

**ENVIRONMENTAL TURBULENCE AND SCANNING BEHAVIOR:
THE MODERATING EFFECTS OF ORGANIZATIONAL MATURITY**

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ABSTRACT

This paper examines the relationship between environmental turbulence and information scanning behavior in a sample of 242 small and medium-sized enterprises (SMEs), and the moderating effects of organizational age. Our results suggest that SME decision makers utilize a selective, cognitive simplification process in their information search activities. Scanning behavior of SMEs is highly differentiated and very selective in the face of turbulent task environments. In general, our sampled SMEs seem to be more attuned to technological and competitive turbulence. Additionally, young and mature SMEs also exhibit different scanning behaviors. While young SMEs prefer a search mode of proactive continuous internal gathering, mature SMEs opt for a mode of reactive internal and external information gathering. Implications of this study are discussed.

INTRODUCTION

The environmental conditions facing today's businesses are increasingly fraught with complexity, turbulence, and uncertainty. Scanning and interpreting environmental changes are the first step in strategic formulation and implementation (Hofer and Schendel, 1978; Hambrick, 1981; May, Stewart, and Sweo, 2000). To date, most studies on environmental scanning and information search activities have centered on large organizations. However, timely and relevant environmental information is equally important for small and medium-sized enterprises (SMEs). Gudmundson, Tower, and Hartman et al. (2001) have stated that management of information and knowledge is the key to developing and sustaining competitiveness for companies big and small.

The few studies with a focus on the environmental scanning behavior of SMEs

are far from conclusive (i.e., Beal, 2000). For example, Pineda, Lerner, Miller, and Phillips (1998) found that managers of SMEs are less willing to seek and accept advice from others, which can be attributed to their high internal locus of control. By contrast, several other researchers contended that small business decision makers lack sufficient resources to create a formal system to conduct environmental scanning; therefore, they must rely more heavily on externally focused scanning activities (Churchill and Lewis, 1983; Mohan-Neill, 1995). Matthews and Scott (1995) also noted that SMEs typically lack the infrastructure necessary to adequately search and collect information needed to deal with environmental turbulence and uncertainty.

This study examines the relationships between environmental turbulence and environmental scanning activities in the context of SMEs. Specifically, this study focuses on two research questions. First, as

compared to large companies, do SMEs exhibit a different pattern of scanning behavior when facing environmental turbulence? Second, does SME maturity make a difference in the relationship between environmental turbulence and SMEs' scanning behavior, i.e., do younger start-up firms behave differently from more established firms?

THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

Environmental Turbulence

Duncan (1972) defined the environment as the relevant physical and social factors outside the organizational boundaries that are taken into consideration during organizational decision-making. Environment can be conceptualized as task environment and general environment. Task environment involves environmental elements that have direct impact on the competitive situation of individual organizations. These elements are commonly defined as technology, competitors, customers, suppliers, and regulatory bodies. General environment refers to factors that affect organizations indirectly, including political, economic and social/demographic elements. Palmer, Wright, and Powers (2001) suggested that the nature of competitive environments may play a critical role in the frequency and success of innovation by firms. Starbuck (1976) performed an excellent literature review on the organization-environment relationship and provided a classification of organizational and industrial task environments. Dess and Beard (1984) built on Starbuck's seminal work (1976) and identified three environmental dimensions: munificence (capacity), complexity, and dynamism. Their work represents an excellent operational guide for classifying organizational task environments in terms of accepted industrial classification.

It is widely accepted in the strategy literature that the external environment is a primary source of uncertainty for managers responsible for identifying opportunities and threats (Duncan, 1972). Duncan proposed that environmental complexity and variability are the two dimensions of

uncertainty. Out of the two, environmental variability or turbulence is most important to organizational adaptation. Turbulence is generally defined by high levels of inter-period changes of key environmental variables (Glazer and Weiss, 1993; Sinkula, 1994). The environment, including both task and general environment, is perceived as turbulent if the number of events per period of time is high for key characteristics such as: consumer preferences, number of new customers, new products, number, and position of competitors (Jaworski, Wee, and MacInnis, 1995), size of the market, use of technology and regulations (Glazer et al., 1993).

