CEOs, Information, and Decision Making: Scanning the Environment for Strategic Advantage

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ABSTRACT

CEOs SCAN THE EXTERNAL ENVIRONMENT for information about events and trends in order to plan their organizations' future courses of action. This study investigates how CEOs in the Canadian publishing and telecommunications industries acquire and use information about the business environment. The uncertainty of the environment was found to be related to the amount of scanning done. The perceived quality of information sources and the environmental uncertainty accounted for a significant proportion of the variance in source use. Information about the environment was often used in making decisions concerning organizational improvements and business strategies.

INTRODUCTION

The work of managers is information intensive. Managers are exposed to a huge amount of information from a wide range of sources and selectively use the information to make day-to-day decisions and to formulate longer term strategies. Yet much remains to be learned about the information behavior of managers as a distinct user group. Relative to the large number of studies on scientists and technologists, there have been only a very few studies that look at managers of business organizations as information users. Should we expect managers to show the same preferences for information sources as scientists and engineers? Are there special features about managers

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scanning for information about an uncertain environment that would influence their use of sources? Organization theory emphasizes the effect of environmental uncertainty on scanning behavior and the use of environmental information to develop courses of action. To what extent does environmental uncertainty affect the use of information sources? How do managers use information about the environment in decision making? The purpose of the present study is to investigate how chief executive officers (CEOs) in the Canadian publishing and telecommunications industries seek and use information about the external business environment, an activity known as environmental scanning.

Environmental scanning is defined as the acquisition and use of information about events and trends in an organization's external environment, the knowledge of which would assist management in planning the organization's future courses of action (Aguilar, 1967; Choo & Auster, 1993). Following Aguilar, we recognize that scanning includes both general viewing of, or exposure to, information, and purposeful searching for information to address particular issues. Furthermore, we recognize that scanning is needed to provide the information for top management to make decisions that create strategic advantage for the organization to succeed in a changing environment (Glueck & Jauch, 1984; Lester & Waters, 1989).

Conceptual Framework

Research on environmental scanning appeared in the 1960s with a pair of pioneering studies by Aguilar (1967) and Keegan (1968). Since then the majority of studies has revolved around four research themes: (1) the effect of perceived environmental uncertainty on scanning; (2) environmental sectors scanned; (3) information sources used; and (4) scanning methods. On the effect of environmental uncertainty, most studies found that managers who perceive greater environmental uncertainty tend to do more scanning (see for example, Nishi et al., 1982; Daft et al., 1988; Auster & Choo, 1992, 1993). The focus of scanning is on market-related environmental sectors, with information about customers, competitors, and suppliers being the most important (Jain, 1984; Ghoshal & Kim, 1986; Lester & Waters, 1989). The information sources most often used are personal sources, especially managers and staff within the organization, while sources such as the company library and online databases were less used (O'Connell & Zimmerman, 1979; Kobrin et al., 1980; Auster & Choo, 1992, 1993). Scanning methods can range from ad hoc informal activities to systematic formalized efforts, depending on the organization's size, its experience, and its perception of the environment (Thomas, 1980; Klein & Linneman, 1984; Preble et al.,

1988) (for an in-depth review of research on environmental scanning, see Choo & Auster, 1993).

Taylor (1991) suggests that a more complete picture of information seeking by a group of users may be gained by analyzing their information use environment, which comprises sets of people, dimensions of the problems to be solved, the work setting, and the ways problems are considered to be resolved. The present study attempts to understand something of the managers' perceptions of their business environments that would reflect the problem dimensions (e.g., complexity, familiarity) which motivate their information seeking, the scanning activity itself, and the ways that they then use the information in problem solving or decision making.

The conceptual framework for investigating these research questions is constructed on theoretical foundations in organization theory and information needs and uses studies. A recent review of past research on scanning concluded that the perceived uncertainty of the environment is related to the amount of scanning done (Choo & Auster, 1993). Uncertainty arises because the executive experiences a lack of information about an external environment that is complex and variable. Furthermore, the more important or strategic that environmental change is perceived to be, the greater the amount of scanning. Thus we identify perceived strategic uncertainty as an independent variable that would affect the executives' scanning behaviors. Information seeking involves both selection and use of sources. Several classic information needs and uses studies have found that users prefer sources that are perceived to be more accessible rather than sources that are perceived to be of higher quality (see, for example, Rosenberg, 1967; Gertsberger & Allen, 1968; Allen, 1977). Some recent studies have examined how the perceived quality of information from a source may influence its use (Halpern & Nilan, 1988; Nilan et al., 1988; Taylor, 1986; Zmud, 1978). Although it is possible to think of other organizational and personal variables that could affect scanning, concentrating on environmental uncertainty, source accessibility, and source quality, provides a useful start in identifying key informational variables that influence the amount of scanning and the use of information sources to do the scanning. Finally, in order to complete our model, we explore how managers use the scanned information in decision making (Mintzberg, 1973, pp. 137-42). The full conceptual framework is shown in Figure 1.

