Environmental Scanning:
Acquisition and Use of Information by Managers

INTRODUCTION

Information is central to every facet of managerial work. A large part of the manager's information comes from or concerns the environment external to the organization. Managers use this information to respond to external change by planning and designing courses of action that shape the future of the organization. This acquisition and use of environmental information, known as *environmental scanning*, is a form of information seeking that is practised by all managers. As the first *ARIST* chapter on environmental scanning, this review includes relevant literature from organization theory and information needs and uses in order to show the relationships between research on scanning and these broader disciplines. After an introduction on environmental scanning, we review organization theories that analyse organizations and their environments, and that treat organizations as information processing systems. Next we look at selected studies on information needs and uses. We follow this with a discussion of research on managers as information users that combines elements from organization theory and information needs and uses studies. This leads logically to research that investigates environmental scanning, and here we survey studies from 1967 to 1992. We conclude with a synthesis of the principal findings of the research thus far. The reader may wish to preview the structure of this discussion by looking at the main headings in Figure 1 near the end of the chapter.

THE NATURE OF ENVIRONMENTAL SCANNING

The seminal study on environmental scanning was published by AGUILAR in 1967. Aguilar defines environmental scanning as "scanning for 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, p.1). Scanning then is the acquiring of information, and the importance of scanning stems directly from the importance of the decisions that result from it. Scanning spans a range of information activities. Aguilar usefully identifies four modes of scanning. In *undirected viewing*, the manager is exposed to information with no specific purpose or informational need in mind. In fact, the manager is unaware of what issues might be raised. Undirected viewing takes place all the time, and alerts the manager that 'something' has happened and that there is more to be learnt.

An example of undirected viewing would be when the manager converses with business associates during social gatherings. In *conditioned viewing*, the manager is exposed to information about selected areas or certain types of information. Furthermore, the manager is ready to assess the significance of such information as it is encountered. An example of conditioned viewing would be the browsing of sections of newspapers or periodicals that report regularly on certain topics. In *informal search*, the manager actively looks for information to address a specific issue. It is informal in that it involves a relatively limited and unstructured effort. An example of informal search would be the activity of keeping an eye on the market to check on the results of some new product pricing policy. Finally, in *formal search*, the manager makes a deliberate or planned effort to obtain specific information or information about a specific issue. An example of formal search would be a systematic gathering of information to evaluate a prospective corporate acquisition. To summarise, the rubric of 'environmental scanning' includes both *looking at* information (viewing) and *looking for* information (searching). It could range from a casual conversation at the lunch table or a chance observation of an angry customer dumping a product in a trash can, to an extensive market research programme to identify business opportunities.

Is environmental scanning different from information seeking? In a review of the literature of library science, management, psychology, and computer science, ROUSE & ROUSE define human information seeking as the process of identifying and choosing among alternative information sources. Information seeking is embedded in a larger process of decision making, problem solving, or resource allocation that provides the context for establishing information needs. Information seeking is dynamic in that the methods and criteria for information selection or rejection vary over time and depend on intermediate results. At a conceptual level then, environmental scanning may be seen as a special case of information seeking. Scanning is part of the process of strategic decision making, and a study of scanning as information acquisition should analyse the selection and use of alternative information sources. However, much of the field research, particularly in library and information science, deals with the information needs and uses of defined groups of users, and with the search for and retrieval of information, often from documentary or bibliographic sources and online information systems. In most of these situations, a problem or information need is articulated or at least made relatively clear, and information is then sought to address the specific question or need. This may be contrasted with scanning, which not only includes searching for particular information but also simply being *exposed* to information that *could* impact the firm. As we explained earlier, scanning is often undirected viewing without specific purpose or information need, and without awareness as to what issues might be raised.

ORGANIZATION THEORY

The relation between organizations and environments has been and continues to be a major area of study in organization theory. Indeed, the shift towards an 'open systems' perspective of organizations in recent years has concentrated attention on the role of the environment as "the ultimate source of materials, energy, and information, all of which are vital to the continuation of the system" (SCOTT, p. 91).

Organizations and Environments

In organization theory, the external environment may be viewed as a source of information, a pool of resources, or a source of ecological variation (ALDRICH & MINDLIN; ALDRICH).

One of the first researchers to view the environment as a *source of information* was DILL (1958; 1962). He suggests that the best way to analyze the environment is not to try to understand it as a collection of other systems and organizations but rather to

> treat the environment as information which becomes available to the organization or to which the organization, via search activity, may get access. It is not the supplier or the customer himself that counts, but the information that he makes accessible to the organization being studied about his goals, the conditions under which he will enter into a contract, or other aspects of his behavior (DILL 1962, p. 96).

Changes, events, and trends in the environment continually create signals and messages. Organizations detect or receive these cues and use the information to adapt to new conditions. ARROW proposed a theory of control and information in large organizations in which managers receive 'signals' from the environment and other managers. When decisions are made based on these messages, further information is generated and transmitted, and these in turn lead to new signals and decisions. The informational view of the organizational environment is implicit in the work of several other researchers, including BURNS & STALKER, CYERT & MARCH, LAWRENCE & LORSCH, THOMPSON, GALBRAITH, and WEICK (1979). The common perspective is that uncertainty is inherent in the environment, so that a basic task of management is coping with this uncertainty by using information from the environment to maintain or change organizational structures and processes.

Another theoretical perspective views the environment primarily as a *source of resources* upon which the organization is dependent. The degree of dependence varies according to three structural characteristics of the environment: munificence, or the scarcity of resources; concentration, the extent to which power in the environment is widely dispersed; and interconnectedness, the number and pattern of linkages among organizations in the environment. Dependence would be great when resources are scarce, and when entities in the environment are highly concentrated or interconnected. According to PFEFFER & SALANCIK, because external entities control the resources needed by the organization, they have power over the organization. An organization can manage resource dependence by setting up coordination links among interdependent organizations in its environment.

In the third perspective, the environment is viewed as a *source of ecological variation*: the environment differentially selects certain types of organizations for survival on the basis of the fit between organizational forms and environmental characteristics. The focus here is on the action of environmental selection processes, with the organizations being relatively passive and unable to determine their own fates. This ecological view of environmental selection is developed principally by HANNAN & FREEMAN (1977; 1989) and ALDRICH to explain why certain forms of organizations survive and thrive, while other types languish and perish.

