-accessibility), and -.12 (change-accessibility). The average inter-item correlation for the scale was -.08. A closer examination of each of the three items revealed that this result could not be explained as a coding error, since the directionality of each response set was scaled consistent with conceptual definitions of the analyzability construct. Thus, it may be concluded that, although conceptual descriptions of the construct of analyzability (Daft & Weick, 1984) propose these variables as equivalent measures of the construct, they may in fact measure quite different aspects of the perceived external environment. Therefore, for the purpose of further analysis of the hypotheses related to the construct of

TABLE 4

COEFFICIENT ALPHAS FOR SURVEY SCALES

Scale	No. of Items	Coefficient Alpha
Scanning Source	10	.83
Scanning Initiation	12	.85
Complexity	12	.79
Analyzability	3	- .30
Intrusiveness	16	.80
Structure	4	.23

analyzability, these items were treated as separate and independent indices of perceived external environment.

In an effort to improve the reliability of the structure scale, items with low or negative correlations with other items in the scale were removed. As a result, the two items which presumably measured organization inflexibility were eliminated from further analysis. The revised scale consisted of two items which tapped the specific characteristics of organizational formalization and correlated .43.

Inter-scale correlations. The lack of standardized and valid instrumentation to measure the constructs suggested by the theoretical model necessitated several novel operationalizations of constructs in the current study. To provide an overview of relationships between variables included in the model, Table 5 presents the inter-scale correlation matrix for the eight scales measured in the survey. In general, the inter-correlations among variables in the model are relatively low, suggesting some discriminant validity. The high correlation between scanning source and scanning initiation (r (75)= .79, $p < .05$), however, demonstrates a lack of discriminant validity. A post hoc explanation for this finding is that the source and initiation questions were placed sequentially on the survey, and although repondents were asked to respond to "routinely" acquired information versus active search ("when routine information is insufficient"), this distinction may not always have been maintained by the respondent.

No significant correlation was found between complexity and any of the three measures of analyzability (i.e., among measures of perceived environment characteristics). Of the executive role characteristics, a significant correlation was found, as would be expected, between hierarchical level and experience,

Table 5
Interscale Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11
	Scanning											
1.	Source	(.83)										
2.	Initiation	.79*	(.85)									
		(75)										
3.	Interpretation											
	Mode	-0.28	-0.17	(.)								
		(31)	(33)									
4.	Complexity	.39***	.49*	-.29*	(.79)							
		(75)	(67)	(35)								
5.	Predictability	.10	.17	-.02	-0.00	(.)						
		(30)	(26)	(19)	(27)							
6.	Change	.09	.15	-.23	.16	-0.41*	(.)					
		(88)	(77)	(37)	(85)	(37)						
7.	Accessibility	.17	.18	.02	.16	-0.00	-0.12	(.)				
		(87)	(83)	(38)	(83)	(32)	(98)					
8.	Structure	.26*	.14	.06	.21*	-0.2	.02	.22*	.23			
		(87)	(81)	(39)	(87)	(34)	(97)	(102)				
9.	Intrusiveness	-0.3	.41**	-0.12	.13	-0.28	.09	.10	.26	(.80)		
		(28)	(43)	(9)	(27)	(7)	(29)	(29)	(34)			
10.	Experience	0.15	.11	-0.07	0.04	-0.02	.13	.09	.01	-0.01	(.02)	
		(95)	(85)	(40)	(92)	(36)	(108)	(113)	(114)	(35)		
11.	Hierarchy	0.09	.07	.14	-0.12	-0.27*	.13	.26*	0.08	.36*	.33*	(.)
		(96)	(86)	(41)	(93)	(37)	(109)	(114)	(115)	(34)	(127)	

*p < .05, **p<.01, ***p<.001

Note: Numbers along the diagonal represent Cronbach Alpha's for multiple item scales. A (.) is printed when reliability could not be computed, e.g., for single item scales. Numbers in parenthesis below each correlation indicate sample size.

and there was no significant relationship between experience and function, nor between hierarchical level and function. These findings are logically consistent with previous conceptualizations of these variables, and with the fact that function is not measured in an ordinal fashion.

The closer examination of the interscale correlations indicated large differences in the sample sizes for each of the computed correlations. This is to a great extent accounted for by the structure of the questionnaire. Respondents were given the option to answer "?" to items for which they did not know or could not estimate an appropriate response. For purpose of analysis, these responses were coded as missing data. Thus, although completed questionnaires were received from 131 executives, the adjusted sample size for several items in the questionnaire is considerably smaller. For this reason, sample sizes will be reported in subsequent analyses of each of the predicted relationships in this study.

CHAPTER V

RESULTS AND DISCUSSION

Description of scanning and interpretation activities in University sample

The first research question posed for the current study was: How do university executives scan and/or interpret their institution's external environment? To answer this question, the data were analyzed to reveal the nature of active versus routine information acquisition, frequency of source usage, formalization of scanning activity, amount of perceived equivocality, and favored equivocality reduction mode. The frequencies, means, and standard deviations for these variables are shown in Tables 6-9.

Active versus routine information acquistion. Of the total sample, 85% indicated that they routinely receive information on business firms (Table 6). In addition, 73% indicated they actively search for information. Average frequency of active search (initiation) was 1.7, or approximately once or twice per year. Average frequency of routine information acquisition was only slightly higher (M = 2.1). As previously noted, however, the similarity in mean frequency of routine and active search may be more a function of the respondents' failure to perceive a difference in the two scales than an accurate representation of equal frequency of use of both modes of data acquisition.

Sources: Table 7 presents the average frequency of use of ten data acquisition sources. The most frequently used sources for routine data

Table 6

Percentage and Frequencies of Active and Routine Search

Routine Search	n	Adjusted Frequency
No	18	14.6%
Yes	108	85.4%
Total	126	100%
Active Search		
No	34	26.8%
Yes	93	73.2%
Total	127	100%

Table 7

Mean Frequency of Use of Scanning Data Sources

Source	Mean*	SD
Newspapers, journals	3.9	.9
Subordinates	3.3	1.8
Business Sector	3.0	1.7
Other administrators	2.2	1.7
Written reports (Intra-unit)	1.7	1.7
Other Universities	1.7	1.4
Written reports (extra-unit, within university)	1.7	1.6
Data bases	1.5	1.8
External Consultants	1.1	1.5
University Library	.9	1.5

*Scale values: 0= not at all, 1= less than once a year, 2= once or twice a year, 3= three to four times a year, 4= once or twice a month, 5= once or twice a week, 6 = daily or more often

acquisition were newspapers (approximately once- twice per month) , internal verbal reports from subordinates, and business firms (3-4 times per year). As Table 7 suggests, least frequently used sources for routine data acquisition were data bases, external consultants, and the library.

The most frequently used strategies for initiating search for external data were planned encounters with members of business firms, calls to business firms and soliciting verbal reports from subordinates (Table 8). Each of these strategies would be classified as active or "intrusive" approaches to data acquisition (Daft & Weick, 1984). Least used search strategies included hiring an external consultant, forming a committee to gather needed data, sending a survey to business firms, and use of data bases, all of which were used less than once a year. These results suggest that an important and frequently used strategy for acquiring data on business firms involved direct contact (by phone or face-to-face) with members of the business environment as well as with internal subordinates.

Formalization of scanning activity. The majority of the respondents (71%) indicate that scanning is not an assigned responsibility in their organizations. When responsibility for scanning is assigned, it most often is assigned to a Dean or Director (37%), or to non-administrative faculty (21%). Most often, (58%) it is assigned to one person, and at most four people within a unit are involved in formal scanning responsibilities. When scanning is assigned, it is most often specified as part of a formal job description.

Equivocality Reduction. The amount of equivocality experienced by an executive provides the context for equivocality reduction mode. In the present

Table 8

Mean Frequency of Scanning Initiation Strategies

Strategy	Mean*	SD
Interact directly with members of business firm	3.3	1.6
Contact business firm	2.6	1.5
Ask subordinates	2.6	2.0
Monitor published reports	2.3	2.0
Ask other administrators	1.8	1.7
Review intra-unit reports	1.6	1.7
Review intra-university reports	1.4	1.5
Contact members of other universities	1.5	1.4
Obtain data bases	.9	1.4
Send survey to business firm	.8	1.3
Contract external consultants	.7	1.3
Form a committee	.7	1.2

*Scale values: 0= not at all, 1= less than once a year, 2= once or twice a year, 3= three to four times a year, 4= once or twice a month, 5= once or twice a week, 6 = daily or more often

sample, perceived equivocality of demands from external business firms was very low. Sixty-one percent of respondents indicated that they never experience equivocality in the data obtained on the external environment.

In the proportion of the sample who reported experienced equivocality (n = 41, or 39%), the consultative mode was favored over the autocratic mode for equivocality reduction. As Table 9 indicates, of those who used a consultative mode, more than half (n = 10) consulted with industry personnel, while the remainder (n = 7) consulted with personnel within their unit. Consistent with these results, when asked how often they consulted with specific groups in the process of interpreting ambiguous data, executives indicated that the most frequently consulted groups were business firms ("often") and faculty and other administrators ("sometimes").

Analyses of the total set of responses to the equivocality reduction item, however, revealed an important "other" mode of equivocality reduction. This category referred to the decision to delegate the reponsibility for equivocality reduction to someone else (n=15, or 36% of those who experienced equivocality). Thus, it may be concluded that although many executives frequently consult with other individuals in the process of equivocality reduction, an almost equal number avoid the responsibility for interpretation of equivocal data by assigning this responsibility to someone else.

Test of Hypothesized Relationships

In an attempt to increase understanding of the characteristics, antecedents and consequences of executive scanning and interpretation of the externalenvironment, a conceptual model was constructed based on a review of

Table 9
Proportion of Sample Using Autocratic and Consultative Modes for Equivocality Reduction

Mode	n	Percentage
Autocratic		
Decide alone	5	12.2%
Consultative		
Form committee	7	17.1%
Consult with industry	10	24.4%
(total)	(17)	(41.5%)
Other		
Delegate responsibility	15	36.6%
Miscellaneous	4	9.7%
Total	41	100%

the theoretical and empirical literature. The hypothesized relationships between organizational, perceived environment, and executive role characteristics, scanning, interpretation and subunit performance were summarized in Table 2. Results pertinent to these hypotheses are described in detail below.

Hypothesis 1: The frequency of use of personal versus impersonal sources was hypothesized to be negatively related to the perceived analyzability of the environment . The ratio of the frequency of use of personal to impersonal source was calculated, and this ratio was correlated with each of the three measures of analyzability (predictability, change, accesssibility). The resulting zero-order correlations were r (28) =.16 ,r *(82)* = -.06 , and r (81) = .02 , respectively. None of the correlations were significant, thus failing to support the hypothesis.