To summarize, the present study investigates environmental scanning by chief executive officers in two Canadian industries by addressing three research questions:

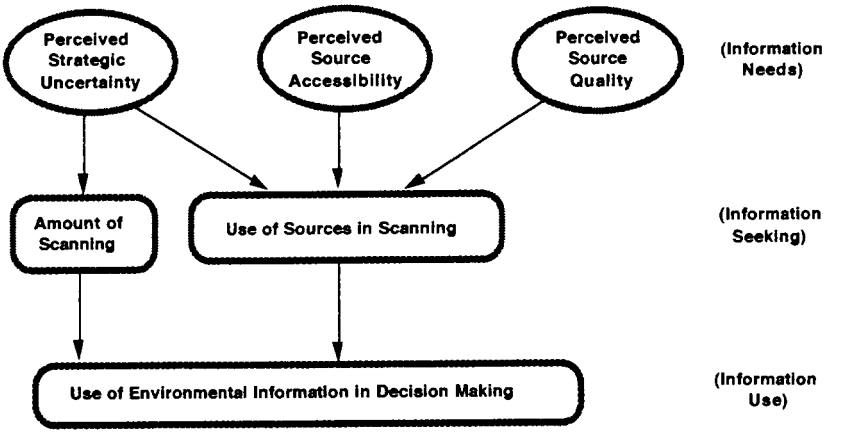


Figure 1. Model of environmental scanning based on environmental uncertainty, source accessibility and quality

1. Is perceived environmental uncertainty related to the amount of scanning?
2. Do source characteristics and environmental uncertainty affect the use of information sources in environmental scanning?
3. How is environmental information used by the executives in decision making?

PROCEDURES

Study Population and Data Collection

The study population consists of CEOs in the Canadian publishing and telecommunications industries. Both industries are vital to the Canadian economy and thrive in dynamic business environments in which the forces of change include increased competition, technological progress, new business structures, population growth, and shifting social preferences. Seven industry groups were defined based on U.S. Standard Industrial Classification Codes. Using these codes, online searches were done in the Canadian Dun's Market Identifiers database and the Cancorp Canadian Corporations database. Companies with annual revenues equal to or greater than C $5 million were selected. This procedure yielded a total of 207 CEOs—94 in publishing and 113 in telecommunications. Data were collected by a mail questionnaire that was sent to every one of the executives identified. From the population of 207 CEOs, 115 returned questionnaires, giving a response rate of 56 percent. Respondents were asked if they were willing to be interviewed. Interviews were

then requested with the twenty-two respondents in the province of Ontario who agreed to be interviewed. The decision to interview in Ontario is based on geographical proximity and on the fact that a large percentage of firms in both industries is located in the province. Eventually, thirteen respondents were interviewed (most of the others were out of town during the three-month interviewing period). Using the critical incident technique (Flanagan, 1954), interview respondents were asked to recall their experiences and behaviors in two specific incidents of acquiring and using environmental information.

Environmental Sectors

The external business environment of a firm is divided into six environmental sectors as defined by Daft et al. (1988) in their study of CEO scanning:

1. Customer sector "refers to those companies or individuals that purchase the products made by your company... [and] include[s] companies that acquire your products for resale as well as final customers."
2. Competition sector includes the companies, products, and competitive tactics—companies that make substitute products; products that compete with the respondent firm's products; and competitive actions between the respondent's firm and other companies in the same industry.
3. Technological sector "includes the development of new production techniques and methods, innovation in materials and products, and general trends in research and science relevant to your company."
4. Regulatory sector "includes federal and [provincial] legislation and regulations, city or community policies, and political developments at all levels of government."
5. Economic sector "includes economic factors such as stock markets, rate of inflation, foreign trade balance, federal and [provincial] budgets, interest rates, unemployment, and economic growth rate."
6. Sociocultural sector "comprises social values in the general population, the work ethic, and demographic trends such as the increasing number of women in the work force" (pp. 137-38).