Botchway, Goodall, Noon, and Lemon (2002) provided an overview of the literature on turbulent environments and the appropriate managerial approaches. They suggested the necessity of studying the impact of environment turbulence on firms' scanning activities, giving as an example the Coventry case, and developing an emergence conceptual model. That study focused mainly on the impact of task environment turbulence on SME environmental scanning activities, excluding general environmental turbulence for the following reasons. First, since task environment refers to forces that may have an immediate or direct impact on an organization, decision makers at SMEs may focus more of their scanning efforts on these immediate forces compared to those in the general environment (Johnson and Kuehn, 1987). For example, empirical research by Brush (1992) indicated that more than half of SME managers participating in her study "never" collected information about the general environment. She observed that SME managers perceived information about "immediate" marketplace environment as more important than information about the "remote" environment. Second, in terms of variability, forces in the task environment may change more frequently and rapidly than those in the general environment such as regulatory, social and cultural changes. Third, decision makers in SMEs often feel they have more direct control of task environment sectors than general environmental sectors.

The environment described by Achrol (1991), Glazer (1991), and Glazer and Weiss (1993) is characterized by its turbulence primarily due to the information, knowledge accumulation and dissemination that changes frequently. Achrol and Stern (1988) provided a complex and comprehensive framework by integrating multiple dimensions of environmental conditions to analyze the challenges facing channel management. Beinhocken (1999) and later Botchway, Goodall, Noon, and Lemon (2002) adopted the same approach. Botchway et al. (2002) constructed a model to explore the issues related to regional economic development. In their study, levels of inter-period changes of variables defining the environment were used to measure turbulence.

Environmental Scanning Behavior

Researchers have developed a number of models to describe the ways managers and organizations deal with environmental turbulence (e.g., Dutton and Duncan, 1987). Daft and Weick (1984) proposed that organizational adaptation entails three key activities: scanning, interpreting, and responding. Scanning refers to as the activities and processes associated with acquisition of information about events, trends, and relationships potentially affecting the supplies of resources (Pfeffer and Salancik, 1978) or protecting the core organization from uncertainty (Thompson, 1967). Aguilar (1967) defined scanning as “the way in which top management gains information about relevant events occurring outside the company in order to guide the company’s future course of action.”

The terms *information*, *intelligence*, and *knowledge* are sometimes used interchangeably. Glazer (1991) defined information as data that have been given structure (i.e., placed in a context). In terms of organizational performance, the most important context can be seen as a function of information's role in facilitating exchange. Jaworski, Wee, and MacInnis (1995) defined competitive intelligence as the ethical gathering and use of publicly or semi-publicly available information about trends, activities, or strategies of competitors. Narver and Slater (1990) and later, Kohli,

Jaworski, and Kumar (1993) developed scales to measure the concept of market orientation. The concept of market orientation was one-dimensional for Narver and Slater (1990) and three-dimensional for Kohli et al. (1993), integrating intelligence generation, intelligence dissemination, and responsiveness. These studies all used information processing as a key element for their scales. Information search represents the ‘generator’ of information for the organization. Market signals are identified and information on those signals is gathered and transmitted to the organizational filter. The more information that can be collected over a given period, the better the information search works. Information is critical for both the formulation of the strategy and for the daily operation of a company.

Information search represents a construct that is referred to as ‘active listening.’ In searching for information, the organization uses more than the usual data collection sources from customers and competition. The more information the organization can gather through the search for information, the more options exist for identifying changes in the environment, and therefore, the better it can respond and perform. For example, Gavetti and Levinthal (2000) found that, in a dynamic business environment, strategies containing elements of information search and learning enhance long-term success. Barkema and Piaskowska (2002) and Barkema, Baum, and Mannix (2002) also demonstrated that information search along with experiential learning are critical for market entry and market location decisions.

Information search is also recognized as a difficult organizational process because of environmental complexity and dynamism, and managerial bounded rationality. Managers typically cannot fully and comprehensively understand the environment (Cyert and March, 1963). Moreover, given the constraints of resources, time and capacity, managers often have to select from a range of scanning alternatives, such as the frequency of information search, the extent of internal search, and external search.