Analyses of the simple correlations between each type of source usage (personal, impersonal) and each analyzability item were also performed. Table 10 shows a significant correlation between use of personal sources and accessibility of information (r (95) = .23, $p < .01$), and a marginally significant correlation for predictability (r (33) = .23, $p <$ .07). There was no significant relationship between any measure of analyzability and the use of impersonal sources. It appears, on one hand, that there was insufficient difference in the relative use of personal versus impersonal sources to test the proposed relationship to perceived environment characteristics. That is, executives used both personal and impersonal sources about equally to scan the external environment. Additionally, executives used personal sources for scanning when the environment is perceived as predictable and when data on the external environment are easily accessible. This result was not predicted by Hypothesis

Table 10

Zero-Order Correlations between Source Usage and Change, Predictability, and Accessibility[a]

	Change	Predictability	Accessibility
Source			
Personal x = 11.32 SD= 6.03	.09 (97)	.25* (33)	.23*** (96)
Impersonal x = 9.75 SD = 5.5	.07 (90)	.04 (31)	.13 (90)
Ratio: Person/Imperson x = 1.24 SD= .64	-.06 (83)	.16 (29)	.02 (82)

*p < .10
***p < .001

[a]Numbers in parenthesis beneath each correlation indicate sample size

1, and was in direct contradiction to the proposition than personal sources would be used more frequently in conditions of perceived unanalyzability of the external environment.

Hypothesis 2: The second hypothesis predicted a positive relationship betweeen environmental complexity and the frequency of use of multiple sources to scan the environment. A significant correlation was found between overall complexity and the summed frequency of usage of all sources (r (74) = .39, $p < .05$). This result supports the hypothesis as stated, and suggests that the more complex the perceived external environment, the more often the executive will use multiple sources to obtain external information.

Hypothesis 3. Hypothesis three suggested that the relationship between intrusiveness and initiation is moderated by the degree of organizational structure. Analyses of the correlations between intrusiveness and initiation for two levels of structure showed that, given a high level of structure (formalization) , the correlation between intrusiveness and initiation was positive(r (7) = .27, *ns*). This correlation was not significant, largely due to the restricted sample size (n= 8), caused by missing data on any one of the three variables. For low structure (less formalized), the correlation between intrusivenss and initiation was .41, (n= 32, $p < .05$). The difference between these correlations was not significant (Z = .34). Thus, the moderator effect of structure on the relationship between intrusiveness and initiation was not confirmed. A positive correlation was found for the total sample, however, between initiation and intrusiveness (r (42) = .41, $p < .05$), suggesting that organizational intrusiveness has a direct effect on executive scanning initiation (as illustrated in Figure 2) which is independent of

the characteristic of organizational structure.

Hypothesis 4 Hypothesis four defines the relationship between analyzability, intrusiveness and equivocality reduction. Specifically, it was proposed that analyzability and intrusiveness would jointly determine interpretation mode. Data analysis called for the use of stepwise regression to determine the order in which the separate dimensions of analyzability (predictability, change, and accessibility) and intrusiveness were to be entered in the regression equation. Analysis of the zero-order correlations between predictability, change, accessibility, intrusiveness and mode (see Table 5), however, showed that none of the predictors were significantly correlated with interpretation mode. The resulting multiple regression analysis, as a consequence, did not yield significant results ($R^2 = .07$, $p > .05$).

Hypothesis 5. Differences in the frequency of scanning initiation were expected to be positively related to executive experience. Hypothesis 5 suggested that more experienced managers will initiate search more often than less experienced managers. No signficant correlation was found between total frequency of scanning initiation and years of administrative experience (r (84) = .11, *ns*), thus failing to support the hypothesis. To further test the hypothesized differences between frequency of active search for different levels of experience, the total scale of scanning initiation was divided into two subscales based on prior conceptual definitions of active versus passive scanning strategies (Aguilar, 1967; Daft & Weick, 1984). Thus, for example, an "active" subscale was composed of strategies which, theoretically, involve a proactive or "intrusive" action on the part of the executive. Examples of active strategies included

forming a committee to gather needed information, calling, writing or interacting directly with members of the business firm. (A complete list of items is provided in Appendix C). "Passive" strategies included review of routinely published reports, monitoring data bases, review of intra-unit reports. Mean frequency of initiation was then calculated for active versus passive subscales by three levels of experience.

Table 11 presents the means and standard deviations in the frequency of initiation (active, passive search) for three levels of experience (high, medium, low). A slightly higher mean frequency of active initiation was found for executives with less experience, coupled with a higher score on passive strategies for executives with greatest (i.e., more than 20 years) experience. This finding is in the opposite direction of the predicted relationship. Thus, results failed to show a systematic relationship between total years of administrative experience and scanning initiation strategy. It may thus be concluded that experience in the executive role is not a major determinant of scanning initiation strategy.

Hypothesis 6. The frequency of source usage was predicted to vary with the functional specialty and hierarchical level of the executive. Two one way analyses of variance were performed. As reported in Table 12, significant main effects were found for function (F (7) = 1.55, $p < .10$) and hierarchy F (2) = 3.35, $p < .05$). Given the large differences in sample sizes for different levels of hierarchy and functional specialty, and the inherent problem of empty cells, no attempt was made to determine the interaction between function and hierarchy. Thus hypothesis 6 was supported by the data, which suggest that systematic

Table 11

Average Frequency of Scanning Initiation by Level of Experience[a]

	n	Mean	SD
Active Search			
Low experience	49	8.65	4.50
Moderate experience	28	8.53	4.30
High experience	14	4.22	4.22
Passive Search			
Low experience	47	5.91	4.80
Moderate experience	31	5.52	5.02
High experience	14	8.71	5.20

[a]For levels of experience, low = 0 - 9 years, moderate = 10 to 19 years, high = > 20 years. A complete list of items for active and passive initiation is provided in Appendix C.

Table 12

Analysis of Variance for the Effects of Function and Hierarchy on Scanning Source Usage

Source of Variation	Sum of Squares	DF	F
FUNCTION			
Function			
Main effects	1089.58	7	1.55*
Residual	7413.40	74	
Total	8502.98	81	
HIERARCHY			
Hierarchy			
Main effects	631.64	2	3.35**
Residual	7264.31	77	
Total	7895.95	79	

*p < .10 **p < .05

differences exist in the frequency of use of scanning sources for different functional specialties and hierarchical levels.

To further delineate the corresponding difference in function and hierarchy, the mean frequency of usage of each of the ten scanning sources by hierarchy and by function was examined. Results are shown in Tables 13 and 14. Newman-Keuls tests of significance between pairs of means ($p < .05$) were performed for the three largest hierarchical subgroups: chairs, directors, and deans. Both directors and deans were found to differ significantly from department chairs in the frequency of use of data acquired from subordinates, internal written reports, and other administrators.

Newman-Keuls tests for differences in source usage by functional specialty showed that business firms were used as a source of external data significantly more frequently by executives in Agriculture than by executives in Education and Liberal Arts. In addition, executives in Agriculture showed the highest overall frequency of scanning. Business School executives used the library significantly more than executives in Computer Science, Education and Engineering.

A somewhat surprising finding was that executives in Business Schools, in comparison with other functional groups, did not demonstrate the highest overall frequency of source usage. In addition, executives from this functional area were most frequent users only of the library (and second most frequent users of newspapers and journals), i.e, documentary rather than personal sources. Interviews with Deans of Business Schools indicated that contact with firms in the business sector was considered a critical and integral part of the mission their schools, yet results of this study show that Business School executives do not

TABLE 13

MEAN FREQUENCY OF USE OF SCANNING DATA SOURCES BY HIERARCHIAL LEVELS*

SOURCE**	1 (2)	2 (3)	3 (52)	4 (3)	5 (25)	6 (4)	7 (17)
NEWSPAPERS, JOURNALS	4.5	4.3	3.7	5.7	3.4	3.5	4.6
SUBORDINATES	3.5	4.0	2.6	4.7	3.9	3.3	4.2
BUSINESS SECTOR	3.0	3.7	2.7	4.3	3.3	2.0	3.1
OTHER ADMINISTRATORS	2.5	2.0	1.5	4.0	2.7	2.5	2.9
WRITTEN REPORTS (INTRA-UNIT)	3.0	1.3	1.2	3.0	2.0	1.3	2.4
OTHER UNIVERSITIES	1.0	2.0	1.5	3.0	1.7	1.0	2.1
WRITTEN REPORTS (EXTRA-UNIT, WITHIN UNIVERSITY)	2.0	0.67	1.3	3.7	1.6	1.5	2.4
DATA BASES	3.0	2.7	1.2	2.3	1.6	1.5	1.8
EXTERNAL CONSULTANTS	1.5	4.0	0.96	3.0	1.0	0.25	1.4
UNIVERSITY LIBRARY	1.0	1.3	0.83	1.0	0.67	1.5	1.3

*Hierarchical levels: 1= Supervisor, 2= Program Coordinator, 3= Chairs, 4= Assistant/Associate Directors, 5= Directors, 6= Assistant/Associate Deans, 7=Deans.

**Scale Values: 0= not at all, 1= less than once a year, 2= once or twice a year, 3= three to four times a year, 4= once or twice a month, 5= once or twice a week, 6= daily or more often.

TABLE 14

MEAN FREQUENCY OF USE OF SCANNING DATA SOURCES BY FUNCTIONAL SPECIALTY*

	AGRICULTURE		BUSINESS		COMPUTER SCIENCE		EDUCATION		ENGINEERING		LIBERAL ARTS		LIFELONG LEARNING		MEDICINE		NATURAL SCIENCE	
	n=(9)		n=(15)		n=(8)		n=(3)		n=(25)		n=(11)		n=(9)		n=(14)		n=(9)	
SOURCE	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
NEWSPAPERS, JOURNALS	3.8	2.1	4.4	1.7	5.0	1.1	2.6	1.3	3.3	2.0	4.4	1.5	4.0	1.4	4.0	1.9	2.8	2.3
DATA BASES	2.4	1.9	1.7	1.8	1.9	2.2	1.3	1.5	2.0	1.8	.81	1.3	1.8	2.0	1.0	2.0	.33	.70
WRITTEN REPORTS (INTRA-UNIT)	2.9	2.1	1.7	2.1	2.5	2.0	1.0	1.7	1.6	1.7	1.8	1.3	1.5	1.9	1.0	1.4	.67	1.0
WRITTEN REPORTS (EXTRA-UNIT, WITHIN UNIVERSITY)	2.4	2.2	1.8	2.0	2.0	1.8	.33	.57	1.7	1.4	2.6	1.0	1.5	1.9	1.3	1.5	.55	.72
SUBORDINATES	4.1	1.5	2.5	2.7	3.6	1.7	2.7	2.3	3.5	1.4	2.9	1.4	4.3	.96	3.2	1.7	2.3	1.9
OTHER ADMINISTRATORS	2.4	1.7	2.0	2.2	2.5	1.5	1.3	2.3	2.5	1.4	2.0	1.0	3.2	1.7	1.4	1.4	1.3	1.7
EXTERNAL CONSULTANTS	.89	1.6	.87	1.3	1.1	1.9	.33	.57	1.0	1.4	1.2	1.5	1.8	2.0	1.4	1.5	1.1	1.7
OTHER UNIVERSITIES	2.4	1.3	1.4	1.5	2.1	1.2	.33	.57	1.7	1.1	1.5	1.4	2.8	2.2	1.6	1.4	1.3	1.2
BUSINESS SECTOR	3.8	1.2	3.2	1.9	3.3	1.7	2.6	2.3	3.2	1.3	2.0	1.5	3.0	1.8	2.0	1.3	1.9	1.7
UNIVERSITY LIBRARY	1.4	.53	1.6	2.3	.75	.86	0	0	.58	1.0	1.5	1.6	1.0	1.7	.42	1.2	0	0
TOTALS	26.7	12.3	20.6	12.1	24.75	10.9	12.7	11.7	21.09	9.8	20.7	7.1	20.0	11.4	18.6	8.9	11.7	7.1

*Scales values: 0= not at all, 1= less than once a year, 2= once or twice a year, 3= three to four times a year, 4= once or twice a month, 5= once or twice a week, 6= daily or more often.

scan the environment as frequently as their colleagues in Agriculture, Computer Science, Engineering and Liberal Arts.