Organizations as Information Processing Systems

A number of important organization theories treat organizations as information processing systems that perceive stimuli, interpret them, store, retrieve, and transmit information, generate judgements, and solve problems (LARKEY & SPROULL). It is possible to differentiate two research orientations in the literature on organizational information processing (CHOO). The first regards organizations as rational, *decision making systems*. Unfortunately, the individual as decision maker is bounded by cognitive limitations. The task of organization design is thus to control the decision premises that guide decision making behaviour. The organization sets its goals first, then searches for alternatives, and selects courses of action which lead to goal attainment. Information is processed in order to reduce or avoid uncertainty associated with decision making. This decision-making perspective was first developed by Herbert Simon, James March and Richard Cyert (SIMON, 1957, 1976, 1977; MARCH & SIMON; CYERT & MARCH) and became very influential in organization theory. According to CYERT & MARCH, a theory of organizational decision making processes must consist of a theory of *search* and a theory of *choice*. Decision

makers are not automatically presented with problems to solve and alternative solutions to choose from. They must identify problems, search for solutions, and develop methods to generate and evaluate alternatives. In other words, decision makers must actively search for the required information in order to make choices.

The second orientation sees organizations as social, loosely coupled systems in which individual actors enact or create the environment to which the organization then adapts (WEICK, 1979; 1977). Although organizations are still viewed as information processing systems, the purpose of processing information is not decision making in the first instance. Instead, it is to reduce the *equivocality*[1] of information about the organization's external environment. Managers as information processors receive information about the external environment and then *enact* the environment to which they will attend. The task of organizing is to develop a shared interpretation of the environment that provides a framework for action. Actions are often taken first and then interpreted retrospectively: in other words, action can precede goals. This 'enactment' perspective was later extended into a model of organizations as *interpretation systems* (WEICK & DAFT; DAFT & WEICK). Organizations receive information about the environment that is ambiguous. Within the organization, various subunits adopt dissimilar frames of reference to view changes in the environment. As a result, the organization must interpret the external environment by collecting and exchanging information, and how the organization goes about its interpretation depends on how analyzable it perceives the environment to be and how actively it intrudes into the environment to understand it. The organizational learning process thus consists of scanning the environment, interpreting information about the environment, and learning from the consequences of taking action.

Summary

Organization theory conceptualizes the environment as a source of information, resources, and ecological variation. To study environmental scanning, the perspective of the organizational environment as source of information seems

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[1]The distinction between equivocality and uncertainty should be made clear. In a situation of uncertainty, managers are able to ask questions and obtain answers. Organizations respond to uncertainty by acquiring information and analyzing data. In contrast, equivocality means ambiguity, the existence of multiple and conflicting interpretations about the organizational situation. Managers are not certain what questions to ask, and if questions are asked there may be no data to answer them.

the most appropriate. Organizations process information in order to make decisions and to interpret changes in the external environment. Both the decision-making and interpretation perspectives are valuable for understanding environmental scanning. Rational, systematic decision making is probably better suited to solving problems where issues may be clearly identified. On the other hand, collective interpretation may be needed in dealing with problems where issues are unclear and information is ambiguous.

INFORMATION NEEDS AND USES

There have been eleven *ARIST* chapters reviewing information needs and uses studies, of which the most recent are DERVIN & NILAN, and HEWINS. TAYLOR (1990) also provides an analytical summary of the research on information use environments. The tremendous diversity in context and scope of the information needs and uses studies defies any attempt to generalize. Nevertheless, based on recent literature surveys, we may make three summary observations:

(1)   Information needs and uses need to be examined within the work, organizational, and social settings of the user. Information needs vary according to users' membership in professional or social groups, their demographic backgrounds, and the specific requirements of the task they are performing.

(2)   Users obtain information from a wide range of formal and informal sources. Informal information sources, including colleagues and personal contacts, are frequently as important as and sometimes more important than formal information sources such as the library or online databases.

(3)   A large number of criteria can affect the selection and use of information sources. Research has found that many groups of users prefer sources that are local or close at hand, which are not necessarily the best regarded. For these users, the perceived accessibility of an information source is more important than its perceived quality.

A recent large-scale survey of US aerospace engineers illustrates many of the above features. The study was conducted as part of the NASA/DoD sponsored Aerospace Knowledge Diffusion Research Project (PINELLI, 1991a; 1991b; 1991c). The survey found that US aerospace engineers prefer informal sources of information, especially conversations with individuals within their organization, when solving technical problems. They seem predisposed to solve problems alone or with the help of colleagues rather than seek answers in the literature. They draw on past experience and consult reliable and efficient colleagues. The engineers' search for information seems to be driven more by a need to solve specific problems than a search for general opportunity. They use the library personally, usually not involving the librarian. When they need technical

information, they use accessible sources such as colleagues, vendors and internal reports (PINELLI 1991a, p. 260-261).

System-oriented Research Paradigm

DERVIN & NILAN identify several premises which define the mindset of "traditional" researchers in information needs and uses. Information is conceived as objective, something that has constant meaning. The user passively receives objective information, and the task of information delivery is to get the information into the user's hands. The research intent is to describe universal user information behaviors that apply across situations. Research concentrates on the intersection of users with information systems, leaving aside factors that lead to the encounter with the system or the consequences of such an encounter. Research also concentrates on external attributes such as use of sources or systems as indicators of information needs rather than internal processes such as cognitive assessments. Finally, research looks for orderly patterns of behavior to guide system design, and there is concern that focusing on individual behavior would yield too much variation for systems to integrate. As a result of this mindset, most information needs and uses studies observe users from the perspective of information systems. A typical systems-oriented study would thus examine the extent a user has used the information systems, perceive barriers to the use of the systems, and report satisfaction with various system features. Differences in user information behavior are explained with factors based on demography, user's social group, life style, and task description. In her review of the literature, HEWINS also concludes that the large body of information needs and uses studies appears to share two themes: it views the user as a member of a sociological group, or it examines the user's behaviour in relation to an information system. The individual user's information needs are largely determined by the needs of the social or professional group to which the user belongs. Group information needs are studied so that information systems can be designed to serve them better.

User-centered Research Paradigm

DERVIN & NILAN proposed that an alternative research paradigm in information needs and uses studies is needed, and is in fact emerging, to replace the traditional system-oriented paradigm. The new approach

> focuses on understanding information use in particular situations and is concerned with what leads up to and what follows intersections with systems. It examines the system only as seen by the user. It asks many 'how questions' – e.g., how do people define needs in different situations, how do they present these needs to

systems, and how do they make use of what systems offer them (DERVIN & NILAN, 1986, p.16).