Research on SMEs' Environmental Scanning Behaviors

Numerous attempts have been made to extrapolate research on environment scanning behaviors from large organizational settings to small firms, but with limited success (i.e., Pearce, Chapman, and David, 1982). SMEs differ from large firms in several important ways that may affect their environmental scanning behaviors. Overall, environmental scanning activities are expected to be low for SMEs (Smeltzer, Fann, and Nikolaisen, 1988). This is primarily because SMEs usually have: (1) little presence of formal organization structure and processes geared toward environmental scanning; (2) lack of extensive external contacts and sophisticated internal management information systems (Kagan, Lau and Nusgart, 1990) and relative inability to influence external events; (3) the low levels of resources available for information search (Golde, 1964); and (4) lack of specialization of scanning activities among top management and the dependence of information search on one or two individuals (Hambrick, 1981). Although conflicting demands of boundary-spanning roles and internal operation roles are pervasive in any size organization, the problem is particularly acute for SMEs. The individuals who are responsible for environmental scanning activities usually are the entrepreneurs themselves. They often have a high degree of internal locus of control and self-efficacy. Due to these contextual features, SME environmental scanning behavior may be unique in many areas, as compared to large companies, even between young SMEs and mature SMEs.

Most prior research always assumes a rational perspective that SME managers would conduct extensive search and make the "best" decision. It fails to consider how bounded rationality affects the search efforts of SME decision makers and how they make decisions heuristically. In this sense, managers in SMEs and large companies share similar human cognitive limitations when facing a task of complexity, ambiguity and uncertainty, such as environmental scanning. Given the constraints of SMEs (i.e., resources, degree of specialization),

SME managers may be more apt to use perceptual processes to simplify scanning activities. Cognitive psychologists and behavioral scientists have identified a wide range of cognitive processes, which serve to simplify decision-makers' perceptions of external environments (Schwenk, 1984). These processes suggest that SME scanning activities may be more complicated than what normative, rational decision theories would imply.

Prior hypothesis bias. Cognitive psychologists found that decision makers who formed beliefs or hypotheses about the relationship between variables tend to seek and use information consistent with these hypotheses rather than disconfirming information (i.e., Koziellecki, 1981). This process may lead decision makers to ignore certain information (Beinhocken, 1999).

Reasoning by analogy. This involves the application of simple analogies and images to guide problem definition (Steinbruner, 1974). This process helps to reduce the uncertainty perceived in the external environment without resorting to extensive scanning and search efforts.

Single outcome calculation. Cyert and March's (1963) concept of problemistic search suggested that decision making involves a single valued problem and a single preferred alternative to which decision makers are committed from the outset of the decision process, rather than attempting to specify all relevant values and goals and generate a number of alternative courses of action as normative decision theory would suggest. This is an extremely powerful simplification process and is probably more likely to occur in highly complex and uncertain decision environments.

Environmental Turbulence and The Frequency of Information Search

Information search frequency is referred to as the number of times managers receive data about the environment (Hambrick, 1981). Fahey, King and Narayanan (1981) observed that managers can obtain information along a continuum ranging from irregular to continuous gathering. The irregular approach is a reactive, spot

behavior that involves external cues to force management into action. By contrast, continuous scanning is a perpetual, systematic, and proactive approach to search relevant environmental information. Some researchers suggest that the level of environmental uncertainty and the availability of resources within an organization affect the extent of scanning activities undertaken by managers (Boyd and Fulk, 1996; Milliken, 1987). Managers routinely use information search to reduce uncertainty. When the environment remains relatively stable or changed in slow cycle, managers at SMEs would commit fewer resources to information search, lengthening cycle time. Higher environmental turbulence generally elicits more frequent scanning efforts (Chakravarthy, 1997). Under such conditions, SME decision makers need more information to define problems and generate and evaluate alternative solutions (Elenkov, 1997).

Based on the above argument, we hypothesize:

H1: In general, the greater the degree of environmental turbulence, the greater the frequency of information search in SMEs.

Firm age is frequently treated as a moderating variable in SMEs and entrepreneurship research (e.g., Smallbone and North, 1995). Research findings generally support the importance of environmental scanning for the survival of new ventures (Brush, 1992; Chrisman and Leslie, 1989). New ventures, as compared to more established small businesses, face a higher level of uncertainty because of their “newness” and lack of legitimacy in the marketplace. Younger firms are also at a disadvantage in terms of contacts established in the marketplace and amount of historical or internal data from which to draw. They are probably still learning the “rules of the game.” When facing the same level of environmental turbulence, younger SMEs may require more frequent and intense information search than mature SMEs to reduce the uncertainty they face. Consequently we hypothesize:

H1a: Environmental turbulence has greater positive impact on the information search frequency of young SMEs than mature SMEs.