Hypothesis 7. The seventh hypothesis proposed that use of autocratic versus consultative modes for equivocality reduction would be related to the degree of executive experience. A chi square analysis was performed, and was not significant (X^2 (35) =.20, *ns*). Thus, this hypothesis was not supported by the data. It may be concluded that use of autocratic versus consultative mode does not vary systematically with the level of experience in the executive position. A potential explanation for this finding is the previously noted small sample size for use of autocratic mode (n = 5) and consultative mode (n = 17), and the correspondent lack of statistical power to test the proposed relationship.

Hypothesis 8. A final hypothesis predicted that the relationship between scanning initiation and subunit performance would be moderated by the level of organizational structure. Table 15 presents the correlations between scanning initiation and each of the subunit performance criteria (grants, contracts) for two levels of structure (high versus low formalization). None of the correlations reached significance; further, the pattern of correlations is in the opposite direction from that predicted. That is, the correlation between initiation and grants was higher under conditions of high formalization (r (8)= .33,) than when structure was less formalized (r (58) =.05). Similarly, the correlation between initiation and number of courses offered to business firms was higher when structure was formalized (r (6) = .24) than when there was low structure (r (39) = .14). Results do not confirm the predicted moderator effect of structure on the scanning- performance relationship, and it must be concluded that structure did

not systematically effect the relationship between frequency of scanning initiation and subunit performance.

A further examination of the zero-order correlations between scanning initiation, and subunit performance (Table 16) showed that scanning initiation was highly correlated with grants and contracts, and to a moderate degree with courses. Small sample sizes limited the statistical power to test for significance of these relationships however, so that no conclusion can be drawn on the direct relationship between frequency of scanning and subunit performance.

Summary

Two of the eight hypotheses proposed in the current study were supported by the data. Frequency of use of multiple scanning sources was found to be significantly related to perceived environmental complexity, (H_2), and frequency of use of scanning sources was found to vary both by the function and hierarchical level of the executive (H_6). In addition, a direct relationship was found between organizational intrusiveness and executive initiation of search which was independent of the level of organizational formalization, thus failing to support H_3.

No relationship was found between perceived analyzability and use of personal versus impersonal sources (H_1), nor was there support for the predicted joint effects of analyzability and intrusiveness on equivocality reduction mode (H_4). Similarly, neither scanning initiation nor equivocality reduction mode were significantly related to experience. Finally, no systematic impact of scanning initiation on subunit performance was found for any level of organizational

structure. The next chapter presents an interpretation of the results of the study and suggests directions for future research.

Table 15

Correlations Between Scanning Initiation and Subunit Performance by Level of Structure

Low Structure

	Performance			
	Grants	(n)	Courses	(n)
Initiation	.05	(58)	.14	(39)

High Structure

	Performance			
	Grants	(n)	Courses	(n)
Initiation	.33	(9)	.24	(6)

Table 16

Zero-Order Correlations Between Scanning Initiation and Subunit Performance

	GRANTS	COURSES	SCANNING INITIATION
GRANTS	(.94) (n=108)		
COURSES	.15 (n=64)	(.98) (n=69)	
SCANNING INITIATION	.15 (n=70)	.23 (n=48)	(.85) (n=111)

CHAPTER VI

CONCLUSIONS

To survive in a dynamic and changing environment, organizations must develop strategies for acquiring intelligence on important trends, events and changes in the external environment. Scanning is defined as the process by which organizational members search for and acquire data on the external environment. The raw data obtained through scanning must be translated, through a process of interpretation, into information which permits stategic responses to perceived environmental conditions. Previous research has generated little knowledge of the strategies used by organizational members to scan and interpret the external environment, and little conclusive evidence has been presented to define the important antecedents and consequences of scanning and interpretation.

The current study sought to contribute further understanding of the characteristics, antecedents, and consequences of executive scanning and interpretation. The lack of integration in the current literature on scanning and interpretation suggested the need for a conceptual model to serve as a heuristic for the development of an empirical study. Therefore, the specific objectives of the current research were to: 1) develop a conceptual model of executive scanning and interpretation, 2) design and conduct an empirical study which investigated the linkages between the antecedents, consequences and characteristics of scanning and interpretation, and 3) describe the impact of

scanning and/or interpretation on organizational effectiveness.

The major findings of the current study were summarized in Chapter Five. Conclusions about the results of this research are discussed below. The general outline of the chapter is as follows: 1) Consistency with prior scanning/ interpretation research; 2) Methodological limitations, 3) Conclusions about the conceptual model; 4) Implications for future research, 5) Practical implications.

Consistency with Prior Research on Scanning

It is important to view the findings of this study in the context of what was previously known about environmental scanning. The findings of the current study , in many cases, were consistent with those of the earlier studies on scanning. This section attempts to reconcile prior and present findings by examining both the consistencies and inconsistencies. Two major areas which will be addressed in this section include 1) descriptions of scanning activities in different types of organizations (e.g., industrial organizations and universities), 2) antecedents and consequences of scanning and interpretation.

Descriptions of scanning activities. A basic question that is useful in interpreting the present findings in light of prior findings is, "Did the patterns of executive scanning activities observed in the present study generally resemble the descriptions of scanning provided in previous studies?" Of particular interest was the comparison the scanning practices of university executives with practices observed in executives in business organizations (the primary target of previous research). Considerations will focus on the comparability of scanning sources and search strategies used across the different types of organizations.

Scanning Source. Conflicting results have been found on the relative use of personal versus impersonal sources for acquiring data on the external environment. Aguilar (1967) found that personal sources greatly exceeded impersonal sources, and that, overall, subordinates were the most important source of external information. Hambrick (1979), however, found that executives in the insurance industry, hospitals and colleges favored the use of impersonal sources over the use of personal sources. In a bank and a manufacturing firm, Culnan (1983) found that personal subscriptions to periodicals were most frequently used, followed by internal personal sources (peers, subordinates, superiors).

Results of the current study suggested that newspapers and journals, subordinates and business firms are sources of external data most frequently used by university executives. These results are consistent with the findings of Culnan (1983) and Jain (1984) on the relatively greater frequency of use of newspapers, with those of Culnan (1983) on the use of internal reports from subordinates and other administrators, and with Keegan (1974) on the frequent use of external sources of data. In general, then, it may be concluded that the sources of external data used most frequently by university administrators are no different from the sources most frequently used by executives in profit-making organizations, and that both personal and impersonal sources are frequently used by executives to scan the external environment.

Initiation Strategy. Inferences about the levels of active search for external information in organizations have generally been drawn at the organizational level of analysis, and researchers have reached conclusions which vary greatly

depending on the sample studied and the methodology used. For example, Aguilar (1967), Fahey and King (1977) and Hambrick (1979) found scanning to be ad hoc, irregular, and to a great extent, externally initiated. Thomas (1980) concluded that corporate giants scan the external environment on a continuous, pre-planned and future- oriented basis. Consistent with results reported by the first set of researchers, the current study concludes that the responsibility for scanning is not typically a formally assigned aspect of the executive's role.

Findings on the absolute frequency of active search are difficult to reconcile with results of previous research due to the different units of measurement which have been used across studies. Hambrick (1979), for example, measured amount of scanning in hours per week, and concluded that executives typically dedicate 8 to 10 hours per week to scanning activities. Culnan (1983) used a five point scale similar to the one developed in the present study ("never" to "once a week or more"), but reported no overall frequency of scanning. A direct comparison between results of the current and previous studies, would therefore be misleading. In general, however, it can be concluded that university executives, similar to business executives, do use multiple sources to acquire information on the external environment.

The question on the extent to which executives are proactive in searching for information on the external environment was only partially answered in the current study. Although the most frequently used strategies for initiating search (planned encounters with or calls to members of business firms, soliciting verbal reports from subordinates) may be classified as proactive or "intrusive", no systematic difference was found in the overall use of active versus passive

acquisition strategies. Thus, it seems that university executives do employ several proactive strategies for scanning the external environment, but also rely on data acquired through routine procedures.

Antecedents and Consequences of Scanning and Interpretation. In the following section, results of the current study are compared for consistency with existing research on the extent to which perceived environment, organizational characteristics, and executive role characteristics determine executive scanning and interpretation. In general, findings of this study show only modest consistency with previous research. Some reasons for these differences are discussed below. Finally, the results of the current research on the impact of scanning and interpretation on organizational effectiveness are summarized relevant to existing research on the topic.

Organizational Characteristics. (Structure, Intrusiveness). Previous studies of scanning and boundary spanning have not systematically investigated the impact of organizational structure and policy on these processes. In general, formalization has been considered very narrowly in terms of assignment of scanning reponsibility, (Aguilar, 1967; Keegan, 1974; Hambrick, 1979). Results of the present study support the conclusion that scanning in universities is basically an informally assumed role of higher level executives. Intrusiveness, as a construct, has not been measured in previous scanning research.

Perceived Environment (Analyzability, Complexity). Contrary to trends suggested in other investigations, (e.g., Keller, 1983; Hambrick, 1979), the environment of universities in the current study was characterized by a high level of predictability and low rates of change. This result was somewhat puzzling,

and inconsistent with results of a related study conducted in the same group of universities (Pelz, 1985). Two potential explanations exist for these findings. On the one hand, the results could represent a failure of executives to understand the items which measured predictability, rate of change, and accessibility. Given the direct language in which these were stated and results of the pilot study, however, this seems unlikely.

An alternative interpretation suggests the possibility that trends, events and changes in interaction with business firms are not perceived to be major characteristics of the external environment for university executives. Almost three-fourths of the sample report no major changes in the number and types of requests for services made by business firms over a two year period. This response could indicate either greater stability and predictablity of the perceived environment or, alternately, a failure on the part of executives to actively pay attention to (or care) what business firms need and want. Only half of the executives who experienced any kind of change faced novel requests (i.e., those which would require non-routine responses from the subunit) from business firms as often as 3-4 times a year.

Executive Role Characteristics (Hierarchy, Function, Experience). Results of the current study revealed a significant effect of both functional specialty and hierarchical level on the total frequency of use of multiple sources for scanning. These results were consistent with Aguilar(1967), and opposite from those found by Hambrick (1979) and Schwab et. al, (1985). Unlike the other role characteristics, however, experience was not found to be related to either scanning initiation or equivocality reduction mode. This result could not be

explained by a lack of variance in reported experience. Thus, it was concluded that experience was not a major determinant of scanning frequency.