Environmental Uncertainty

The measurement of perceived environmental uncertainty is based on Duncan's (1972) model. Duncan identifies two dimensions of the environment: (1) the simple-complex dimension is the number of environmental factors taken into consideration in decision making;

and (2) the static-dynamic dimension is the degree to which these factors remain the same or change continually over time (pp. 314-17). Decision makers in environments which are complex and dynamic experience the greatest amount of perceived environmental uncertainty (p. 325). Daft et al. (1988) and Boyd (1989) found that the perceived importance of trends and events in the various environmental sectors has a major effect on scanning activity. Uncertainty and importance were merged in a measure called "perceived strategic uncertainty" (PSU), defined as a combination of uncertainty measured by the complexity and variability of an environmental sector, and the importance to the firm of events in that sector. In the questionnaire, respondents assessed each of the six environmental sectors according to three questions on the relative importance, rate of change, and level of complexity of each sector.

Information Sources

Sixteen information sources are selected for the questionnaire based on sources studied in past research on environmental scanning, notably in Aguilar (1967), Keegan (1974), Culnan (1983), Preble et al. (1988), and Daft et al., (1988). The sixteen sources are: customers; competitors; business and professional associates (including other executives, bankers, lawyers, financial analysts, and consultants); government officials; newspapers and periodicals; government publications; broadcast media (radio and television); industry and trade associations (publications and reports); conferences and trips; superiors and board members; subordinate managers; subordinate staff; internal memoranda and circulars; internal reports and studies; company library; and electronic information services that include news wire services and online databases.

Perceived Source Accessibility

Based upon the theoretical and empirical work of Allen (1977), Culnan (1983), and O'Reilly (1982), perceived source accessibility is operationalized as the amount of effort needed to locate a source and then to get the needed information from that source. Two questions in the questionnaire measure the perceived accessibility of each source:

1. How much of your time and effort is needed to approach, contact, or locate each information source?
2. After contacting or locating the source, how easy is it to get the desired information from that source?

For each of the sixteen sources, respondents indicated their answers to these questions on a five-point ascending scale. Each point on the scale is defined with a short description. The response scores

from these two questions are summed into an index of the perceived accessibility of each source.

Perceived Source Quality

Based upon the theoretical definitions of Saracevic (1975), Zmud (1978), Taylor (1986), and the empirical findings of O'Reilly (1982), Nilan et al. (1988), and Halpern and Nilan (1988), perceived source quality is operationalized as the perceived relevance and reliability of the information provided by the source. Two questions in the questionnaire measured the perceived quality of each source: (1) How relevant is the information from each source about the environment? (relevant information is defined as information that is needed and useful with respect to the goals and activities of the respondent's firm), and (2) How reliable is the information from each source about the environment? (information is reliable when it is authoritative and dependable. It is information that you personally trust). For each of the sixteen sources, respondents indicated their responses to these questions on a five-point ascending scale. Each point on the scale is defined with a short description. The response scores from these two questions are summed into an index of the perceived quality of each source.

Amount of Scanning

Applying a method developed by Hambrick (1979) and subsequently validated by Farh et al. (1984), two questions in the questionnaire measured the amount of scanning: (1) To what extent do you keep yourself informed about developments in each environmental sector? and (2) How frequently does information about each environmental sector come to your attention? Hambrick believed that each question touches upon a different aspect of scanning. Thus, the level of interest (question 1) would be affected by the executive's cognitive traits and value system, while the frequency with which information comes to the executive's attention (question 2) would be related to other factors such as the kind of information channels in the industry and the executive's scanning style.

Source Use

The second dependent variable is the frequency with which each information source is used in environmental scanning. In the questionnaire, each respondent is asked to indicate how frequently he or she uses each of the sixteen sources to scan the environment. The response is indicated on a descending scale with six categories: "At least once a day," "At least once a week," "At least once a month," "Few times a year," "Less than once a year," and "Never."

Information Use

The use of environmental information in decision making was analyzed using the data collected from personal interviews. Each critical incident of information use related by the respondent was categorized according to Mintzberg's (1973, pp. 77-94) model of decisional roles. According to Mintzberg, access to information and positional authority empowers the manager to perform four decisional roles. As *entrepreneur,* the manager initiates "improvement projects" such as new lines of business or joint ventures that exploit an opportunity or solve a problem. As *resource allocator,* the manager controls the distribution of all forms of organizational resources through, for example, budget allocations and the setting of targets. As *disturbance handler,* the manager deals with unexpected but important events. Finally, as *negotiator,* the manager engages in major negotiations with other organizations or individuals.