Environmental Turbulence and Sources of Information Search

Aguilar (1967) distinguishes two major sources of search, namely internal and external. Internal search mode pertains to reports, memos, and discussion with internal partners, managers, and employees about the external environment. External sources of search include direct contacts with government officials, customers, trade magazines, and attendants of association. Gudmundson et al. (2001) analyzed the internal and external information search for small businesses. Their findings suggest that managers in small firms might want to consider increasing both the acquisition of more external information and the use of various processes for gathering and sharing information, especially present in turbulent environments.

However, several studies suggested that while SME managers use a variety of information, they are usually apt to rely heavily on their own experience and internal sources of information when making decisions, even in situations where seeking external sources of information would be more appropriate and beneficial (i.e., Pineda and Lerner, 1998; Brush, 1992). There are several possible explanations for the types of search behavior by SMEs. First, SME decision makers tend to place a high value on their personal judgments due to their high levels of internal locus of control and self-efficacy. People with an internal locus of control tend to believe that what happens to them is the consequence of their own actions and that rewards are contingent upon their own behavior, as opposed to being controlled by outside factors (Robbins, 1994). Second, SME decision makers are likely to use more accessible sources even if the quality of the sources used may be lower than other alternative (O’Reilly, 1982). Third, even when SME managers seek external sources of information, there is an issue of trust, which is perhaps the most significant factor in influencing the choice of various sources.

Who can be trusted to see issues in the same context as the managers of a SME? Who has a vested interest in dealing with issues in a way that SME decision makers would find acceptable and maintain confidence? SME managers tend to look for advice and information from those with whom they share a common bond, often within an organization. Finally, due to limited time and resource constraints for information search activities, SME managers are always conscious of social and economic costs associated with obtaining such information. In most of the cases, external sources of information are usually more expensive than internal ones. Therefore, rather than searching extensively for optimal sources of information and incurring the additional costs, they prefer to use the most readily available information sources, usually internal – a characteristic of bounded rationality (March and Simon, 1958).

As the overall environmental conditions become more turbulent, SME managers may increasingly depend on the internal sources of information due to low search costs and high level of trust. Based on the above arguments, we propose:

H2: In general, the greater the degree of environmental turbulence, the greater the extent of internal search in SMEs.

As Covin and Covin (1990) adroitly argued, “the simple fact that researchers study new ventures implies that the age effect can be significant.” Entrepreneurship research generally supports the importance of external environmental contact and scanning activities, and frequently points out that the lack of information is a primary problem for new ventures (Chrisman et al., 1989). The typical organizational challenges, such as time and resource constraints, are especially greater for young SMEs compared to their mature counterparts due to the liability of newness and smallness. For mature SMEs, as they become experienced over time in terms of where to find internal and external sources of information, they may have developed, or be in the process of developing, formal organization structures and processes for information search. Additionally, these mature SMEs may have to overcome the

liability of newness and establish a network of relationships upon which they can draw resources and information. When facing environmental turbulence, mature SMEs may have an internal organization routine to upon which to rely. However, this may not be the case for young SMEs. Consequently, we argue:

H2a: Environmental turbulence has greater positive impact on the internal search of mature SMEs than young SMEs.

Internal search and external search may not be the two extremes on a continuum, rather two different sources of search. The preference of one source of information search does not preclude SME managers to use the alternative sources at the same time. For example, there may be incidences when SMEs use both sources of information extensively. However, given the time and resource constraints, the lack of personnel specialized in environmental scanning, coupled with a high degree of dependence on one or few individuals, there could be a trade-off relationship between internal and external sources of information search. Therefore, in conjunction with hypothesis 2, we hypothesize the following corollary:

H3: In general, the greater the degree of environmental turbulence, the less the extent of external search in SMEs.

Young SMEs have to overcome the “liability of newness.” Survival remains a major concern for young SMEs as compared with mature SMEs. As Johannisson (1990) argued, entrepreneurs should use their personal relationships with individuals outside their respective organizations to collect relevant environmental information. Such external search would not only serve the purpose of reducing organizational uncertainty, but would also increase organizational legitimacy in the marketplace. Therefore, in conjunction with hypothesis 3, we expect the following corollary:

H3a: Environmental turbulence has a greater positive impact on the external search of young SMEs than that of mature SMEs.