Organizational Effectiveness (Subunit Performance). In the one study encountered which measured the impact of boundary spanning activity on organizational performance, Dollinger (1984) found a positive relationship between intensity and range of boundary spanning and financial performance. The current study provided little evidence to substantiate Dollinger's results, since no significant relationship was found between scanning initiation and subunit performance. Methodological issues which provide a context for interpreting this finding are discussed below.

Methodological limitations

Lack of prior instrumentation to measure the context and characteristics of scanning and interpretation necessitated the development of instrumentation to test the relationships proposed in the conceptual mode. Although special attention was paid to the content validation of the measures of organizational characteristics, perceived environment, scanning and initiation, some evidence emerged which indicated that the research fell short of generating fully valid and reliable measures of these variables.

Scanning Source and Scanning Initiation. A great degree of collinearity was found between the scales used to measure scanning source and scanning initiation. As previously noted, this result is partially explained by the sequential placement of source and interpretation items and the relative similarity of phrasing. Thus, a major difficulty was encountered in operationalizing the difference between the issues of source (i.e., "where do you get information

from") and strategy ("how, or what do you do to get information) as well as the difference between routine and exceptional search. This suggests that executives tended to interpret the scales idiosyncratically, despite the scales' behavioral anchors. That is, it was apparently difficult for executives to perceive any difference in the questions which were constructed to measure essentially different aspects of environmental scanning. This is an issue which must be noted as a limitation of the current research and as an opportunity for future investigation of appropriate operationalizations of scanning characteristics.

Interpretation Mode. The current model suggested a tentative classification of interpretation strategies based on previous research on individual decision-making behavior in organizations. Specifically, it was proposed that the typical styles of equivocality reduction could be described as autocratic and consultative modes. Results of the current research suggest, however, that at least one other mode should be included in the classification of interpretation styles. Executives in the current study frequently chose not to assume direct responsiblity for reducing equivocality in data acquired on the external environment, and rather delegated the responsibility for sense-making and interpretation to others. Thus, it may be concluded that the classification proposed in the current model did not capture all the essential variations in interpretation mode.

A second issue relevant to the determination of interpretation mode was the failure to generate data across the total sample on this variable. In hindsight, it is apparent that a major reason for this failure was a "successive cut-off" approach to items related to equivocality reduction. That is, respondents were first asked the general question: "Do you ever experience equivocality in the data received

about the external environment". If the answer was no, the subsequent items on equivocality reduction were irrelevant, and the respondent skipped to the following set of items.

This approach was also responsible for reduced sample sizes for responses to predictability and change items. For example, executives were first asked, " Have you experienced any changes over the last two years in business firm's requests for services from your unit?" and if the answer was no, the next item on predictability of these changes was left blank.

Missing data was also a major problem in the measurement of subunit performance. Several difficulties were experienced in obtaining data from executives when no written record on the performance variables existed, and no measure was available on the reliability of data obtained by executive estimations of performance levels. Differences might be expected, for instance, between statistics on performance obtained from objective public records (e.g., lists maintained by the research office or lifelong learning program coodinator) and those which are "guestimated" at the department level. Thus, since it is impossible to correct for attenuation due to unreliability in the criterion variable, obtained estimates of the true effect of executive scanning on subunit performance may be highly biased.

Structure. The scale which measured organizational structure in the current study consistent of two items which tapped the characteristic of organizational formalization. The structure items in this study, however, were worded to provide an overall appearance of consistency with the rest of the research instrument (i.e., to reflect an interest in linkages between universities and business firms).

As a result, respondents were specifically asked about the extent to which rules and regulations existed on cooperation with industry. A broader measure of overall levels of organizational formalization and inflexibility of written rules and guidelines might be more appropriate for tests of the hypothesized moderator effect of structure on scanning characteristics and outcomes.

A final methodological issue that should be raised is that of the possible restriction of range in the levels of organizational structure, intrusiveness and perceived environmental analyzability. As results of this study indicated, there was no demonstrable relationship betweeen analyzability and source usage or interpretation mode, nor was structure found to impact scanning or interpretation. One of the reasons for these findings may have been that the sample of universities from which executives were drawn were too homogeneous to capture the essence of polar positions on these environmental and organizational characteristic variables. If the sample had included executives from different types of universities, (e.g., private as well as public, small and medium as well as large) or universities from diverse geographical areas, we would potentially have witnessed much more variation on these variables. By broadening the universe of organizations eligible for inclusion in the study, there might have been greater observed difference in organizational intrusiveness, including specific policies which encourage or discourage active search and interpretation strategies.

The advantage in the present study of polling executives from a relatively homogeneous group of organizations was the ability to hold constant potentially intrusive variables. However, the lack of a larger and more diverse sample of

executives may have acted to suppress the relationships predicted in the conceptual model.

Conclusions about the Conceptual Model

One objective of the current study was to develop a conceptual model which incorporated major antecedents, consequences and characteristics of executive scanning and interpretation. In general, results of the study failed to provide evidence for several of the relationships predicted by the model. These results suggest that the proposed model may have only partially captured the essential characteristics of the predicted linkages. Tentative explanations for the experienced shortcomings of the conceptual model are offered below.

Perceived Environment Characteristics. Characteristics of the perceived environment were predicted to have a systematic impact on environmental scanning and interpretation. Specifically, it was hypothesized that complexity of task environment would be positively related to frequency of scanning initiation (Link 1 in Figure 2). Results supported this hypothesis, and it may be concluded that perceived environmental complexity is a relevant antecedent for scanning initiation and overall frequency of data acquisition.

The attempt to operationalize the construct of analyzability, however, was not fully successful, and provided little insight on the relationship between this dimension of perceived external environment and aspects of scanning and interpretation. The lack of internal consistency of the analyzability scale was puzzling for several reasons. Aspects of the analyzability construct are not foreign to the literature. Predictability, rate of change, and accessibility of information sources have each been elements that previous authors have

conceptualized as components of perceived environmental uncertainty.

Thus, failure to find significant relationships in this study does not negate the importance of the construct of analyzability, but rather points to the need to better define and operationalize the construct. In particular, the lack of predicted relationship between the three measures of analyzability suggests that these items, rather than representing a single construct, may in fact index different and conceptually distinct aspects of the external environment. A major conclusion of the present study therefore suggests that current conceptual definitions of analyzability, as described in the interpretation systems model proposed by Daft and Weick, (1984) do not adequately delineate the essential characteristics of this construct.

Several of the proposed conceptual linkages were not adequately addressed in the current study due to problems wioth small sample sizes on a few key variables. In particular, the failure to generate a sufficient reponse rate to items measuring analyzability, formalization, equivocality reduction, and subunit performance severely limited the statistical power necessary to test links 2, 5 and 6 of the proposed model.

An additional explanation for the overall lack of support for the conceptual model developed in the current study focuses on the nature of the sample used to test the proposed relationships. As previously noted, propositions for the current model were developed based on limited empirical evidence obtained from prior research which was primarily performed in business and industrial (i.e., profit-making) organizations. Little agreement exists in the literature on the extent to which the context and processes of institutions of higher education can be

appropriately described by the same models used for profit making firms. Although some authors have argued that modern academic institutions should be run like business firms (Keller, 1983) or, at least, are basically similar to other types of organizations (Gross, 1968), other authors have insisted on the use of different models which incorporate the "loosely coupled" nature of schools and universities (Bidwell, 1965; Cameron, 1978; Cohen & March, 1974; Weick, 1976). If one subscribes to the latter perspective, university executives do not provide the most appropriate sample with which to test the conceptual model.

Implications For Future Research

This research suggests certain caveats and opportunities for researchers interested in exploring the strategies, processes and contingencies of environmental scanning and interpretation. Both methodological and theoretical implications can be drawn from this research.

Measurement of interpretation modes. The results of this study indicate the need to develop more elaborate measures of executive interpretation strategies or modes. Interpretation is a complex, multi-faceted activity which is difficult for researchers, or executives themselves, to quantify or characterize. In particular, the notion of experienced equivocality needs to be operationalized in a mannner that permits a clearer, more relevant measure of the context for equivocality reduction strategy. When possible, multiple measures of amount of equivocality and equivocality reduction modes should be designed. In addition, a different classification system is needed to capture the essential ways in which executives in organizations make sense of or interpret their external environment. Given that the process of interpretation may be unconscious or "pre-cognitive", attention

should be devoted to the development of process capturing mechanisms for investigating the equivocality reduction process.

Measurement of Scanning Sources versus Strategies. Implications of the current research suggest the need for operationalizations of scanning strategy which are both conceptually and "visibly" distinct (i.e., transparent to the respondent) from indicators of scanning source. The emphasis placed in the current research on the action of data acquisition (e.g., solicit, interact, monitor) did not provide a sufficient distinction. Researchers interested in these characteristics of scanning, therefore, must devise new scales which clearly differentiate between the strategy (or "how") and the source ("from whom") of data on the external environment.

Perceived External Environment. The construct of complexity appears to be an appropriate and relevant dimension for examining the impact of the perceived external environment on executive scanning. Further research is need, however to clarify and demonstrate the interrelatedness of proposed "dimensions" of analyzability (predictability, rate of change, accessibility of information).

Conceptual Model. Finally, future research on the model of scanning and interpretation should be undertaken. Particular attention to the selection of samples which vary on the dimensions of organizational structure, policy, and perceived external environment is warranted. Selection of respondents based on an a priori determination of levels of these variables will provide construct validity for these critical organizational and environmental characteristics.

Practical implications

This research has important implications for executives responsible for boundary spanning, environmental scanning and interpretation. Results of the present study suggest that university administrators very often get information about the external environment directly from members of the business firm constituency. Although no attempt was made to determine the accuracy of acquired data, this results suggests that much of the data which executives get is acquired informally and through personal contacts with members of the external environment. Additionally, routine sources such as newspapers and professional journals provide an important source of information on external events.

In general, the environmental scanning practices of university executives may be characterized as Phase 3, or reactive (Jain, 1984). The majority of the executives recognized the importance of environmental scanning, as evidenced by interview and open-ended responses to the effect that "we should be doing more". Most scanning activities, however, were found to be informally initiated and unstructured. Little evidence was found for use of highly proactive or novel strategies for testing and manipulating the external environment. An important implication of these results for future scanning efforts suggests that executives may find that greater attention to and systematization of environmental scanning will allow them to make a more definitive and vital contribution to their organization's ability to shape as well as respond to the external environment. As a result, these executives will have a greater opportunity to impact upon the increased viability, adaptability, and effectiveness of their organizations.