New research that illustrates this alternative paradigm includes the "value-added" approach (TAYLOR, 1986), the "sense-making" approach (DERVIN), and the "anomalous states of knowledge" approach (BELKIN). For example, in the sense-making approach, the individual is a sense-maker who is stopped in a *situation* because the individual's internal sense has "run out" and needs more information to create new sense. Movement forward is prevented by a cognitive *gap* which may require, for example, certain questions to be answered. The individual defines the gap and selects strategies to bridge this gap. Finally, the information obtained is put to *use* by the individual. According to Dervin, the individual use of information and information systems depends on the individual's definition of the gap that is faced, and on the selection of strategies to bridge this gap. The methodology has developed a set of categories for defining and coding situations, gaps, and uses into what are assumed to be universally relevant dimensions of information needs and uses (DERVIN).

Four years after Dervin and Nilan's review chapter, HEWINS found that the user-centered approach now constitutes the mainstream of research in information needs and uses. Studies applying this approach start from the premise that user information needs occur cognitively as well as sociologically. Research thus examines cognitive characteristics that are unique to each user, as well as cognitions that are common to most users. Hewins mentions several cognitive traits that are the subject of research, including categorization techniques, long- and short-term memory, learning styles, motivation, personality types, and semantic factors. One consequence of the adoption of the user-centered cognitive approach is that the analysis of information needs and uses must now draw upon multiple disciplines. The study of information-seeking and -retrieving behavior by SARACEVIC ET AL., which combines elements from several disciplines in a comprehensive framework to examine user and searcher characteristics, is perhaps a bellwether of the future of interdisciplinary research on information needs and uses.

Information Use Environments

After a survey of the user study literature, TAYLOR (1990) proposes that research on information needs and uses should encompass not only the user and the uses of information, but also the contexts within which users makes choices about what information is useful to them. He calls these contexts *information use environments*, and they comprise the factors that affect the flow and use of information, and determine the criteria by which the value of information is judged. Information use environments can be divided into four components:

sets of people, typical problems faced by those sets of people, work settings, and resolution of problems. Sets of people are defined in terms of their information behaviors, and Taylor identifies four classifications: the professions, the entrepreneur (including managers), special interest groups, and special socioeconomic groups. Each *set of people* has its own demographic (e.g., age, education) and non-demographic (e.g., media use, social networks, attitudes) characteristics that explain differences in information behavior. Each set of people is concerned with a distinct class of *problems*, created by the requirements of its profession, occupation or life style. Problems change all the time as new information is obtained and as the user changes position and perception. Four attributes of the *work setting* influence information behavior: attitude towards information, task domain, information access, and past history and experience. Finally, each set of people has a different perception of what constitutes the *resolution of a problem*. Eight classes of information use are defined, as well as several information traits that can be related to problem dimensions to determine information usefulness. Taylor believes that information use environments "can become a generalizable model, a fruitful means for organizing, describing, and predicting the information behavior of any given population in a variety of contexts." (TAYLOR, 1990, p. 251)

Summary

After many decades of decrying the lack of a general theoretical framework for analyzing information needs and uses studies, we now appear closer to the development of models that give structure and order to a seemingly chaotic field. The work of DERVIN and TAYLOR (1990) broaden the system-orientation of traditional information needs and uses studies to include three additional elements: the *user* as a sentient, cognitive person; information seeking and use as *processes* extending over time and space; and information use *contexts* as crucial determinants of the usefulness of information. Their research suggests that while individual user behavior may exhibit infinite variety, order may be found by analyzing the user's sense-making processes and information use contexts. Furthermore, Taylor identifies managers as a distinct set of users with its own information behaviors, class of problems to be handled, work setting, and ways of resolving problems. The orientation towards cognitive processes and information use contexts provides a helpful focus for research on environmental scanning as an information activity of managers.

MANAGERS AS INFORMATION USERS

Traditionally, management research has always recognized the important role of information in managerial work. However, this recognition is expressed typically in the form of research on the *use* of information in managerial decision

making. As we will discuss in the final section of this chapter, the *acquisition* of information is assumed to be non-problematic and is therefore seldom addressed. While there is a very large literature on decision making, there are very few studies on managers that elaborate on *both* the acquisition and use of information. We highlight a selection of these studies in chronological sequence, so that the reader may directly get a sense of the research questions they pursue.

Managerial Roles

The conceptualization of managerial work by MINTZBERG clearly articulates how the acquisition, dissemination and use of information lies at the heart of managerial work. Mintzberg divides the work of managers into three sets of interlocking roles: interpersonal, informational, and decisional roles. By virtue of the formal authority vested in the position, the manager performs three *interpersonal roles*, as figurehead, leader, and liaison. Interpersonal roles give the manager access to many internal and external sources of information and so enable three *informational roles*. As monitor, "the manager continually seeks and receives information from a variety of sources in order to develop a thorough understanding of the organization and its environment." (MINTZBERG, p. 97) As disseminator, the manager transmits special information into the organization. As spokesman, the manager disseminates the organization's information out to the environment. The unique access to information combined with the authority empowers the manager to discharge four *decisional roles*. As entrepreneur, the manager initiates "improvement projects"; as disturbance handler, the manager deals with unexpected events; as resource allocator, the manager distributes organizational resources; and as negotiator, the manager engages in major negotiations with external organizations. Ultimately, "it is the manager's informational roles that tie all managerial work together – linking status and the interpersonal roles with the decisional roles" (MINTZBERG, p. 71).

Information Acquisition and Use by Managers

BLANDIN & BROWN examined the relationship between perceived environmental uncertainty and the information search behavior of top-level managers in four electronics firms and four wood products firms. They found significant positive correlations between the level of perceived uncertainty and (1) their reliance on external information sources, (2) their use of informal sources of information, (3) their frequency of use of all information sources, and (4) the amount of time they allocate to environment-related information gathering activities. They suggested that the cause-effect relationship between uncertainty and information search is interdependent: information search may initially

attempt to reduce uncertainties surrounding strategic choices, but as information is acquired, new uncertainties are revealed and require further investigation.

STABELL investigated the relationship between managers' perception of their information environment and their use of information sources. Perception of the information environment was measured by the individual manager's integrative complexity. An integratively simple person choosing between information sources might use only a single rule such as to leave out quantitative information. An integratively complex person recognizes several source attributes and gives added importance to some attributes in certain decision situations. Complexity theory predicts that the more integratively complex person will sample a larger number of different sources, will sample more information, and will sample these sources more evenly. By examining the actual investment decision making of 30 portfolio managers in a large US bank, Stabell found significant support for the hypothesis for impersonal sources, but weak support for personal sources.