METHODS

Sampling

A random sample of 1,000 SMEs in Washington State was bought from Sampling, Inc. to test the hypotheses. Responses were collected from 284 companies (28.4 % response rate) and 242 usable questionnaires were obtained. Nineteen were incomplete, 12 belonged to companies having fewer than 30 employees, and 11 were not-for-profit organizations. Almost half of the respondents, 43.4 %, represent businesses in the manufacturing sectors and 22.3 % were businesses in the service sector. Retailers and wholesalers come next, each with 8.7%; the rest were finance businesses, transportation companies, construction, and agriculture businesses.

The questionnaire was mailed to businesses having between 50 and 500 employees. Nevertheless, responses were obtained from companies with both large numbers of employees and very small number of employees; there are 13 respondents under 50 employees and 11 over 500. Companies having at least 40 employees and those having less than 900 employees were retained in the study. More than 85% of the respondents had between 50 and 400 employees. Only 12% had between 400 and 500 employees. Eighty-one percent are corporations and all are privately held. Almost half of the businesses were in manufacturing (see Table 1).

The overall response rate was of 28.4% but some of the questionnaires were either incomplete or the companies were not-for-profit. We test for the non-response bias using Chi-square. Table 2 shows the distribution of respondents and non-respondents for the eight types of industries used to classify businesses in U.S. The χ^2 test was statistically insignificant, suggesting that there is no difference in the industry distribution between our sample and non-respondents.

Measures

Task environmental turbulence. It was measured by managers' perception of

number and extent of changes for a given period of time (Bourgeois, 1980). The study adopted a 14-item scale validated in Stoica (1995), Glazer et al. (1993), and Sinkula (1994). Participants were asked to rate the degree of change for various characteristics of task environment, including technology, competition, market/customers, suppliers, and regulations. The answers were measured on 5-point scales, with a rating of "1" indicating that environmental element has the least change and a "5" indicating many changes. The scale is reliable with a Cronbach alpha of 0.84.

Information Search. Market signals are identified and information on those signals is gathered and transmitted to the filter. How well the company does on this scale should be judged on the amount of information that is detected. The more information that can be collected over a given period of time, the better the detector operates. The major problem for any research involving information is represented by its measurement. Kholi, Jaworski, and Kumar (1993), Narver and Slater (1990), and Slater and Narver (1994) measured information generation by the number of signals gathered in a given period of time. It can be assessed by how often the responsible entities in the business unit meet with clients, competitors, etc. Multiple departments (within the organization) should engage in this activity because each has a unique market lens (Kholi, Jaworski, and Kumar 1993). Consistent with previous research by Glazer and Weiss (1993) and Sinkula (1994), we adopted a twelve-item intelligence generation MARKOR scale to measure the construct of information search. An additional two items were added after in-depth interviews. Our measure has a Cronbach-alpha 0.77, suggesting good reliability.

Frequency of information search was measured by asking participants the frequency with which the managers scan the task environment. This construct was measured using a five-point ordinal scale anchored by extremely infrequent to extremely frequent.

Table 1
Firms' Characteristics

Type of Business	Primary SIC Code (adjusted to one digit)	Number	%
Agriculture	1	3	1.2
Construction	2	3	1.2
Manufacturing	3	105	43.4
Transportation	4	16	6.6
Wholesale	5	21	8.7
Retail	6	21	8.7
Finance & Investment	7	19	7.9
Services	8	54	22.3
Total		242	100.0

Characteristic	Range	Businesses% (n = 242)
Number of Years in Business	Less than 5	4.1
	From 5 to 25	37.3
	From 25 to 50	38.2
	More than 50	20.4
Number of Employees	Less than 50	5.7
	From 50 to 100	39.5
	From 101 to 400	37.9
	From 401 to 500	11.9
	More than 500	5.0
Type of Business	Sole Proprietorship and Partnership	10.2
	Limited Liability Company	0.0
	Corporation	80.6
	Other	9.2
Marketing Budget	Zero	2.0
	Less than 1 %	31.0
	From 1 to 4 %	29.6
	More than 4 %	37.4

Table 2
The Analysis of Non-Response Bias

Type of Industry	Respondents		Non-Respondents		χ^2
	Number	%	Number	%	
Agriculture	3	1.2	12	1.5	2.7
Construction	3	1.2	21	2.7	
Manufacturing	105	43.4	313	41.2	
Transportation	16	6.6	53	6.9	
Wholesale	21	8.7	62	8.1	
Retail	21	8.7	78	10.3	
Finance	19	7.9	66	8.6	
Services	54	22.3	153	20.1	

$p < .01$

Internal search was measured by a list of items related to internal sources of information, such as “We consider every employee in the business as a possible source of information,” or “In this business, we do a lot of in-house market research.” Respondents were requested to rate the statement on a five-point scale, with a rating of 1 indicating strongly disagree and 5 indicating strongly agree.