APPENDICES

APPENDIX A

DEFINITIONS AND INDICATORS FOR MAJOR VARIABLES IN THE SCANNING AND INTERPRETATION MODEL

Appendix A
Definitions and Indicators for Major Variables in the Scanning and Interpretation Mode

Variable	Conceptual Definition	Operational Definition	Dimensions & Indicators *
scanning	The activity of searching for and acquiring data about events and relationships in an organization's external environment.	Strategies used by an organization's executives to search for and acquire data about the external environment.	source: point of origin from which data on the external environment is acquired. - personal-impersonal (humans vs. written documents, journals) - internal (org. members & reports) vs. external (people & documents outside the organization). search initiation: extent to which data search requires a direct request or action on the part of the executive.
interpretation	Process by which acquired data on the external environment is translated into information useful to the executive and his/her organization for decision making and action.	Strategies used by executives to process and make sense of acquired data	degree of equivocality: extent to which data about the environment are unclear of subject to multiple interpretations. equivocality reduction strategy: preferred process for reducing equivocality of data. mode: consultation: (with other org. members) or autocratic: independent sense-making
perceived external environment	Collection of highly complex and ambiguous stimuli which emmanate from multiple constituent groups.	Equivocal cues on the needs and demands of a critical constituent --the private business sector.	Analyzability: extent to which equivocal cues demonstrate discernible, predictable uniformities or rationalized patterns. complexity: extent to which executive's task requires the monitoring of many different constituent groups - number of constituent types monitored - number of members in each constituent type - number of different services or products provided to constituent groups
organizational characteristics	Distinguishing properties of organizational structure and policy for acquiring and interpreting data on events and conditions in the external environment.	Structure: degree of formalization and inflexibility in organizational rules, policies and decision making procedures.	formalization: extent to which written goals, plans,standard operating procedures and groundrules exist for organizational tasks. inflexibility: rigidity of organizational rules and operating procedures.
		policy on intrusiveness: extent to which formal and informal organizational policy supports the active search & interpretation of the external environment.	- resource allocations to scanning activities - existence & role of planning structure. - policy on manipulation of external environment.

* See Appendix C for a list of items for each dimension

Appendix A (Cont'd)

Variable	Conceptual Definition	Operational Definitions	Dimensions & Indicators *
individual characteristics	Attributes of the executive which are associated with the performance of the executive's principle tasks.	functional specialty: area of specialization to which the executives role responsibilities and major tasks adhere.	Administrative unit, college, school, department
		hierarchical level: position the executive holds in the organizational chain of command, as defined in the organizational chart.	first (Dean, Assoc. Dean), second (Director, Asst. Director), third (Department Chair) fourth (Supervisor, Coordinator)
		previous experience: number of years-months of formal experience in the executive role.	
organizational effectiveness	Maximization of returns to the organization which contribute to organizational adaptation and survival	ability of the organization to secure critical resources from and satisfy the demands of critical environmental constituents	Resource acquisition: money received from gifts and grants from business firms
			Constituent satisfaction: number of courses provided for business firms

* See Appendix C for a list of items for each dimension

APPENDIX B

EXECUTIVE SCANNING AND INTERPRETATION SURVEY

SECTION I. We would like to begin by asking some questions about the ways in which your unit (that is, your college, school, department) relates to business and industrial firms. In this and all subsequent sections, if you don't know or can't estimate the answer to any question, please enter a "?" rather than leaving the item blank.

1. Listed below are different ways in which people in universities can cooperate with business firms. In the last two years, have you or other members of your unit participated in cooperative efforts with business firms?

Yes_____ NO____ → SKIP TO SECTION II, p. 2 003

→ please answer all parts of questions 2, 3 and 4

2. For each type of cooperative effort listed, please estimate how frequently you and other members of your unit have participated in these activities. Using this scale, circle one number in column B:

0) not at all
1) less than once a year
2) once or twice a year
3) three to four times a year
4) once or twice a month
5) once a week or more

A. Participation	B. Frequency						
-conduct research supported by business firms (contract research)	0	1	2	3	4	5	004
-collaborate in research projects (joint, non-proprietary research)	0	1	2	3	4	5	005
-engage in faculty consulting	0	1	2	3	4	5	006
-place graduates in industry	0	1	2	3	4	5	007
-hold conferences and seminars for business sector participants	0	1	2	3	4	5	008
-conduct seminar/colloquia series in which business people participate	0	1	2	3	4	5	009
-place student interns in business firms (e.g., coop ed, work study, formal internships)	0	1	2	3	4	5	010
-permit faculty sabbatical or temporary placement of faculty in business firms	0	1	2	3	4	5	011
-hire part-time faculty from business firms	0	1	2	3	4	5	012
-provide technical service to industry	0	1	2	3	4	5	013
-faculty or staff hold equity or membership in business firms	0	1	2	3	4	5	014
-other_____	0	1	2	3	4	5	015
_____	0	1	2	3	4	5	016
_____	0	1	2	3	4	5	017

3. Universities often establish cooperative linkages with business firms in many different types of industries, such as automotive, pharmaceutical, paper products.

A. In column A below, please list the types of industries your unit has had contact with over the last two years. Do not give specific names of businesses, but rather types of industries, such as computer, banking, electronics, etc.

B. For each type of industry you listed, please estimate to the nearest 5 the number of firms with which you or other members of your unit have cooperated over the last two years. If you don't know or can't estimate, please enter "?" in column B.

A. Type of Industry		B. Number of firms	
_____	018	_____	023
_____	019	_____	024
_____	020	_____	025
_____	021	_____	026
_____	022	_____	027

4. Of the total number of contacts between your unit and business firms listed above, what percentage were started by direct initiatives from you or someone in your unit? (Please estimate) 028

1) almost none
2) about one quarter
3) about one half
4) about three quarters
5) almost all

SECTION II. In addition to cooperative efforts which are initiated by university units, business firms may seek specific services from different units.

5. In the past two years, have business firms approached your unit seeking some type of service or cooperative activity?

Yes _____ No _____ If no, SKIP TO SECTION III, p. 3 029

6. Have there been any major changes over the last year or so in the types of requests business firms have made for service from your unit?

No_____ → SKIP TO QUESTION 8 030

Yes_____ Please describe: (If you need more space, use the back of the page)

_____ 031

_____ 032

_____ 033 034

7. On the whole, to what extent were these changes in business firms° requests predictable? 035

1) not at all predictable
2) slightly predictable
3) somewhat predictable
4) quite predictable
5) extremely predictable

8. How often, in the past two years, have business firms requested novel services from your unit? By novel we mean services different from those your unit has previously provided. 036

0) not at all → SKIP TO SECTION III, p.3
1) less than once a year
2) once or twice a year
3) three or four times a year
4) once or twice a month
5) once a week or more

9) Please give examples of the types of novel services which have been requested. 037

_____ 038

_____ 039

_____

SECTION III. To maintain existing links and to establish new links with the business sector, universities require information about the needs of private business firms. We would like to ask you about how members of your unit go about "monitoring" or collecting data about business firms.

10. Is the primary responsibility for monitoring the business sector currently assigned to any individual or group of individuals in your unit?

Yes_____ No_____ → SKIP TO QUESTION 13 040

11. To whom?_____ 041

[If committee, how many members?]_____ 042

12. How is this responsibility assigned? For example, it this assigned as part of a formal job description, through an informal agreement between individuals, or what? 043

_____

_____

_____

13. Of all the information that you get <u>routinely</u> about business firms, how often does this information come from each of the following sources? Using the scale below, circle one number for each source.

0) not at all
1) less than once a year
2) once or twice a year
3) three to four times a year
4) once or twice a month
5) once or twice a week
6) daily or more often

____ I don't routinely get information about business firms → SKIP TO QUESTION 14 044

	SOURCES	FREQUENCY	
a)	subscriptions to periodicals (newspapers, magazines, journals).	0 1 2 3 4 5 6	045
b)	computerized data bases or monitoring services	0 1 2 3 4 5 6	046
c)	written reports (memos, documents) produced within your unit	0 1 2 3 4 5 6	047
d)	written reports produced by other units within the university	0 1 2 3 4 5 6	048
e)	verbal reports or contacts with subordinates	0 1 2 3 4 5 6	049
f)	verbal reports or contacts with other administrators within the university	0 1 2 3 4 5 6	050
g)	external consultants	0 1 2 3 4 5 6	051
h)	members of other universities	0 1 2 3 4 5 6	052
i)	members of the relevant business sector	0 1 2 3 4 5 6	053
j)	the university library	0 1 2 3 4 5 6	054
k)	other_____	0 1 2 3 4 5 6	055
	_____	0 1 2 3 4 5 6	056

14. Aside from information that comes routinely, administrators often must actively search for additional information. There are many different ways in which an administrator might search for information on business firms. Please review the list below, and indicate how often you actively use any of these approaches to get nonroutine information on the business sector. Using the following scale, circle one number for each approach:

0) not at all
1) less than once a year
2) once or twice a year
3) three to four times a year
4) once or twice a month
5) once or twice a week
6) daily or more often

___ I don't actively search for information on business firms → SKIP TO QUESTION 15 057

	APPROACHES	FREQUENCY	
a)	monitor and review routinely published reports or data bases	0 1 2 3 4 5 6	058
b)	obtain reports from computerized data bases or monitoring services	0 1 2 3 4 5 6	059
c)	review written reports produced within my unit	0 1 2 3 4 5 6	060
d)	review written reports produced by other units within the university	0 1 2 3 4 5 6	061
e)	ask for verbal reports from subordinates	0 1 2 3 4 5 6	062
f)	solicit verbal reports or contacts with other administrators within the university	0 1 2 3 4 5 6	063
g)	contract external consultants	0 1 2 3 4 5 6	064
h)	contact members of other universities	0 1 2 3 4 5 6	065
i)	form a committe to acquire the needed information	0 1 2 3 4 5 6	066
j)	call or write someone in the relevant business firm	0 1 2 3 4 5 6	067
k)	interact directly with members of the relevant business sector (planned encounters)	0 1 2 3 4 5 6	068
l)	send questionnaires or surveys to business firms	0 1 2 3 4 5 6	069
m)	other_____	0 1 2 3 4 5 6	070
	_____	0 1 2 3 4 5 6	071
	_____	0 1 2 3 4 5 6	072

15. How <u>easy</u> is it for you to get information about the needs that business firms have for services which your unit could provide? Circle one number: 073

1) difficult
2) not very easy
3) somewhat easy
4) very easy
5) extremely easy

→ a) What are the major difficulties faced in getting information?

_____ 074

_____ 075

_____ 076

16. Approximately what percent of your annual discretionary budget is allocated to each of the following activities to obtain information on the needs of private business firms? (Please estimate to the nearest 1-2% or enter "?")

		%	
a)	faculty attendance at professional meetings at which business contacts are likely	____	077
b)	attendance at business-oriented conferences and seminars	____	078
c)	subscriptions for your unit to business-oriented journals or trade magazines	____	079
d)	industry-related data bases or monitoring services	____	080
e)	travel related to increasing/improving contacts with business firms	____	081
f)	entertaining members of business firms	____	082
g)	bringing business people to your unit	____	083
h)	other information-seeking activities:		084
	_____	____	
	_____	____	085
	_____	____	086

17. In what other ways do you support information-seeking activities like those listed above? For example, do you provide faculty release time or internal incentives for participation in these kinds of activities? (Please decribe).

_____ 087

_____ 088

_____ 089

18. Particularly when information received on business firms is unusual or unexpected, this information can be unclear and lead to a variety of different interpretations. As unit head, can you recall instances when you've received information or requests from business firms that were unclear or ambiguous?