O'REILLY looked at the impact of source accessibility and quality on the use of information sources by decision makers in four branch locations of a county welfare agency. Data were collected by a survey of 163 respondents. Results show that the reported frequency of use of the four major information sources is explained in three of the four cases by the accessibility of the source. The exception is the "group" source, consisting of sources within the work unit, including superiors and peers, which is highly accessible to all respondents. Although the rated importance of the sources was related to their perceived quality, the reported frequency of use was found to be mainly a function of the perceived source accessibility.

KOTTER (1982a; 1982b) studied the information behaviour of 15 successful general managers of nine corporations in various industries in cities across the US. Data were collected by interviews, observation, and questionnaires. He concluded that successful general managers are especially effective in "agenda setting" and "network building." In agenda setting, the managers develop loosely connected goals and plans that address their short- and long-term responsibilities. They evolve their agendas incrementally over time by gathering information continuously. Successful general managers seek information aggressively, often by asking critical questions that would provide answers useful for agenda-setting purposes. They rely more on information from discussions with individuals rather than on books, magazines, or reports. In network building, the managers develop cooperative relationships among those people whom they feel are needed to implement their emerging agendas. They cultivate relationships with people and sources both inside and outside the firm, mainly through face-to-face contact. The most successful managers create

networks with many talented people in them and with strong ties binding the members. Kotter's study suggests that the performance of general managers is linked to their ability to seek information aggressively, to use this information in developing agendas, and to implement their agendas through information-sharing networks.

JONES & MCLEOD, JR explored the use of information sources by senior managers in the four decisional roles proposed by MINTZBERG. Data were collected by interviews, questionnaires and transaction logs of five senior executives over two weeks. A large proportion of the executives' information came from people and organizational sources in the external environment. Information from subordinates was frequently obtained and valued highly. In the entrepreneur decisional role, executives preferred internal sources and verbal messages. In the resource allocator role, they preferred internal information but did not care if it was verbal or written. In the disturbance handler role, they preferred internal sources that use verbal media. Finally, in the negotiator role, they were indifferent about where it came from or how.

The Consultancy and Research Unit (CRUS) of the Department of Information Studies at the University of Sheffield undertook a number of studies in the 1980s which examined business information needs and uses (ROBERTS & WILSON). A 1984 study investigated the demand and supply of business information of manufacturing firms (ROBERTS & CLIFFORD). Data were collected by interviews with 60 firms in three selected geographical areas in the UK. The study found that the main demand for external information was in the areas of marketing, products, exporting, finance, and competitors. Information was demanded to respond to current events rather than longer term issues. Information gathering was unsystematic, intermittent, and eclectic. The five main sources of external information were trade associations, sales force, customers, suppliers, Chambers of Commerce, and public libraries. Fifty four percent of the respondents, at some time or another, made use of pubic library services for business purposes. In a pair of CRUS studies sharing the same research focus, WHITE and WHITE & WILSON examined the relationship between managers' functional roles and their information needs and uses. Data were collected by interviewing 82 managers of ten manufacturing firms in the South Yorkshire/Derbyshire region of Britain. They found no correlation between the managers' functional roles (production, sales, marketing, finance, or personnel) and their information needs. Significant numbers from all five functional areas ranked financial information as very important. Marketing and sales managers, who are typically considered to be external-oriented, were found to use large amounts of internally-produced data. Conversely, managers who mostly handle internal data could encounter a problem requiring outside information. Overall, the manager's major information resource are the personal

contacts, who are seen as the best sources of vital market and competitor intelligence.

ACHLEITNER & GROVER investigated information transfer patterns among managers and information workers in the finance department of a major defence/commercial contractor. All the managers identified people as the sources of information for their work. People were major sources of data, procedural information, interpretive information, source (who to see) information, current information, and some external information. Task-related information dominated daily activities, that is, procedures, meeting objectives, and problem solving. The information workers requested information from trusted human sources in an informal network. Communication patterns generally followed the organization's hierarchy.

MCKINNON & BRUNS examined how middle and upper level managers in Canadian and US manufacturing firms obtain and use information they need to control their daily operations. Data were collected by interviewing 73 managers (plant managers, sales directors, accountants, and other managers) in six US and six Canadian manufacturing corporations. They found that managers' information needs are determined by operational tasks: production managers need information to order materials and manage production facilities; sales and marketing managers seek information about orders, prices, competitor actions, and customer needs. For them, "Yesterday's information is of little interest, and tomorrow's is hard to come by. It is today that must be managed, and only today's information will do" (MCKINNON & BRUNS, p.19). The two most important sources of information that the managers value and use are personal observation and management work itself. Other people are a third important source, especially when they have proved themselves to be reliable. Another frequently used source are reports, including informal as well as formal outputs of a management accounting or information system.

Summary

From the small number of studies on how managers acquire and use information, we may deduce tentatively the following generalisations:

(1)   Managers indicate a substantial need for information about the external environment. This need for external information spreads over a number of environmental sectors.
(2)   Managers' information needs are often task-related, and are typically driven by current, immediate problems.
(3)   Managers prefer people sources, and often have their own interpersonal networks of familiar, trusted sources.

(4)   Managers prefer verbal media and oral communication.

TAYLOR (1986) and KATZER & FLETCHER arrived at similar observations when they summarized the special information requirements of managers: managers rely heavily on evaluated aggregated data; they suffer from an abundance of irrelevant information; they strongly favour verbal media; and they have a critical need for external information.

RESEARCH ON ENVIRONMENTAL SCANNING

One of the earliest studies on how managers scan the business environment was AGUILAR's (1967) path-breaking research, and his work continues to provide a reference point for current research. Most of the studies since then revolve around a handful of research themes: (1) The effect of perceived environmental uncertainty on scanning; (2) Focus and scope of scanning; (3) Information sources used in scanning; (4) Scanning modes and methods; (5) The influence of managerial job characteristics on scanning behavior.

Perceived Environmental Uncertainty

The concept of *perceived environmental uncertainty* is central to understanding how different levels of uncertainty affect scanning behavior (ACHROL; SHARFMAN). DUNCAN identified dimensions of the environment that would determine its perceived uncertainty. He infers two dimensions from earlier theorists such as EMERY & TRIST, THOMPSON, and TERREBERRY: the simple-complex dimension (the number of environmental factors considered in decision making) and the static-dynamic dimension (the degree to which these factors change over time). Duncan found that decision makers in environments which are dynamic and complex experienced the greatest amount of perceived environmental uncertainty. Perceived environmental uncertainty itself is conceptualized as: (1) lack of information on environmental factors associated with a decision situation; (2) lack of knowledge about the outcome of a specific decision; and (3) inability to assign probabilities with confidence on how environmental factors affect success or failure.