External search was measured by a list of items related to external sources of information. Respondents were requested to rate statements—e.g., “We poll end users at least once a year to assess the quality of products/services”—on a 5-point scale. A rating of “1” indicates strongly disagree and a “5” indicates strongly agree.

Statistical Procedures

Multiple regression analysis was utilized to test the formulated hypotheses. The statistical testing procedures are as follows. First, three full regression models using frequency of information processing, internal search, and external search as the dependent variables, and different types of task environmental turbulence as the independent variables were tested. Second, the sample was divided into two sub-samples using SMEs’ median age, yielding young and mature SMEs. Third, the same

regression models were tested for each of the two sub-samples.

RESULTS

Descriptive statistics and correlation matrix for the independent and dependent variables are reported in Table 3.

The first hypothesis (H1) stated that environmental turbulence overall will lead to more frequent information search activities in SMEs. The full model 1 indicates a strong significant relationship exists between environmental turbulence and information search frequency ($R^2 = .061$, $F = 3.018$, $p < 0.05$). The individual standardized regression coefficients suggest that technological turbulence increases the frequency of information search activities significantly ($\beta = .155$; $p < 0.05$), however, competitive changes were found to be negatively associated with information search frequency ($\beta = -.164$; $p < 0.05$). Thus, H1 was partially supported (See Table 4). The hypothesis (H1a), stating that environmental turbulence will have greater positive impact on information search frequency of young SMEs than mature SMEs, was strongly supported. As presented in Table 4, a regression model for the young SME subgroup yielded an R-square of .097 ($F = 3.236$; $p < 0.1$), with technological turbulence as the leading predictor ($\beta = .238$; $p < 0.05$).

Table 3. Descriptive Statistics and Correlations Matrix

	Mean	STD	Frequency of Environment Scanning	Internal Search	External Search	Technological Change	Market Turbulence	Competitive Turbulence	Supplier Turbulence	Regulatory Turbulence
Frequency Of Environmental Scanning	3.5579	1.0138	1.000							
Internal Search	3.0979	0.5838	.383***	1.000						
External Search	3.6229	0.8465	.316***	.436***	1.000					
Technological Change	3.4417	0.9620	0.089	.250***	.161**	1.000				
Market Turbulence	2.9367	0.6983	-0.055	0.080	0.028	.434***	1.000			
Competitive Turbulence	2.8625	0.9417	-.136**	0.015	-0.114	.247***	.444***	1.000		
Supplier Turbulence	2.8458	0.9622	-0.040	.150**	0.023	0.085	.199***	.163*	1.000	
Regulatory Turbulence	3.0688	1.0532	-0.013	0.044	-0.106	0.120	.285***	.306***	.147*	1.000

*p < 0.1, ** p < 0.05, ***p < 0.01 (Listwise N=237)

**Table 4. Regression Analysis:
Environmental Turbulence and Information Scanning Activities**

	Frequency of Information Search/Scanning			Internal Search/Scanning Activities			External Search/Scanning Activities		
	Full Model I	Young	Mature	Full Model II	Young	Mature	Full Model III	Young	Mature
Technological Change	.155**	.238**	0.060	.258***	2.41**	.269***	.191***	0.107	.269***
Market Turbulence	0.008	-0.178	0.066	-0.052	-0.129	0.039	0.063	0.107	-0.016
Competitive Turbulence	-.164**	-0.069	-.273**	0.028	-0.118	-0.042	-0.057	-.244**	-0.054
Supplier Turbulence	-0.120	-.185*	0.149	-0.093	-0.035	.268***	-.230***	0.046	-0.017
Regulatory Turbulence	0.066	0.047	0.019	0.048	0.055	-0.018	-0.055	-.172*	-0.024
R square	0.061	0.097	0.071	0.063	0.058	0.164	0.093	0.102	0.064
F	3.018**	2.236*	1.862	3.142***	1.283	4.679***	4.764***	2.368**	1.635

*p < 0.1, ** p < 0.05, ***p < 0.01

However, we did not find an overall significant relationship between environmental turbulence and search frequency for the mature group. Also, competitive turbulence, which leads to decreasing search frequency for mature SMEs, showed no impact on the young SMEs.