_____Yes _____No → SKIP TO SECTION IV, p. 8 090

19. How often, on the average, would you say that the information you receive on business firms is unclear or ambiguous?

1) never → SKIP TO SECTION IV, p.8 091
2) rarely
3) sometimes
4) often
5) almost always

20. How often do you discuss unclear or ambiguous data with people from the following groups in the process of trying to understand the implications for your unit? Using this scale, circle one number on each line:

1) never
2) rarely
3) sometimes
4) often
5) almost always

a)	others at my same administrative level	1	2	3	4	5	092
b)	higher level administrators	1	2	3	4	5	093
c)	faculty	1	2	3	4	5	094
d)	staff	1	2	3	4	5	095
e)	professional colleagues outside this university	1	2	3	4	5	096
f)	members of the relevant business firm	1	2	3	4	5	097
g)	members of other business firms	1	2	3	4	5	098
h)	others(please specify)_____	1	2	3	4	5	099
	_____	1	2	3	4	5	100
	_____	1	2	3	4	5	101

21. What other approaches do you take to reduce ambiguity? For example, do you frequently pass the information along to others to let them determine its meaning? Do you assess the information yourself, and determine what it means based on what you already know about the firm? In your answer, please provide one or two examples of approaches that you've used.

_____ 102

_____ 103

_____ 104

_____ 105

22. What criteria do you use to decide whom, if anyone, you will discuss ambiguous information with? (For example, does it vary with the type of information--eg, technical versus financial? or by the specific firm involved?).

_____ 106

_____ 107

_____ 108

SECTION IV. Next we ask some questions about the context of industry-university cooperation. There are many ways in which university-wide policies can influence relationships between members of the university and the external business sector. We would like to know how, if at all, the formal and informal policies in this university affect relationships between your unit and private sector business firms.

23. Please use the scale below to rate the extent to which each of the following university policies discourages or encourages you to take an active role in industry-university cooperation.

0) not aware of any poliicy on this issue
1) discourages considerably (interferes with taking active role)
2) discourages slightly
3) doesn't affect either way (neutral)
4) encourages slightly
5) encourages considerably (greatly facilitates active role)

	University policy on:							
a)	faculty-owned business firms	0	1	2	3	4	5	109
b)	consulting for pay	0	1	2	3	4	5	110
c)	use of university facilities to assist business firms (e.g., when consulting for pay, or faculty-owned firm)	0	1	2	3	4	5	111
d)	overhead	0	1	2	3	4	5	112
e)	tenure and promotion	0	1	2	3	4	5	113
f)	university patent and copyright policies	0	1	2	3	4	5	114
g)	proprietary research	0	1	2	3	4	5	115
h)	overload (supplementary compensation)	0	1	2	3	4	5	116
i)	other_____	0	1	2	3	4	5	117
	_____	0	1	2	3	4	5	118
	_____	0	1	2	3	4	5	119

24. Are there any additional policies (formal or informal) within your unit which discourage or encourage faculty to take an active role in industry-university cooperation? Please describe:

120
121
122
123

Listed below are other general characteristics of University policy or structure that may affect university-industry cooperation. Using the scale below, circle one number to indicate the extent to which you believe each statement applies to this university.

1) not at all
2) to a limited extent
3) to some extent
4) to a considerable extent
5) to a very great extent

25. There are few formal guidelines for industry-university cooperation	1	2	3	4	5	124
26. Clear, written goals and objectives exist for pursuing industry-university cooperation	1	2	3	4	5	125
27. Formal, written policy statements exist on the importance of maintaining up-to-date information on the relevant trends and events in the business sector	1	2	3	4	5	126
28. People in this university consider the rules for industry-unversity cooperation as general guidelines, not as rigid and unbending	1	2	3	4	5	127
29. There are many contradictions and inconsistencies between written policy statements and actual practices related to industry-university cooperation	1	2	3	4	5	128

SECTION V. Here we ask you to describe formal planning activities that go on in this university. Please indicate your response by circling the appropriate answer below.

30. Many universities engage in the development of formal long-range plans (e.g., academic, budget, goal setting) at the institutional level. As far as you know, does this university have a structure (e.g., commission, division) for university-wide planning?

_____Yes _____No → Skip to QUESTION 33 129

31. To what extent will the long-term success of this university depend on formal long-range planning? Circle one: 130

1) not at all
2) to a limited extent
3) to some extent
4) to a considerable extent
5) to a very great extent

32. To what extent do formal planning activities take into account trends and events in the business sector? 131

1) not at all
2) to a limited extent
3) to some extent
4) to a considerable extent
5) to a very great extent

33. We'd like to ask your general opinion about industry-university cooperation. From your perspective as unit head, how important is industry-university cooperation to the mission of this university? Circle one: 132

1) not at all important
2) slightly important
3) somewhat important
4) very important
5) extremely important

34. Compared to cooperative activities with other groups outside the university (e.g, federal or local government, the public sector, individual donors, alumni), how important is industry-university cooperation to the success of your unit? Circle one: 133

1) not at all important
2) slightly important
3) somewhat important
4) very important
5) extremely important

35. What do you see as the major barriers to increased industry-university cooperation? 134

_____ 135

_____ 136

_____ 137

36. Can you suggest ways in which the University can make changes which will facilitate more effective industry-university cooperation? 138

_____ 139

_____ 140

_____ 141

SECTION VI. Finally, we'd like to ask some questions about your experiences involving cooperation with industry and other universities. Let's consider the four major research universities--The University of Michigan, Michigan State University, Wayne State University and Michigan Technological University.

37. Do you work in a committee, program, or activity (such as research) that also involves members from any of these other universities PLUS someone from a business or industry firm?

YES_____ NO_____ → SKIP TO QUESTION 38 142

Please describe:_____ 143

144

_____ 145

_____

38. It has been suggested that one way to facilitate industry-university cooperation is to increase the level of cooperation BETWEEN THE FOUR RESEARCH UNIVERSITIES. In your opinion, is it a good or bad idea to promote cooperation among the four universities? Circle one number:

1	2	3	4	5	146
Very bad idea		mixed		excellent idea	

39. What do you see as the major costs and benefits of increased cooperation among the four research universities? 147

_____ 148

_____ 149

_____ 150

_____ 151

_____

SECTION VII. We are interested in the ways in which views of industry-university cooperation may vary across different levels of the university.

40. Please indicate your current position: 152

____Dean, College of _____

____Director of _____

____Chair, Department of _____

____Other (Please specify)_____

41. How many years have you held this position at this university? 153

_____years

42. How many years have you held a university administrative position (including those held at other universities) prior to taking your current position? 154

_____years

The space below has been provided for any further comments you wish to make.

THANK YOU FOR YOUR COOPERATION

Please place the questionnaire in the self-addressed return envelope provided.

APPENDIX C: QUESTIONNAIRE DIMENSIONS AND ITEMS

APPENDIX C: QUESTIONNAIRE DIMENSIONS AND ITEMS

SCANNING SOURCE

13. Of all the information that you get routinely about business firms, how often does this inforamtion come from each of the following sources? Using the scale below, circle one number for each source.

0) not at all
1) less than once a year
2) once or twice a year
3) three to four times a year
4) once or twice a month
5) once or twice a week
6) daily or more often

	SOURCES	FREQUENCY
Impersonal		
a)	subscriptions to periodicals (newspapers, magazines, journals).	0 1 2 3 4 5 6
b)	computerized data bases or monitoring services	0 1 2 3 4 5 6
c)	written reports (memos, documents) produced within your unit	0 1 2 3 4 5 6
d)	written reports produced by other units within the university	0 1 2 3 4 5 6
e)	the university library	0 1 2 3 4 5 6
Personal		
f)	verbal reports or contacts with subordinates 0 1 2 3 4 5 6	
g)	verbal reports or contacts with other administrators within the university	0 1 2 3 4 5 6
h)	external consultants	0 1 2 3 4 5 6
i	members of other universities	0 1 2 3 4 5 6
j)	members of the relevant business sector 0 1 2 3 4 5 6	

SCANNING INITIATION

14. Aside from information that comes routinely, administrators often must actively search for additional information. There are many different ways in which an administrator might search for information on business firms. Please review the list below, and indicate how often you actively use any of these approaches to get nonroutine information on the business sector. Using the following scale, circle one number for each approach:

0) not at all
1) less than once a year
2) once or twice a year
3) three to four times a year
4) once or twice a month
5) once or twice a week
6) daily or more often

	APPROACHES	FREQUENCY
"Passive"		
a)	monitor and review routinely published reports or data bases	0 1 2 3 4 5 6
b)	obtain reports from computerized data bases or monitoring services	0 1 2 3 4 5 6
c)	review written reports produced within my unit	0 1 2 3 4 5 6
d)	review written reports produced by other units within the university	0 1 2 3 4 5 6
e)	ask for verbal reports from subordinates	0 1 2 3 4 5 6
f)	solicit verbal reports or contacts with other administrators within the university	0 1 2 3 4 5 6
"Active"		
g)	contract external consultants	0 1 2 3 4 5 6
h)	contact members of other universities	0 1 2 3 4 5 6
i)	form a committee to acquire the needed information	0 1 2 3 4 5 6
j)	call or write someone in the relevant business firm	0 1 2 3 4 5 6
k)	interact directly with members of the relevant business sector	0 1 2 3 4 5 6
l)	send questionnaires or surveys to business firms	0 1 2 3 4 5 6

INTERPRETATION: EQUIVOCALITY REDUCTION

18. Particularly when information received on business firms is unusual or unexpected, this information can be unclear and lead to a variety of different interpretations. As unit head, can you recall instances when you've received information or requests from business firms that were unclear or ambiguous?

_____Yes _____No

19. How often, on the average, would you say that the information you receive on business firms is unclear or ambiguous?

1) never
2) rarely
3) sometimes
4) often
5) almost always

20. How often do you discuss unclear or ambiguous data with people from the following groups in the process of trying to understand the implications for your unit? Using this scale, circle one number on each line:

1) never
2) rarely
3) sometimes
4) often
5) almost always

a)	others at my same administrative level	1 2 3 4 5
b)	higher level administrators	1 2 3 4 5
c)	faculty	1 2 3 4 5
d)	staff	1 2 3 4 5
e)	professional colleagues outside this university	1 2 3 4 5
f)	members of the relevant business firm	1 2 3 4 5
g)	members of other business firms	1 2 3 4 5

21. What other approaches do you take to reduce ambiguity? For example, do you frequently pass the information along to others to let them determine its meaning? Do you asses the information yourself, and determine what it means based on what you already know about the firm? In your answer, please provide one or two examples of approaches that you've used.

PERCEIVED ENVIRONMENTAL COMPLEXITY

2. For each type of cooperative effort listed below, please estimate how frequently you and other members of your unit have participated in these activities. Using this scale, circle one number in column B:

0) not at all
1) less than once a year
2) once or twice a year
3) three to four times a year
4) once or twice a month
5) once a week or more

A. Participation	B. Frequency
-conduct research supported by business firms (contract research).....	0 1 2 3 4 5
-collaborate in research projects (joint, non-proprietary research).....	0 1 2 3 4 5
-engage in faculty consulting.....	0 1 2 3 4 5
-place graduates in industry.....	0 1 2 3 4 5
-hold conferences and seminars for business sector participants.....	0 1 2 3 4 5
-conduct seminar/colloquia series in which business people participate.....	0 1 2 3 4 5
-place student interns in business firms (e.g. coop ed, work study, formal internships)..	0 1 2 3 4 5
-permit faculty sabbatical or temporary placement of faculty in business firms	0 1 2 3 4 5
-hire part-time faculty from business firms....	0 1 2 3 4 5
-provide technical service to industry.....	0 1 2 3 4 5
-faculty or staff hold equity or membership in business firms.....	0 1 2 3 4 5

A. In column A below, please list the types of industries your unit has had contact with over the last two years. Do not give specific names of businesses, but rather types of industries, such as computer, banking, electronics, etc.