FINDINGS

Profile of Respondent CEOs and Firms

Of the 207 CEOs in the study population, 115 CEOs returned completed questionnaires (56 percent). Sixty-seven of the respondents are CEOs of telecommunications companies (60 percent), with the remaining forty-eight being CEOs of publishing firms (51 percent). The 115 firms have a combined annual turnover of over C $18 billion and employ a total of over 132,000 people. The smallest firms had an annual sale of C $5 million, while the largest had sales of over C $7.3 billion and hire 50,000 staff. On the whole, the distribution of respondent firms by size is similar to that of the study population. Among the respondents, 43 percent fall in the age group 45-54, while another 28 percent are between 35 and 44. In terms of length of tenure as chief executive, the mean number of years as CEO is 6.5. The mean number of years with the firm is twelve. Before becoming CEO, over 49 percent of the respondents were in the marketing functional area with another 15 percent in production. As for educational background, nearly 42 percent have a Bachelor's degree, and another 26 percent have a Master's degree.

Environmental Uncertainy and Amount of Scanning

Respondents assessed each of the six environmental sectors according to its complexity, variability, and importance on a five-point ascending scale. The complexity and variability scores were summed and multiplied by the importance score to give an overall index of perceived strategic uncertainty. Table 1 shows the environmental sectors in order of descending mean perceived strategic uncertainty. The customer and technological sectors are perceived

TABLE 1.
PERCEPTION AND AMOUNT OF SCANNING OF ENVIRONMENTAL SECTORS

Environmental Sector	*Perceived Strategic Uncertainty*	*Frequency of Information about Sector Coming to Attention*		*Level of Interest in Keeping Informed about Sector*	
		Frequency	*Correlation*[1]	*Interest*	*Correlation*[1]
Customer	33.98	3.83	.32	4.17	.40
Technological	32.95	3.46	.38	3.45	.36
Competition	27.80	3.35	.30*	3.53	.44
Regulatory	27.64	3.25	.46	3.85	.46
Economic	25.81	2.70	.35	3.41	.42
Sociocultural	21.47	2.66	.42	2.76	.58

[1]: All Pearson's correlation coefficients are statistically significant, $p \leq .001$, except *: $p \leq .001$.

to be the most strategically uncertain, followed by the competition and regulatory sectors.

In terms of amount of scanning, respondents indicated that information about the customer, technological, and competition sectors came most frequently to their attention. Respondents were most interested in keeping themselves informed about the customer, regulatory, and competition sectors.

The amount of scanning is correlated with perceived strategic uncertainty (see Table 1). All correlation coefficients are positive and statistically significant ($p \leq .001$ with one exception at $p \leq .01$). Correlation coefficients between uncertainty and the frequency measure of scanning range from 0.30 to 0.46, with an average value of 0.37. Correlation coefficients between uncertainty and the interest measure of scanning range from 0.36 to 0.58 with an average of 0.44. These correlations are comparable to, but slightly lower than, those found by Daft et al. (1988) and Boyd (1989) using a similar measure of perceived strategic uncertainty.

Perception and Use of Information Sources

Table 2 shows the mean frequency with which the respondents use each source to scan the environment. A high numerical score indicates a high frequency of use (6 = > Once a day, 5 = > Once a week, 4 = > Once a month, 3 = > Few times a year, 2 = < Once a year, and 1 = Never.) Newspapers and periodicals are the most frequently used source followed by subordinate managers, subordinate staff, broadcast media, and internal memoranda and circulars. The respondents tap a broad array of sources, including internal and external sources, as well as personal and impersonal sources. As was

TABLE 2.
PERCEPTION AND USE OF INFORMATION SOURCES

Information Source	*Frequency of Use*	*Perceived Source Accessibility*	*Perceived Source Quality*
Newspapers, periodicals	5.32	7.71	7.00
Subordinate managers	5.05	7.83	8.62
Subordinate staff	4.78	7.92	8.07
Broadcast media	4.64	7.76	6.17
Internal memo, circulars	4.45	7.95	7.57
Customers	4.43	6.58	8.55
Business/professional associates	4.13	7.08	7.66
Internal reports, studies	4.04	7.74	7.98
Industry, trade associations	3.75	7.23	7.46
Superiors, board members	3.75	7.68	7.91
Competitors	3.68	5.74	7.11
Government publications	3.44	7.26	6.22
Company library	3.32	7.49	6.58
Conferences, trips	3.09	6.68	7.49
Government officials	3.03	6.20	6.56
Electronic information services	2.93	7.09	6.10

found in other scanning studies, personal sources are very important—the most frequently used personal sources are subordinate managers, subordinate staff, customers, and business associates. However, other personal sources like competitors and government officials are less used. The least frequently used sources are conferences/trips, government officials, and electronic information services.

In terms of accessibility, internal memoranda and circulars are perceived to be the most accessible source followed closely by subordinate staff and subordinate managers (see Table 2). The least accessible sources are competitors, government officials, and customers. Interestingly, the company library is ranked eighth among the sixteen sources, while electronic information services is ranked eleventh.