Generally, research on scanning has found that managers who experience higher levels of perceived environmental uncertainty tend to do a greater amount of environmental scanning. KEFALAS & SCHODERBEK surveyed the scanning behavior of 40 executives from six companies in the farm equipment and meat packing industries. They found that executives in the dynamic environment (farm machinery) did more scanning than those in the stable environment (meat packing), although the difference was not statistically significant. NISHI ET AL. analyzed the scanning behaviour of 250 executives in the Japanese computer

industry and information-processing industry. Again, executives in the dynamic (computer) industry spent more time scanning than did those in the stable (information-processing) industry. DAFT ET AL. studied scanning by the chief executive officers of small to medium-sized manufacturing companies located in Texas. They introduced the concept of *perceived strategic uncertainty* as a predictor of scanning activity. Perceived strategic uncertainty is a combination of the uncertainty of an environmental sector, *and* the importance of events in that sector to the firm. Chief executives responded to greater perceived strategic uncertainty with higher scanning frequency using all available sources, implying that they employ multiple, complementary sources to interpret an uncertain environment. Chief executives of high-performing firms did more frequent scanning through all media when strategic uncertainty was high, compared to low-performing firms. Moreover, their breadth of scanning was wider, and they tailored their scanning according to the amount of perceived uncertainty in each sector. BOYD studied the scanning behavior of executives in several industries[2]. He found a strong relationship between scanning of an environmental issue and the perceived importance of that issue, and concluded that "perceived importance is itself the most important predictor of scanning activity" (BOYD, p. 95). This is so even when the issue is experiencing a low rate of change, or when the executive already has adequate information about that issue. Boyd's work confirms the finding by DAFT ET AL. that the perceived importance of environmental developments has a large impact on scanning. AUSTER & CHOO (1991; 1992; 1993) examined the environmental scanning behavior of chief executive officers in the Canadian publishing and telecommunications industries. They found a substantial correlation between the executives' amount of scanning and their level of perceived environmental uncertainty.

Although HAMBRICK (1979; 1981; 1982) did not explicitly examine perceived environmental uncertainty, his study did analyze the effects of two sets of related environmental factors: the strategy adopted by the organization vis-a-vis the external market; and the nature of the industry that the organization is in. Based on a survey of executives from the top three levels of organizations in three industries (higher education, health care, life insurance), he found that organizational strategy alone did not appear to affect the amount of scanning conducted, but that the industry that the organization was in strongly affected the content of what was scanned. Thus, hospitals stressed scanning on the engineering environment, insurance firms stressed the entrepreneurial environment, and colleges had mixed patterns of emphasis. Hambrick explains the lack of a connection between strategy and scanning in the following way.

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[2]Most of the firms were in banking, health, insurance, and chemicals. Data were collected by mailing questionnaire surveys which were completed verbally by telephone interviews.

Organizations adopting different strategies have different propensities and capacities to act on environmental information. They may possess generally equal information, but they act on it in different ways to create their own competitive positions.

Focus of Environmental Scanning

The external environment of a business enterprise includes all outside factors which can affect the performance or survival of the organization. Although there are many factors, organizational research divides the external business environment into a few *environmental sectors*.   For example, JAUCH & GLUECK identify six environmental sectors: customers, suppliers, competition, socioeconomic, technological, and governmental. FAHEY & NARAYANAN distinguish between a macroenvironment comprising social, economic, political, and technological sectors, and a task/industry environment comprising mainly the customer and competitor sectors.

There is agreement among the research studies on which environmental sectors form the primary focus of environmental scanning. The market-related sectors of the external environment, with information on customers, suppliers and competitors, appear to be the most important. AGUILAR's 1967 scanning study involved interviews with managers in over forty companies in the US and Western Europe[3]. The study found that for these managers, the importance of information on "market tidings" was overwhelming – it was three times as important as the next area of concern ("technical tidings"). Similarly, NISHI ET AL. found that for both the Japanese computer industry and information-processing industry, the marketing sector was the major environmental sector, followed by the technology sector. JAIN studied scanning in Fortune 500 US corporations through interviews and questionnaire surveys. He found that scanning was directed at four areas: economic, technological, political, and social. Scanning the economic area was the most significant, followed by scanning the technological area. GHOSHAL & KIM surveyed the scanning practices of managers in the largest companies in the Republic of Korea (South Korea). The most important kinds of environmental information are those concerning the market, competition, technology, regulatory policies, resources, and broad issues. JOHNSON & KUEHN studied the scanning behaviours of managers and owners of small and large businesses in the US Southwest. Small business respondents spend almost a third of their information-seeking time looking for market-related information on sales, products, and customer problems. Next in importance is information about technology. LESTER & WATERS investigated the environmental scanning activities by corporate planning departments of

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[3]The companies were mostly chemical manufacturing firms which supplied industrial products.

seven large UK-based companies. The study found that the planners put most effort into acquiring information on the competitive sector, information concerning competitive industries, companies, products and services, and markets. Relatively little attention was given to macro-environmental influences such as economic, political, social/cultural factors.

Information Sources

Almost every study on scanning seeks to identify which information sources are used most frequently or are most important in environmental scanning. Because managers have access to a large number of information sources, sources are commonly classified according to whether they are internal or external to the organization, and whether they are personal or impersonal sources. The internal and external source categories are self-explanatory. Personal sources communicate information personally to the manager whereas impersonal sources are often defined as sources that communicate information to broad audiences, or through formalized, group-communciation activities (e.g., AGUILAR; KEEGAN, 1974). By this definition, impersonal sources would include publications, conferences, company library, and online databases. The pattern of source usage in scanning that emerges from the literature is that while both internal and external sources are frequently used, personal sources such as customers, associates and staff appear to be more important. Furthermore, sources like the library and online databases are not often used in scanning.