B. For each type of industry you listed, please estimate to the nearest 5 the number of firms with which you or other members of your unit have cooperated over the last two years. If you don't know or can't estimate, please enter "?" in column B.

ANALYZABILITY

Change

6. Have there been any major changes over the last year or so in the types of requests business firms have made for service from your unit?

No_____

Yes_____ Please describe:

Predictability

7. On the whole, to what extent were these changes in business firms' requests predictable?

1) not at all predictable
2) slightly predictable
3) somewhat predictable
4) quite predictable
5) extremely predictable

Rate of Change

8. How often, in the past two years, have business firms requested novel services from your unit? By novel we mean services different from those your unit has previously provided.

0) not at all
1) less than once a year
2) once or twice a year
3) three or four times a year
4) once or twice a month
5) once a week or more

Assessibility

15. How easy is it for you to get information about the needs that business firms have for services which your unit could provide? Circle one number:

1) difficult
2) not very easy
3) somewhat easy
4) very easy
5) extremely easy

ORGANIZATIONAL CHARACTERISTICS

Listed below are other general characteristics of University policy or structure that may affect university-industry cooperation. Using the scale below, circle one number to indicate the extent to which you believe each statement applies to this university.

1) not at all
2) to a limited extent
3) to some extent
4) to a considerable extent
5) to a very great extent

STRUCTURE

Formalization

26. Clear, written goals and objectives exist for pursuing industry-university cooperation 1 2 3 4 5

27. Formal, written policy statements exist on the importance of maintaining up-to-date information on the relevant trends and events in the business sector 1 2 3 4 5

Inflexibility

28. People in this university consider the rules for industry-university cooperation as general guidelines, not as rigid and unbending 1 2 3 4 5

INTRUSIVENESS

Resource Allocation

16. Approximately what percent of your annual discretionary budge is allocated to each of the following activities to obtain information on the needs of private business firms? (Please estimate to the nearest 1-2% or enter "?")

a) faculty attendance at professional meetings at which business contacts are likely _____
b) attendance at business-oriented conferences and seminars _____
c) subscriptions for your unit to business-oriented journals or trade magazines _____
d) industry-related data bases or monitoring services _____
e) travel related to increasing/improving contacts with business firms _____
f) entertaining members of business firms _____
g) bringing business people to your unit _____
h) other information-seeking activities: _____

Policy

23. Please use the scale below to rate the extent to which each of the following university policies discourages or encourages you to take an active role in industry-university cooperation.

0) not aware of any policy on this issue
1) discourages considerably (interferes with taking active role)
2) discourages slightly
3) doesn't affect either way (neutral)
4) encourages slightly
5) encourages considerably (greatly facilitates active role)

University policy on:

a) faculty-owned business firms	0 1 2 3 4 5
b) consulting for pay	0 1 2 3 4 5
c) use of university facilities to assist business firms (e.g., when consulting for pay, or faculty-owned firm)	0 1 2 3 4 5
d) overhead	0 1 2 3 4 5
e) tenure and promotion	0 1 2 3 4 5
f) university patent and copyright policies	0 1 2 3 4 5
g) proprietary research	0 1 2 3 4 5
h) overload (supplementary compensation)	0 1 2 3 4 5

Formal Planning

31. To what extent will the long-term success of this university depend on formal long-range planning? Circle one:

1) not at all
2) to a limited extent
3) to some extent
4) to a considerable extent
5) to a very great extent

32. To what extent do formal planning activities take into account trends and events in the business sector?

1) not at all
2) to a limited extent
3) to some extent
4) to a considerable extent
5) to a very great extent

EXECUTIVE ROLE CHARACTERISTICS

40. Please indicate your current position:

HIERARCHY	FUNCTIONAL SPECIALTY
_____Dean, College of	_____
_____Ass't or Assoc. Dean, College of	_____
_____Director of	_____
_____Ass't or Assoc. Director of	_____
_____Chair, Department of	_____
_____Coordinator of	_____
_____Supervisor of	_____

EXPERIENCE

41. How many years have you held this position at this university?

_____years

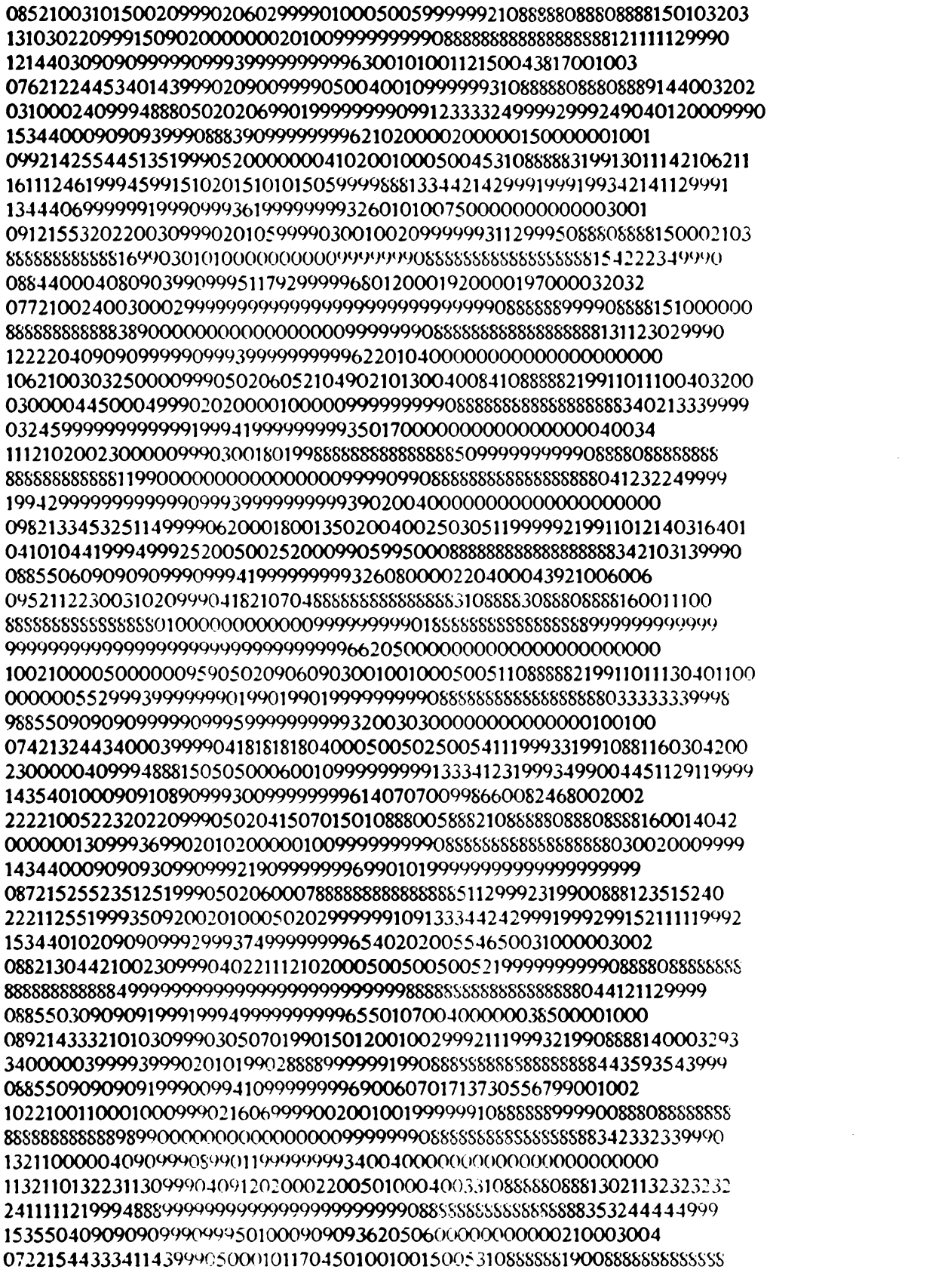
42. How many years have you held a university administrative position (including those held at other universities) prior to taking your current position?

_____years

APPENDIX D

DATA MATRIX AND SURVEY CODEBOOK

APPENDIX D DATA MATRIX



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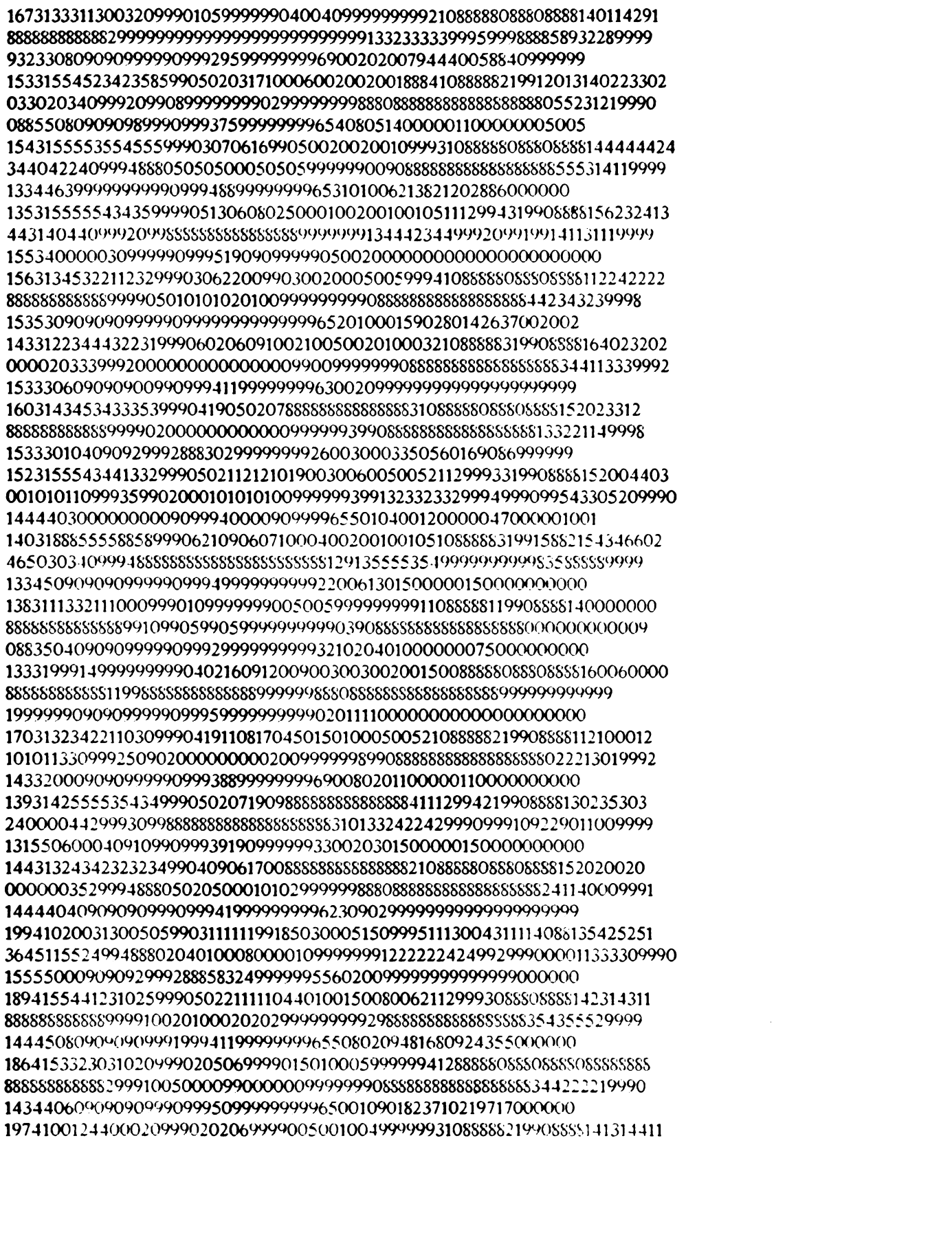