In terms of quality, subordinate managers and customers are perceived to provide information of the greatest relevance and reliability (see Table 2). The next best regarded sources are subordinate staff and internal reports and studies. Broadcast media and electronic information services have the lowest mean quality scores, implying that information they provide is seen to be less relevant and reliable.

Figure 2 plots the use of sources in relation to perceived accessibility and quality. Each circle represents a source: its size indicates approximately the use frequency, while its position indicates its perceived accessibility and quality. The number following the source

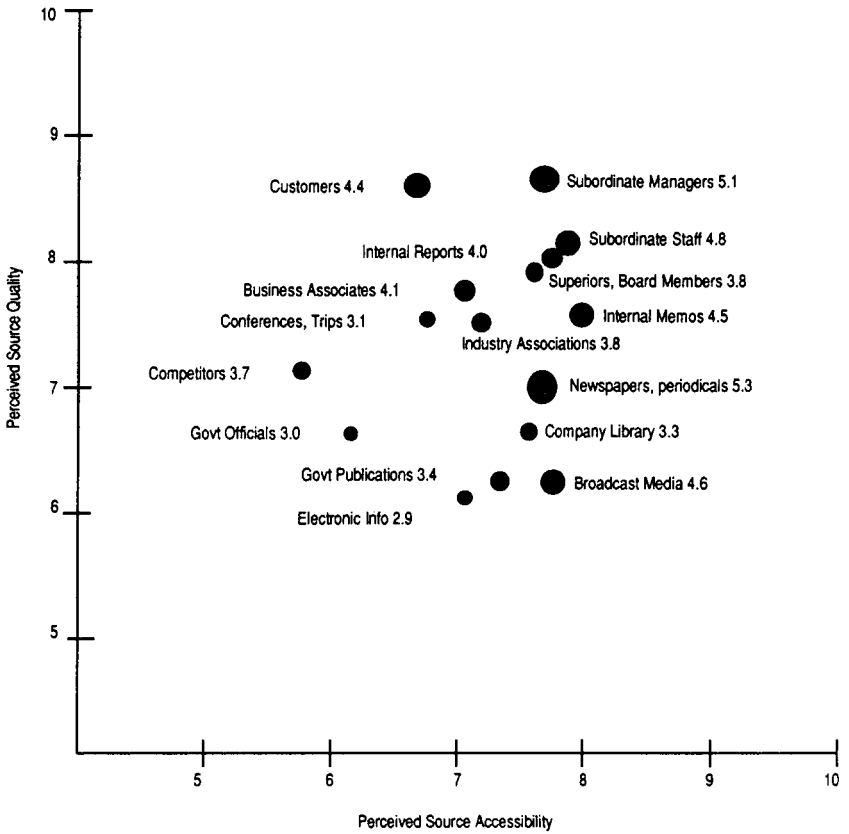


Figure 2. Perception and use of information sources

name is the mean use frequency of the source. The plot suggests that the frequency of source use is related to both perceived source accessibility and quality with perceived quality appearing to be a stronger factor.

Our conceptual model implies that both environmental uncertainty and source characteristics influence source use in scanning. To test this, regression models are computed for each source to compare the effects of environmental uncertainty, source accessibility, and source quality on source use. An overall measure of environmental uncertainty (perceived environmental uncertainty) is obtained by summing the perceived strategic uncertainty values over the six environmental sectors. The results are presented in Table 3. All sixteen equations are significant at $p \leq .001$. The adjusted

TABLE 3.
EXPLAINING FREQUENCY OF SOURCE USE USING REGRESSION MODELS OF PERCEIVED SOURCE ACCESSIBILITY AND QUALITY, AND PERCEIVED ENVIRONMENTAL UNCERTAINTY

	Variance Accounted For	*Contribution of Perceived Source Accessibility*[1]	*Contribution of Perceived Source Quality*[2]	*Contribution of Perceived Environmental Uncertainty*[3]
	Adj. R^2	*sR^2*	*sR^2*	*sR^2*
Customers	.18	.00	.16	.05
Competitors	.14	.00	.07	.09
Business/ professionals	.21	.02	.14	.07
Government officials	.33	.01	.28	.05
Newspapers/ periodicals	.13	.01	.09	.04
Government publications	.29	.00	.29	.02
Broadcast media	.15	.00	.17	.01
Industry, trade associations	.19	.02	.19	.01
Conferences, trips	.31	.00	.29	.04
Superiors, board members	.30	.00	.28	.03
Subordinate managers	.30	.01	.25	.02
Subordinate staff	.22	.00	.21	.03
Internal memo, circulars	.28	.00	.27	.02
Internal reports, studies	.24	.01	.18	.07
Company library	.28	.01	.29	.00
Electronic information	.48	.02	.47	.01