Hypothesis 2 (H2), stating that the usage of internal search will increase as the environmental turbulence increases, was supported. As indicated in Table 4, the full model with internal search as the dependent variables yielded an R-square of .063 (F = 3.142; p < 0.01) was also found. A strong significant positive relationship between turbulence and internal search activities of mature SMEs (R² = .164; F = 4.679, p < 0.01) was also found. Among the significant predictors were turbulence in the sectors of technology (β = .269; p < 0.01) and suppliers (β = .268; p < 0.01). However, the analysis failed to detect the overall relationship between turbulence and internal search for young SMEs (R² = .058; F = 1.283), although the model indicates internal search activities in young SMEs increase as the task environments become more turbulent. These findings lend support for hypothesis H2a in predicting that environmental turbulence will

have a greater positive impact on mature SMEs than young SMEs.

The third hypothesis (H3) stated that the greater environmental turbulence, the less likely SMEs would resort to external search. As presented in Table 4, overall turbulence is a significant predictor of external search (R² = .093; F = 4.764; p < 0.01). However, we found mixed results for individual environmental factors. Technological turbulence tended to intensify the usage of external search (β = .191; p < 0.01) but that was not the case for supplier turbulence (β = -.230; p < 0.01). Thus, we only found partial support for H3.

Hypothesis H3a's prediction that environmental turbulence will lead to greater usage of external search in young SMEs rather than mature SMEs was supported, but in the opposite direction. As indicated in Table 4, regression analysis for the young SMEs subgroup uncovered significant negative relationship between turbulence and external search (R² = .102; F = 2.368; p < 0.05), with competitive turbulence (β = -.244; p < 0.05) and regulatory turbulence (β = -.172; p < 0.1) as the significant predictors. The findings suggested that decision makers in young SMEs tend to decrease, rather than increase,

the external search activities, as the regulatory and supplier environment become more turbulent. However, for the mature SMEs sub-sample we failed to detect an overall relationship between turbulences and external search. Yet, technological changes were positively related to the external search activities ($\beta = .269$; $p < 0.01$). This finding suggests that mature SMEs were more geared toward external search as technological changes increase.

DISCUSSION

The results of this study shed insightful light into the relationship between environmental turbulence and SMEs' environmental scanning activities, and the moderating role played by firm age in the context of SMEs. These findings can be explained if the specificity of SMEs and the decision makers' cognitive limitations are taken into consideration.

This study shows that SMEs overall are very selective and prudent, or somewhat biased in their search efforts when facing increasing task environmental turbulence. As Table 3 indicates, our sampled SMEs were very attuned to technological and competitive turbulence, but surprisingly not to market turbulence. There are several possible explanations. First, as environmental conditions become more uncertain, ambiguous and turbulent, SMEs may experience information overload. Given the limited times and resources and lack of specialization in scanning activities within SMEs and individual cognitive limitations, SME decision makers may therefore resort to a series of cognitive simplification techniques such as prior hypothesis bias and single outcome calculations. Consequently, they will not be equally (rather than selectively) responsive to all environmental signals. Second, environmental turbulence by itself does not lead to scanning activities unless the external events are perceived to be salient to SME decision makers. SME decision makers may even choose to ignore certain environmental changes that do not fit with their schematic preference. There were approximately 45% manufacturing firms in the sampled SMEs, which points to the

possibility of a bias regarding technological environmental factors. The lack of response and some ignorance of market signals may also well be attributed to the phenomena of single outcome calculations and prior hypothesis bias. SMEs in the sample may have strong preference to be "prospectors", instead of "defenders" (Miles and Snow, 1978). Therefore the perceived market, regulatory and supplier turbulence may be less salient for SME managers than technological turbulence and competitive turbulence.