AGUILAR's study found that personal sources greatly exceeded impersonal sources in importance. The most important personal sources were subordinates and customers, and the most important impersonal source was publications. Managers of large companies tended to rely more on internal sources. Information from outside sources was mostly unsolicited, whereas information from inside sources was mostly solicited. KEEGAN (1967; 1974) was one of the first to focus on the environmental scanning of multinational companies. He interviewed executives in 13 US multinational companies about recent instances when they received external information. The study concluded that sources outside the organization were more important than sources inside the organization, with the former accounting for 66 per cent of information from all sources. Furthermore, the flow of information within the company was strongly constrained by intra-organizational, departmental boundaries. O'CONNELL & ZIMMERMAN compared how policy-level executives and planning staff managers in 50 US and 50 European multinational corporations scanned the international environment. Both groups identified persons in their own positions as the chief sources of environmental information. The most important sources were the categories "Home office top management" and "Home office staff" – both of which are internal sources. KOBRIN ET AL. studied how large

US international firms assessed foreign social and political environments through a survey of nearly 500 firms. The information sources considered important by a majority of the firms were internal – subsidiary and regional managers, and headquarters personnel. Banks were clearly the most important external source. There was a preference for obtaining environmental assessments directly from people whom they know and trust. They rely on their subordinates, colleagues in other firms, banks, and personal observations during frequent trips to foreign countries. SMELTZER ET AL. analyzed the scanning practices of small business managers in the Phoenix and Kansas City metropolitan areas in the US. Personal sources were significantly more important than impersonal sources. Family members and customers were the most prevalent personal sources, while magazines and journals were the most prevalent impersonal sources. The study of large UK companies by LESTER & WATERS found that traditional sources, such as libraries, were felt to be tedious and frustrating to use. Respondents were also skeptical about the value of information-brokering services, and they preferred raw to refined data. There was great interest in, and in some cases considerable usage of, online information services. Generally, the use of formal, published resources was ad hoc, informal, and low key.

A few studies have attempted to examine some of the factors that might explain the selection and use of certain types of information sources in environmental scanning. For example, CULNAN looked at the scanning behavior of a few hundred professionals in a bank holding company and a diversified natural resources manufacturing firm. She examined the effects of perceived source accessibility and perceived task complexity on the use of various information sources. The study found that information acquisition was not entirely a function of perceived source accessibility: information needs associated with the complexity of the task to be performed were related to the use of sources which were perceived as less accessible. The study of large South Korean firms by GHOSHAL & KIM concluded that information about the immediate business environment (competitors, existing technologies, and product markets) required daily for operational decisions is usually obtained from business associates such as customers, suppliers, trade associations, and bankers. On the other hand, for information about the broader environment (general social, economic, political and technological changes) printed sources in the public domain are more important: general and trade journals, special government publications, reports from academic institutions, think tanks or consulting organizations. The study of Canadian chief executives by AUSTER & CHOO (1992; 1993) revealed that executives use multiple, complementary sources when scanning the environment. Personal sources (managers, staff, customers, associates) are among the most frequently used, while the company library and electronic information services are not frequently used. Perceived source quality is the

more important factor in explaining source use than either perceived source accessibility or perceived environmental uncertainty. The study suggests that the turbulence of the external environment, the strategic role of scanning, and the information use contexts of managers, all combine to explain why information quality is more important than source accessibility when managers scan the environment.

Scanning Methods

Several studies have attempted to classify different modes or methods of environmental scanning practised by organizations. Scanning activities in business corporations can range from being ad-hoc and informal to being highly systematic and formalized. Field research seems to suggest that the size of the firm, the experience and proficiency with long-term planning and analysis techniques, and the perception of the external environment, are some of the factors that influence the choice of scanning method.

AGUILAR's case studies found that in the small firms, scanning was done by top management in the course of normal business operating activities, and the information obtained tended to be concerned with the immediate industrial milieu. In the medium-size firm, "a number of distinct scanning systems were loosely linked at the top management level through internal communication characterized by an element of bargaining" (AGUILAR, p.175). In the large firms, there was an increased amount and complexity of internal communications, a greater use of institutionalized scanning units, and an increased reliance by top management on staff assistants to filter information. In the study by KEEGAN (1974) of multinational companies, there was little evidence of any systematic method of information scanning: computer-based systems were not being used, and even manual systems did not play a significant role. THOMAS surveyed the scanning activities of nine very large corporations in the US and Europe through published sources. He concluded that the practice of scanning for planning has taken firm root among these large firms. According to Thomas, the scanning process was characterised by its permanence (continuity over time), periodicity (linkage with planning), and pervasiveness (spread over multiple levels and units). Thus, some of the firms studied had operated scanning systems for several years, integrated scanning into their corporate planning, and involved many functional units at various organizational levels in their scanning process. WILSON & MASSER explored the environmental monitoring activities of County Planning Authorities in England and Wales. They discerned two stereotypes: those authorities that defined information as "hard data" and those that defined it more widely as "qualitative data." The latter group was more likely to have a policy of comprehensive information acquisition and to regard information retrieval, processing, and evaluation as

serious information management issues. However, information management is seen as a technical task undertaken by specialists, and is to some extent divorced from organizational characteristics. KLEIN & LINNEMAN conducted an extensive international survey of the environmental assessment practices of large corporations. Approximately half of the respondents had formalized environmental assessment as part of the planning process. The increased importance of environmental assessment was attributed to greater environmental turbulence, longer planning time horizons, use of futures forecasting techniques, and greater experience with long-range planning processes. Trend extrapolation was the most widely practised form of forecasting, while scenario development was the most frequently used form of judgmental technique. PREBLE ET AL. analyzed the scanning done by 95 multinational corporations based in the US. Their key findings were:

(1)   Over 53 percent of the firms were conducting continuous in-house international scanning.
(2)   Nearly half of the executives reported some degree of computerization used in their scanning processes.
(3)   Executives relied on internal sources of international environmental information much more than external sources.
(4)   Formal procedures were in place in 51 percent of the firms where executives were regularly involved in the scanning of publications.

Comparing these results with the study by KEEGAN (1974), published 14 years earlier, it appears that, at least among multinational companies, there has been a shift towards more formalized scanning systems and more sophisticated scanning techniques.

A few researchers have attempted to cast a theoretical framework over the various modes of environmental scanning that they have observed in the field. Thus, FAHEY & KING suggested that corporate environmental scanning may be classified according to three distinct models: the irregular model, periodic model, and continuous model. In the irregular model, scanning is ad hoc and driven by some external occurrence or crisis. In the periodic model, scanning is regular, and is directed at decisions or issues in the near term. Finally, in the continuous model, scanning is structured and integrated with corporate planning processes, and usually involves a central scanning unit. From their structured interviews with planning officers of twelve large corporations they found that scanning in most of the firms was ad hoc and event-driven. None of the firms had successfully integrated environmental scanning into their strategic planning. From his study of Fortune 500 US corporations, JAIN proposed that organizational scanning systems go through four phases as they evolve: primitive, ad hoc, reactive, and proactive phases. As the firm progresses through the phases, its intensity of scanning increases, the time horizon of the scanning

lengthens, and the level of confidence in the scanned information rises. A scanning system needs time to evolve and adapt to the organizational culture, and to gain the confidence of top management.