All models are statistically significant at $p \leq .001$.
Adj. R^2: Adjusted squared multiple correlation. sR^2: Squared semipartial correlation.
[1] For Perceived Source Accessibility, all standardized partial regression coefficients are nonsignificant, except for the source Business/professionals, significant at $p \leq .05$.
[2] For Perceived Source Quality, *all* standardized partial regression coefficients are significant, at $p \leq .01$ or better, except for the source Competitors, significant at $p \leq .05$.
[3] For Perceived Environmental Uncertainty, all standardized partial regression coefficients are significant, at $p \leq .05$ or better, except for the sources Government publications, Broadcast media, Industry & trade associations, Company library, and Electronic information, which are not statistically significant.

R^2 value indicates the proportion of the variance in source use that is explained jointly by perceived environmental uncertainty, perceived source accessibility, and perceived source quality. For electronic information services, these three variables account for 48 percent of

the source use variance. Government officials and publications, conferences/trips, superiors, subordinate managers, internal memos, and the company library account for approximately 30 percent of the source use variance. For the other sources, the regression models account for less than 25 percent of the source use variance. These values of R^2 suggest that environmental uncertainty and source characteristics can account for a significant proportion of the total variance in source use frequency.

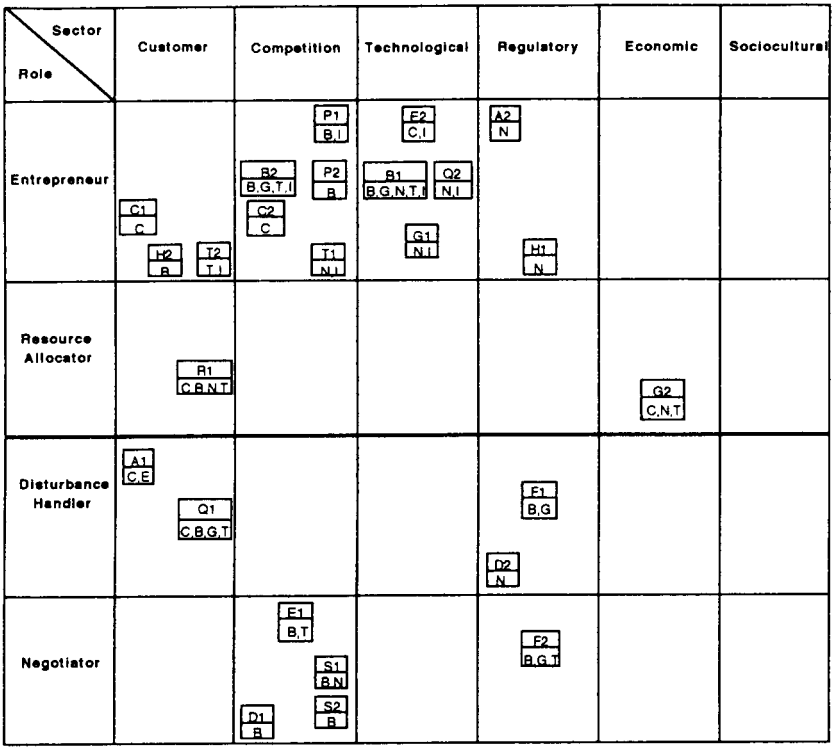
The squared semipartial correlations (sR^2) of the independent variables are computed to compare the unique contributions of each independent variable in explaining the total source use variance. sR^2 is the proportion of the total variance accounted for by the independent variable beyond that accounted for by the other independent variables (Cohen & Cohen, 1983, p. 101). For most of the sources, a very large part of the explanatory power of the regression model is due to perceived source quality and perceived environmental uncertainty—the adjusted R^2 value is due largely to the squared semipartial correlations (sR^2) of the perceived source quality and perceived strategic uncertainty variables (see Table 3). For five information sources—competitors, customers, business associates, newspapers and periodicals, and internal reports/studies—perceived environmental uncertainty accounted for a substantial part of the total source use variance. However, for every source except competitors, the greatest part of the variance is accounted for by perceived source quality.