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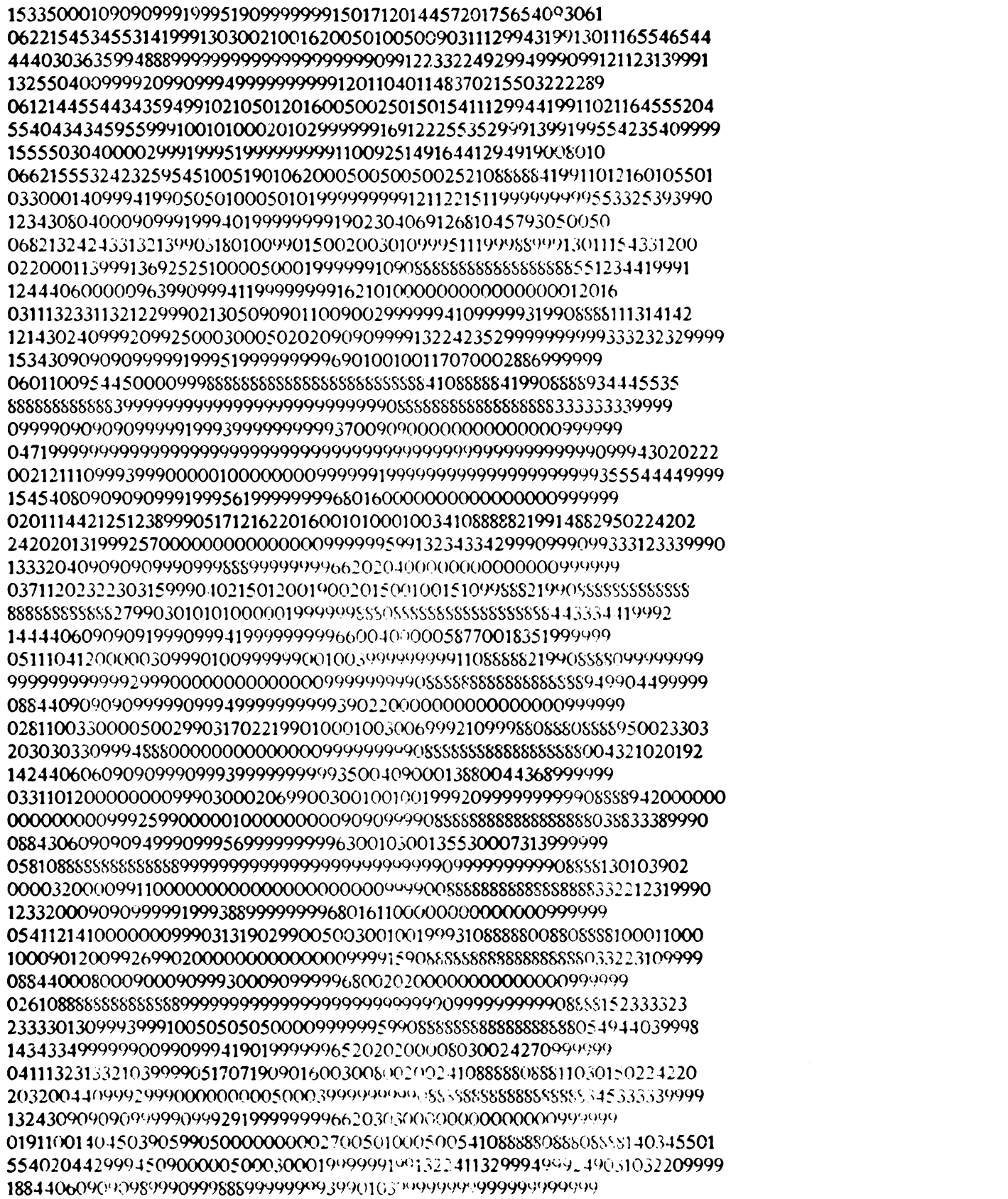

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APPENDIX D: SURVEY CODEBOOK

VAR	DESCRIPTION
1	RESPONDENT NUMBER
2	UNIVERSITY CODE: (1 THRU 4)

ENVIRONMENTAL COMPLEXITY

3-17	Frequency of activities with industry (singlets)
18	Total Number of industries (up to 98) 2 digit
19-22	Type of Industry codes

00	Other
01	Agricultural
02	Automotive
03	Auto suppliers
04	Aerospace, transportation
05	Chemical
06	Computer
07	Electronic
08	Engineering
09	Financial (Banks, insurance, accounting)
10	Law firms
11	Metal/Mining
12	Healthcare (Hospitals, nursing homes, HMO's)
13	Pharmaceutical
14	Research firms
15	Retail chains
16	Telecommunications
17	Utilities
18	Wood Product Manufacturers
19	Petroleum, oil
20	Food Processors
21	Misc. manufacturing
22	Consulting firms

23	total number of firms (3 digit)
24-27	number of firms: (3 digit numerical code)
28-29	Misc descriptive, (Singlets)

VAR DESCRIPTION

30 **ANALYZABILITY** (Singlet)
31-34. Types of changes: (Singlet)
0. Other
1. Changes in content
2. Changes in volume
3. Shift in program emphasis
4. More requests for consultative services
35-36 predictability, change (Singlets)
37-39. Types of novel services: (singlets)
1. See survey for specific answer
8. Don't know, not relevant
9. Blank

ORGANIZATIONAL STRUCTURE:

40 Monitoring responsibility (singlet)
41. Position to which scanning assigned (singlet)
0. Other
1. Director or Dean (incl. Ass't and Assoc.)
2. Dept. chair
3. Coordinator, manager
4. Non-administrative faculty
5. Staff
42. Number of people (2 digit)
43. How is responsibility assigned (singlet)
0. Other
1. Formal job description
2. Informal agreement between individual and unit head
3. Individual initiative to take on responsibility

44-56 **SCANNING SOURCE** (Singlets)

57-72 **SCANNING INITIATION** (Singlets)

73 **ANALYZABILITY** (Singlet)
74-76. Major difficulties in getting information (Singlet)
0. Other
1. Communication problems
2. Business doesn't know/ can't tell us what it wants
3. Lack of experience with talking to business firms
4. Low prestige of university with business
5. Time involved
6. Info not available/sources unknown
7. Not enough personnel

ORGANIZATIONAL POLICY

VAR	DESCRIPTION
77-86	Resource allocation (2 digit)
87-89	" " (Singlet)
	Other support of information-seeking activities:
	0. Other
	1. Faculty release time
	2. internal incentives
	3. Travel funds
	4. Sabbatical support
	5. Informal encouragement
	6. Recognized/expected part of personnel function

INTERPRETATION

90 Abiguity: existence (Singlet, 0, 1)
91 frequency (Singlet)
92-101 Interpretation mode (Singlets)
102-5. Approaches to reduce ambiguity (Singlet)
0. Other
1. Pass on to others (delegate responsibility for reduction)
2. Assess based on own knowledge
3. Form a committee, do jointly with personnel
4. Analyze or discuss with industry personnel
5. Ignore it
106-8. Criteria for discussion decision (singlet)
0. Other
1. Expertise or interest of individual relative to information
2. Type of information
3. Complexity of data
4. Specific firm involved

ORGANIZATIONAL POLICY

109-119 Specific policy affects initiation (Singlets)
120-23. Policies within unit (Singlets)
1. Yes. There are policies which encourage
2. Yes. There are policies which discourage
0. No.
124-28 *Formalization* (singlets) [RECODE:reverse score]
129-131 Formal planning
132-133 **Opinion Industry-University Cooperation (I-U-C)** (Singlets)

VAR DESCRIPTION

134-37. Major barriers to I-U cooperation (2 digit)
0. Other
1. Lack of communication between business and industry
2. Overhead policies
3. Internal (University) policy or leadership
4. Conflict of interests/values, missions
5. Low status of University with Industry
6. Insufficient resources/support for faculty
7. Lack of interest from faculty
8. Insufficient information on business needs
9. No response

138-41. Suggested changes (Singlets)
0. Other
1. Change policies
2. More leadership from the top
3. More outreach to business
4. Change hiring policies
5. Increase exchange of information between business and U's
6. Change image of U
7. Decrease administrative barriers
8. Create central unit for coordinating information
9. No response

142-45 Interuniversity cooperation: 9 [see survey for specific responses]

146 Interuniversity cooperation (Singlet)

147-51. Benefits and costs of increased I-U-C: (2 digits)
First digit = Benefits of increased I-U-C:
1. More optimum use of university resources
2. Better service to industry
3. More successful outreach to industry
4. Shared information
5. Greater visibility for research
6. Greater distribution of industry resources
7. Easier for industry to contact/communicate with university units

Second digit = Costs of increased I-U-C:
1. Loss of time in coordination efforts
2. Greater constraints on individual initiatives
3. Difficulty in legislating coordination
4. Costly
5. Loss to individual universities

EXECUTIVE ROLE

VAR DESCRIPTION

152. Current Position (1 digit)
Hierarchical
1 = Dean
2 . Ass't or Associate Dean
3. Director
4. Ass't or Associate Director
5. Coordinator
6. Department chair (including Acting)
7. Supervisor
0. Other

153. **Functional Area (2 digits)**
10. Agriculture
11. Ag Econ
12. Ag Engineering
13. Crop & Soil Science
14. Forestry
15. Other
20. Business
21. Accounting
22. Economics
23. Finance
25. Management
26. Other
30. Computer Services
40. Education
50. Engineering
51. Chemical
52. Civil
53. Electrical
54. Mechanical
55. Metallurgical
56. Mining
57. Other
60. Liberal Arts (Literature, Arts, Social Sciences, Humanities)
61. Arts & Letters
62. Social Sciences
63. Humanities
64. Other
70. Lifelong Learning
80. Medicine
90. Natural Science
00. Other

EXPERIENCE

VAR	DESCRIPTION
154	Current position (2 digit)
155	Years previous experience (2 digit)

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