Managerial Job Characteristics

Another leitmotif in the research on environmental scanning is the effect of the manager's job-related characteristics on scanning activity. The expectation is that factors such as the manager's hierarchical level and functional specialization would affect the conduct of environmental scanning. Unfortunately, no coherent pattern emerges from the few studies that have examined job-related characteristics.

AGUILAR found that functionally specialized managers tended to use particular sources (e.g., production managers relied on suppliers), whereas top-level managers tended to rely on informal networks of contacts outside the company. Managers of large companies tended to rely more on internal sources. The study of KEFALAS & SCHODERBEK concluded that executives' hierarchical level was not related to the focus of scanning. Furthermore, there was considerable scanning of the market sector by executives of all functional specialties. Similarly, HAMBRICK (1979) found that the scanning activities of executives did not appear to vary significantly with their hierarchical levels, nor with their functional specializations. The study of executives in the Japanese computer industry and information-processing industry by NISHI ET AL. concluded that upper-level executives spent more time on external scanning than lower-level executives. In addition, executives spent a higher proportion of their time scanning the environmental sector closest to their functional specialties.

Among the five research themes that characterize the state of the research on environmental scanning, the effect of managerial job characteristics on scanning is the least developed. A potentially useful extension to the investigation on hierarchical level and functional specialization would be to relate scanning and the use of acquired information to the managerial decision making roles suggested by organization theory. For example, JONES & MCLEOD, JR found that the use of information sources by managers varied according to the type of decisional role that they were performing. AUSTER & CHOO (1993) found that chief executives who scan more tend to use environmental information more frequently when making decisions in the entrepreneur role.

Because environmental scanning requires managers to make sense of an uncertain environment, research on scanning should investigate the cognitive processes by which managers assimilate and use environmental information. These processes go beyond job-related functions, and raise research questions

such as how do managers know what information they need about the environment, how do they deal with multiple sources that provide information on the same topic, how do they interpret ambiguous messages about environmental change, and how do they detect, recognize and frame problems using a stream of environmental information. Only very few past studies have addressed questions like these. An early example is STABELL, who found that how a manager chooses between impersonal information sources is associated with the manager's cognitive ability to selectively apply multiple source selection rules (the manager's 'integrative complexity'). More recently, BOYD found tentative support for the hypothesis that managers with a higher tolerance for ambiguity will engage in higher levels of scanning activity.

Summary

What may be gleaned from the research that has been completed so far on environmental scanning? A summary may include the following observations:

(1)   There is a growing awareness of the value of environmental scanning.
(2)   Managers who experience higher levels of perceived environmental uncertainty tend to do a greater amount of environmental scanning.
(3)   The market-related sectors of the external environment, with information on customers, suppliers and competitors, appear to be the most important for environmental scanning.
(4)   While managers use both internal and external sources frequently to scan the environment, personal sources such as customers, associates and staff are more important. Furthermore, sources like the library and online databases are not widely used in scanning.
(5)   Scanning methods in business organizations can range from being ad-hoc and informal to being highly systematic and formalized. Scanning mode depends on firm size, experience with planning and analysis techniques, and perception of the external environment.
(6)   Managers' job characteristics such as hierarchical level and functional specialty do not have a clear effect on scanning behavior.

This is a parsimonious list: much more needs to be learned about how organizations scan their external environments.

SYNTHESIS OF MAIN FINDINGS

Figure 1 shows the interrelationships among the sets of literature that we have reviewed. It also summarizes the main findings and principal variables that were investigated in those studies. *Organization theory* provides a useful perspective of the external environment acting as source of information, continually creating signals to which an organization attends. A lack of

information about the environment is perceived as uncertainty. As decision-making and interpretation systems, organizations need information in order to reduce uncertainty and equivocality about environmental changes. On the other side, the large number of field studies about *information needs and uses* suggest that information needs must be considered in the context of the user's work, organizational, and social settings. Both formal and informal information sources are important. For many groups of users, the use of a source is strongly influenced by its perceived accessibility. Research is shifting from a traditional system-focus to a user-focus that emphasizes cognitive processes and information use contexts. A small number of studies of *managers as information users* combine elements from organization theory and information needs and uses to investigate how managers acquire and use information. These have found that managers perceive a growing need for information about the external environment. At the same time, their information needs are mostly driven by current, immediate problems. In information acquisition, managers prefer

ORGANIZATION THEORY

• *Environment as source of information*: Lack of information about environment creates *Perceived Environmental Uncertainty*

• *Organisations as Decision Making and Interpretation systems*: Organisations need information to reduce uncertainty and equivocality.

INFORMATION NEEDS & USES

• Information needs and uses depend on work and social *context.*

• *Formal* and *informal* information sources are both important.

• For many groups of users, source *accessibility* is more important than source quality.

MANAGERS AS INFORMATION USERS

• Managers perceive growing *need* for information about external environment.

• Information needs are determined by current, *immediate problems*.

• Managers prefer *people sources* and personal observation.

• Managers prefer *verbal media* and oral communication.

ENVIRONMENTAL SCANNING

• Scanning increases as *perceived environmental uncertainty* increases.

• Managers are most concerned with the *market-related* sectors of the environment.

• Managers use *internal* and *external sources* to scan. Personal sources are very important.