Information Use in Decision Making

The thirteen respondents related a total of twenty-five critical incidents of using environmental information to make significant decisions for the firm. These incidents are plotted in Figure 3 which shows the decisional role the respondent was acting in, the environmental sector concerned, and the information sources used (for a detailed discussion of the interview findings, including examples of the use of environmental information, see Auster and Choo, 1994). Of the twenty-five critical incidents, fourteen are associated with the entrepreneur decisional role. This number is much larger than the number of incidents reported in the other decisional roles (five in the negotiator role, four in the disturbance handler role, and two in the resource allocator role). It would appear that respondents use environmental information mainly in the entrepreneur decisional role—they were deciding about "improvement projects" such as introducing new products and formulating business strategies (Mintzberg, 1973, pp. 78-81, 92-93). Twenty-four of the twenty-five incidents were spread over four environmental sectors: competition,

customer, technological, and regulatory. No incident was recalled for the sociocultural sector, and only one touched on the economic sector. The distribution of incidents confirms the findings of the questionnaire survey that the respondents concentrate their scanning on the competition, customer, technological, and regulatory sectors.

Because the majority of incidents concerned decision making in the entrepreneur role, we provide an example of such an incident related by one of the respondents. George (fictitious name) is CEO of a firm that designs and manufactures multiplexing and switching equipment for common carriers, interexchange carriers, and data distributors. The firm reports annual sales of $29 million and employs sixty people. The incident that George described concerned his plan to improve his firm's organizational effectiveness. Over a period of eight months, George had been looking for the best method to do this. It was during this time that he came across information about process management (PM), and he became so interested in PM that he attended a seminar in Phoenix, Arizona, to better understand its content. After the seminar, George collected data on productivity in his firm and focused his attention on possible process improvements. He then developed a short presentation on PM which was made to his management staff in Canada and to the U.S. corporate headquarters. Following that presentation, George launched a training program on PM and targeted two internal processes for review. George and his management team are now working through these two processes. George remembered that he first read about PM in an article in *Fortune* magazine. He had also been tracking journals like *Harvard Business Review*, *BusinessWeek*, and *Newsweek*. George observed that, because of depressed economic conditions, there was a growing number of articles on organizational improvement using concepts like high-performance team building, empowerment, total quality management, and so on. George's interest in PM was reinforced by another article on the topic that appeared in a more recent issue of *Fortune*. He explained that his "reason for choosing PM is that we are a very action-oriented company and we want quick returns on the things we undertake." Information about the seminar on PM came from the vice president of human resources in corporate headquarters. For his subsequent presentation to management, George used excerpts from the seminar, bought a book on the subject, and also used articles from periodicals that he had collected over the past eight months. In this incident, George was acting in the entrepreneur role, introducing an organizational improvement project based on a relatively new technique.



Each box represents one critical incident. the upper part of the box is the incident identifier (A1=First incident related by executive A), the lower part lists the sources used.

B=Business associates; C=Customers; E=Electronic information; G=Government sources; N= Newspapers, periodicals, reports; I=Internal staff; T=Trade associations.

Figure 3. Critical incidents of information use in decision making

Discussion

Perception and Scanning of Environmental Sectors

Respondents indicated that, as a group, they perceive the customer sector to have the highest perceived strategic uncertainty, followed by the technological and competition sectors. The importance of the customer and competition sectors is in line with past research—many studies have found that business executives were most concerned with the market and competitor sectors of the environment (Choo & Auster, 1993). The perceived importance of the technological sector is probably due to the recognition that technology is developing at a rapid pace and in ways that can radically alter how businesses operate in the publishing and telecommunications

industries. One interview respondent, who heads Canada's largest private paging firm, describes the paging market thus:

> The evolution of paging is driven by technology: capacity is expanding, size is getting smaller, and cost is falling. . . . There are certain types of decisions in which I would use environmental information more frequently. When it comes to a decision involving new technology, I would scan the horizon much more closely. I would want to answer the question: Has this technology been used anywhere else in any shape or form, not necessarily in the way that we are thinking of? We would tend to look externally much more frequently on a technical issue.

Analysis of the questionnaire data shows that there is a positive correlation between respondents' perceived strategic uncertainty of each sector and the amount of scanning of that sector. For a sector that is perceived to be strategic, the executive feels a need to be well-informed about trends and developments in that sector which may affect the firm in some fundamental way. Furthermore, for a sector perceived to be changing rapidly and in which many different factors have to be taken into account, the executive feels a need for more information in order to keep up to date with the latest developments and to understand cause and effect chains linking the factors. In sum, our analysis suggests that it is the combined effect of an environmental sector's strategic importance, variability, and complexity that influences the amount of scanning of that sector.

Daft, Sormunen, and Parks (1988) and Boyd (1989) found a positive association between perceived strategic uncertainty and frequency of scanning. The former study obtained a mean correlation of .58 for a sample of fifty chief executives of manufacturing firms in Texas, while the latter obtained .53 for his sample of seventy-two top- and mid-level executives in nine different industries. The present study shows a mean correlation coefficient of .44 between perceived strategic uncertainty and amount of scanning for our sample of Canadian CEOs. While the two earlier studies employed frequency of scanning as the dependent variable, this study measures amount of scanning by using the frequency and interest measures developed by Hambrick (1979) and validated by Farh, Hoffman, and Hegarty (1984).