Results suggest different search modes for young and mature SMEs in the face of a turbulent task environment, which support the presence of an age effect on the relationship between environmental turbulence and SMEs' search behavior. First, as technological turbulence increases, decision makers in young SMEs prefer to increase their search frequency and more extensive utilization of internal sources of information. By contrast, their counterparts in mature SMEs are apt to engage in more extensive internal and external searches, but will not necessarily increase their search frequency. External search is usually an expensive choice as compared with an internal one (Pearce, Chapman, and David, 1982). This is due to the fact that young SMEs compared with mature SMEs may have fewer resources available for search and fewer contacts in the external environment, among other disadvantages. Therefore, they tend to make up the shortage of external search with more *frequent* internal search in face of technological turbulence. Second, as competitive turbulence increases, managers in young SMEs are apt to *decrease* their external search activities, while managers in mature SMEs will decrease their search frequency. These counter-intuitive findings challenge the widely held rational notion that in order to reduce organizational uncertainty, SME managers would *increase* their search activities with the increase in competitive dynamics. It is speculated that SMEs might place different emphases on their search efforts. Young SMEs' search efforts may be understandably more geared toward efficiency and timeliness, given the resource constraints. Frequency takes precedence

over search breadth. For mature SMEs, effectiveness is more important than efficiency. Therefore, search scope and breadth may be valued more importantly than frequency. The results suggested that young SMEs prefer a search mode of proactive internal gathering (high frequency, continuous) and mature SMEs a mode of reactive internal and external gathering (low frequency, irregular).

These findings offer some cautions on the conventional wisdom of improving problem solving through planning and increasing search frequency and range of information provided to managers. When facing environmental conditions with a high degree of complexity, ambiguity, and turbulence, managers quickly reach the point of information overload and errors of attribution and selective perception are likely to occur. Although there may be good noncognitive reasons for advocating more timely and broader information, increasing the rate and the range of information scanning does not alter the kinds of cognitive errors (Kiesler and Sproull, 1982). In reality, it may simply increase the opportunity for constructing illusory correlations, erroneous causal explanations or false analogies, given total cognitive limits on their information processing capacity. The results are somewhat consistent with Bhide's (1994) observation that entrepreneurs typically lack the time and resources to conduct extensive information search. In fact, he found that compared with typical corporate practice, successful entrepreneurs use a more timely, selective, and economic approach that represents a middle ground between planning paralysis and no planning at all (Bhide, 1994; 2000).

CONCLUSIONS AND FUTURE RESEARCH OPPORTUNITIES

This paper contributes to the SMEs' research in the following ways. First, it may sensitize SME managers and researchers to the role of cognitive limitation and selective perception played in SMEs' search behaviors. We found that SME managers are not equally receptive to all task environmental changes. Instead, their search

behaviors are highly differentiated and very selective in face of turbulent task environments. Additionally, it was discovered that age does make a difference in SMEs' search activities. Young and mature SMEs exhibit different search behaviors in the face of a wide range of environmental turbulence.

In understanding SMEs' information search behavior, a model that integrates both a rational perspective and cognitive psychology theory is called for. Also, there are a variety of additional factors that should be considered in understanding the relationships between the environment of SME search behaviors, such as individual parameters and competitive strategy, and organizational structure and processes. Differences in SME decision makers' cognitive capabilities, predispositions, and inclinations, to a large extent may determine the choices and uses of sources. Which individual factors determine the entrepreneur's selection of information sources (Welsch and Young, 1982)? The dominant competitive strategy may determine the types of external stimuli to which SME manager may be responsive. Structural parameters such as formal and informal positions for scanning activities and the importance placed on these functions should be also incorporated when building a comprehensive model.

In dynamic business environments, strategies containing elements of learning theory will enhance long-term success. Both external and internal information search will help foresight (Karp, 2004). Organizational foresight will augment the organization's ability to envision the future and then actively shape the future. However, new information will very often be denied unless, through effective foresight, there exists a balance between the amount of threat (generated by a turbulent environment, we say) and enough psychological safety (Gavetti and Levinthal, 2000) to allow the change target (the business) to accept and disseminate the new data. Organizations that want to enrich their foresight abilities need to become learners, in order to expose themselves to different contexts (Karp, 2004). This study can be

seen as a preliminary step towards the development of foresight abilities in small businesses. Future research is needed to understand the way companies craft strategies that contain elements of learning theory, particularly when operating in a turbulent environment.

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