• The *method of scanning* depends on firm size, experience, and perception of the environment.
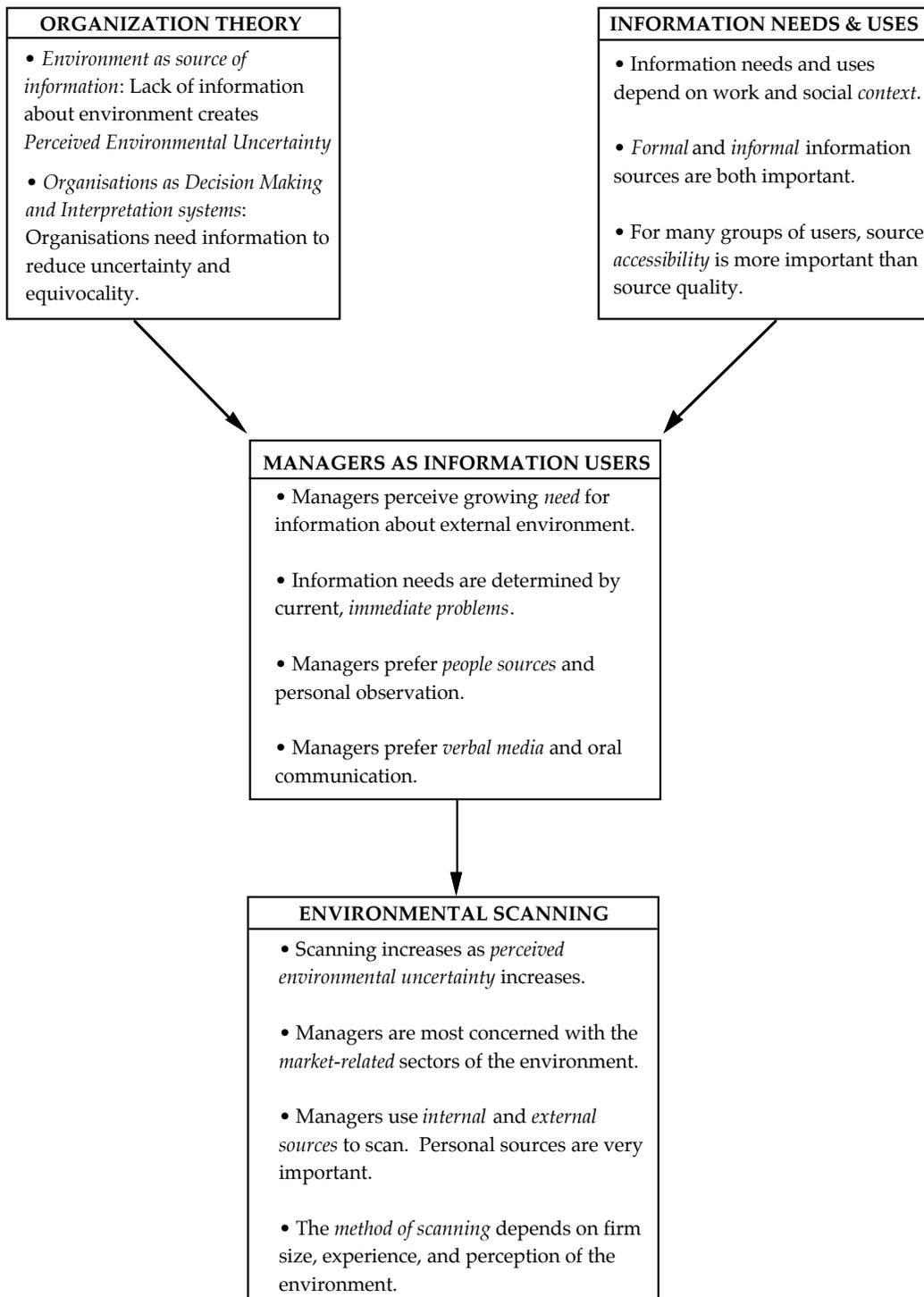
Fig. 1. Overview of research literatures

personal sources and verbal media. Generally, *environmental scanning studies* may be considered a subset of studies of managers as information users. Research has found that there is rising awareness of the value of scanning, and that scanning increases with environmental uncertainty. Managers are most concerned with the market-related sectors of the environment. They use both internal and external sources in scanning, and personal sources are very important. Scanning methods vary from the informal to the formal, and seem to depend on firm size, experience with planning and analysis, and perception of the environment.

Information Perspective in Organization Theory

There is a clear differentiation between the information orientations of the research in organization theory and information needs and uses studies. In organization theory, emphasis is on the *utilization* of information by managers in decision making and planning. The typical treatment of information excludes a substantive consideration of the problems associated with the acquisition of information in external environments. The assumption is that information would somehow "flow" into the organization so that information acquisition would be non-problematic. Complex issues in the perception, evaluation, and selection of multiple sources from an expanding array of choices are not recognized. Relationships between managerial information roles and the selection and use of information sources are not explored. Information is regarded as a homogeneous commodity. "Real world" information, however, is far from homogeneous and has attributes of accuracy, timeliness, relevance, trustworthiness, and so on. Managers do not treat information as uniform, and express distinct preferences for certain types and formats of information. Reliance on certain preferred channels would have an effect on managers' information seeking and decision making behaviors. All these issues imply that information acquisition is the "missing link" in our efforts to understand the information processing chain of the organization (ROBERTS & CLARKE, 1987; 1989).

Information Perspective in Information Needs and Uses Studies

One of the themes in information needs and uses studies on the other hand, is the *acquisition* of information. Most of the research concern users' perceptions of sources, their methods of accessing and using sources, and their assessments of the value of information provided. Research typically attempts to account for patterns of source or system usage and satisfaction through an analysis of users' demographic factors, their membership in social or professional groups, their life style, or their task requirements. Several reviewers of the literature on information needs and uses have pointed out limitations. There is overemphasis

on a few specialised or professional populations, notably academics, engineers and scientists. Too few studies have looked at the information behaviors of laypeople, managers, or other professionals (CRAWFORD; BRITTAIN; KATZER). Traditionally, information needs and uses studies tend to start with the information source or system and examine the user in relation to that system. A great majority of the studies confine themselves to formal information sources, such as documentary sources and computer-based information systems, even though most information exchange is verbal and informal (ROBERTS & WILSON). Finally, traditional information needs and uses studies seldom relate information behaviors to the user's social or work settings (WILSON; TAYLOR, 1990). Partly in response to these criticisms, the research focus has broadened in recent years to examine cognitive processes of the information user, and factors in the information use setting that influence information usefulness (DERVIN & NILAN; HEWINS; TAYLOR, 1990; DERVIN).

Conclusion

This review underscores the need to recognize managers as a distinct and important group of information users, and to expand our limited knowledge of managers as information users. A significant part of the information acquired and used by managers concerns the external environment. We believe that information science and the information profession have the tools and the techniques to enhance the breadth and depth of environmental scanning by managers. At the same time, we need to know more about how managers scan the environment. We need field studies to collect data to build theories about managers as information users and to guide the development of information systems and services. This review suggests that research on environmental scanning could fruitfully apply frameworks that integrate perspectives from both organization theory and information needs and uses. Organization theory views managers as decision makers and interpreters of environmental change. Information needs and uses studies approach managers as a special group of information users with its own distinctive information needs, ways of defining and resolving problems, and information use contexts. The two perspectives complement each other and provide a brighter lens through which to scrutinize managers as information users.

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