Scanning Model

Applying our conceptual model, we found that environmental uncertainty (operationalized as perceived environmental uncertainty) and source characteristics (operationalized as perceived source accessibility and quality) were able to account for a significant proportion of the total variance of source use frequency. The impact of perceived environmental uncertainty was most marked for the use frequency of five sources, namely, competitors, customers, business associates,

newspapers and periodicals, and internal reports and studies. Excepting internal reports, these are all outside sources which are close to events and developments in the external environment. We may reasonably expect executives to use these sources more frequently when they perceive environmental uncertainty to be high. As for internal reports, we suggest that when external uncertainty is high, these reports and studies are useful because they summarize information and draw inferences that help executives to clarify issues and make decisions. In other words, these reports help to absorb external uncertainty (March & Simon, 1958).

The contribution of perceived source accessibility in explaining source use variance was in most cases very small and not statistically significant. On the other hand, the impact of perceived source quality is much greater and accounts for the largest part of the source use variance. This dominant importance of source quality appears to contradict well-known studies of engineers and scientists as information users which concluded that source accessibility was a more important factor in source use than source quality (Allen, 1977; Gerstberger & Allen, 1968; Rosenberg, 1967). The contradiction may be explained by considering the special nature of environmental scanning as an information-seeking activity.

When scanning, the executive would have to attend selectively to numerous signals created by an increasingly complex and dynamic environment, interpret often confusing messages, and make sense of cues in relation to the firm's goals and activities. Weick (1979, p. 130) suggests that a central information task of managers is to interpret equivocal information about the external environment. Eventually, information from scanning is used by management to chart the company's future course of action (Aguilar, 1967, p. 1), and to make decisions that could have long-term consequential implications for the firm. Taylor (1986, p. 57) also observes that when managers seek information to make unstructured decisions about unpredictable situations, the factor of "physical accessibility" may be less important than other traits (e.g., noise reduction, data quality). Since strategic planning in response to external change would often have to deal with new unpredictable situations, we may expect that accessibility is not a major concern in these conditions. In summary, we suggest that the turbulence of the external environment, the strategic use of information acquired by scanning, and the special demands of information needed to deal with unstructured situations, all combine to help explain why source quality may be more important than source accessibility when managers scan the environment.

Information Use in Decision Making

In the twenty-five critical incidents of information use related by the executives, fourteen, or more than half, involved the executive acting in the entrepreneur decisional role. As noted earlier, this number is much larger than the number of incidents related in the other decisional roles (five or fewer incidents were related in the other roles). The interview data thus suggest that executives use environmental information from scanning mainly to make "entrepreneurial" decisions about "improvement projects" such as introducing new products and formulating market strategies (Mintzberg, 1973, pp. 78-81, 92-93). Seven of the thirteen interview respondents indicated environmental information was used in ways that were strategic to the firm. This link between scanning activity and the entrepreneur decisional role is predicted by Mintzberg (1973). In the entrepreneur role, the manager initiates improvement projects to exploit opportunities or to solve problems. According to Mintzberg (1973): "Entrepreneurial work begins with scanning activity" (p. 78) where the executive uses information from scanning the environment to identify opportunities or problems, and then design and select improvement projects. The chief executive who scans a greater amount would therefore have more information about developments in the external environment, including information about opportunities or problems as well as possible solutions or alternatives. As a result, the executive who scans more would have more environmental information to call upon and to use when deciding about improvement projects in the entrepreneur role. The interview data are consistent with this interpretation. Two executives said that they regularly scan the environment for new business opportunities—one scans for new ideas about how technology is being applied in other countries while the other reads accounts of how new products have been developed successfully elsewhere. Both executives were scanning for innovations and improvements that they could introduce into their own companies.

Conclusion

The purpose of the present study has been to investigate how CEOs in the Canadian publishing and telecommunications industries acquire and use information about the external business environment. The study examined the relationship between environmental uncertainty and the amount of scanning, compared the effect of environmental uncertainty and source characteristics on source use, and explored how executives use environmental information in decision making. Our findings suggest that CEOs who experience greater environmental uncertainty tend to do a greater amount of

scanning. CEOs use a broad range of sources when scanning. The perceived quality of a source and the perceived uncertainty of the environment account for a significant proportion of the total variance of source use in scanning. Finally, the CEOs in the study use environmental information mainly to make "entrepreneurial" decisions concerning organizational improvements and business strategies.

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