Journal of Competitive Intelligence and Management

Volume 3, Number 4, 2006

Competitive Intelligence Foundation

Journal of Competitive Intelligence and Management

Volume 3, Number 4, 2006

Competitive Intelligence Foundation

Journal of Competitive Intelligence and Management

Volume 3, Number 4, 2006

Development of an Expert System on Environmental Scanning Practices in SME: Tools as a Research Program

François Brouard
Carleton University, Canada

Abstract

The purpose of this study is to improve awareness of environmental scanning practices. The specific research objective is to develop a diagnostic tool that will assist in understanding existing environmental scanning practices, and in making the underlying processes more explicit. To achieve this objective, a diagnostic tool that is a prototype of an expert system was developed for small and medium-sized enterprises (SMEs). Environmental scanning can be defined as an informational process by which an organization stays attuned to its environment in order to make decisions and then act in pursuit of its objectives. The research methods used are action research and prototyping of an expert system. The diagnostic structure has five main components: scanning types, scanning context, scanning organization, scanning process and security. These components were broken down to form a total of 30 components. During the development of the prototype, six medium-sized Canadian enterprises and 33 experts were involved during the three iterations. The six SMEs were the subjects of case studies. This paper outlines how an expert system on environmental scanning practices of SMEs was developed. The prototype is still in progress. Tools could be viewed as opportunities in a research program.

Introduction

Organizations are affected by every facet of their external environment; they need to be more aware of their external environment and of how it may affect them (Aguilar 1967; Garg, Walters and Priem 2003; Peteraf 1993; Raymond, Julien and Ramangalahy 2001). Managers and consultants can use tools that help them to become aware of their environment. One such management tool, environmental scanning, is a recognized way of anticipating changes (Lesca 2003). Environmental scanning is the informational process by which an organization stays attuned to its environment in order to make decisions and then act in pursuit of its objectives. Business intelligence is the output of this process.

Since the world is continually changing, our thinking must also change (Tsoukas and Shepherd 2004). With all the environmental changes and their inherent risks, there is a need for organization pilotage. Based on Selmer (1998) and Genelot (1999a; 1999b), there are four levels of pilotage: exploitation, management, evolution, mutation. Accounting can be described as a tool used at the management level to achieve more control, gain a short- or medium-term perspective, and focus on internal activities. Environmental scanning can be described as a tool used at the evolution and mutation levels – it supports the development of strategy, provides a medium- and long-term perspective, and focuses on external activities. As such, environmental scanning, like accounting, is a distinct information system.

The managerial problem addressed in this study is how internal and external participants can help organizations with their environmental scanning practices. Research results show that organizations, especially small and medium-sized enterprises (SMEs), should be aware of and sensitive to environmental scanning and its benefits (Bulinge 2002, 2003; CNRC-ICIST 1999; Larivet 2002; Lesca and Raymond 1993). They benefit from investing in and implementing effective environmental scanning practices, and they need tools to help them to assess their existing practices.

The broad purpose of this study is to help consultants and managers improve their awareness of environmental scanning practices and contribute to increased use of these practices. The specific research objectives were to develop a diagnostic tool that will help consultants and managers understand existing environmental scanning practices in a given organization, and to make the underlying processes inherent in environmental scanning more explicit. To achieve these objectives, a diagnostic tool – a prototype of an expert system – was developed for SMEs.

This paper outlines how an expert system on the environmental scanning practices of SMEs was developed. The study contributes to our understanding of environmental scanning practices by establishing an integrated framework, and it contributes to information system research by presenting an action research study that makes IS research relevant to practice (Baskerville and Myers 2004).

The remainder of this paper is organized as follows. The second section provides conceptual frameworks for environmental scanning. The third section summarizes the research method used. The fourth section discusses some results of this study, and the final section presents conclusions and summarizes contributions.

Environmental Scanning

An early warning system is an important tool for managing the future (Tsoukas and Shepherd 2004). The main issue is the survival of the organization, which is threatened by uncertainties created by the changing environment. Environmental scanning can be defined as an informational process by which an organization stays attuned to its environment in order to make decisions and then acts in pursuit of its objectives. Through environmental scanning, an organization monitors information from its external environment that is relevant to its internal environment (Aguilar 1967; Bourgeois 1980; Daft, Sormunen and Parks 1988; Elenkov 1997; Fleming 1998; Thomas, Clark and Gioia 1993). Business intelligence is the result of this process. Terms used to describe concepts similar to environmental scanning are Competitive Intelligence (CI) and Strategic Scanning. As the terminology is still in flux, in this paper "environmental scanning" and "business intelligence" are used interchangeably as comprehensive terms that include both process and results (Brouard 2000).

Environmental scanning can be viewed as a global process that is divided into four more specific processes (Brouard 2000; Martinet and Ribault 1989):

1. Technological scanning is concerned with the technological dimension of an organization's product, service or production process.

2. Competitive scanning is related to actual and potential competitors.

3. Commercial scanning involves the clientele and supplier dimensions.

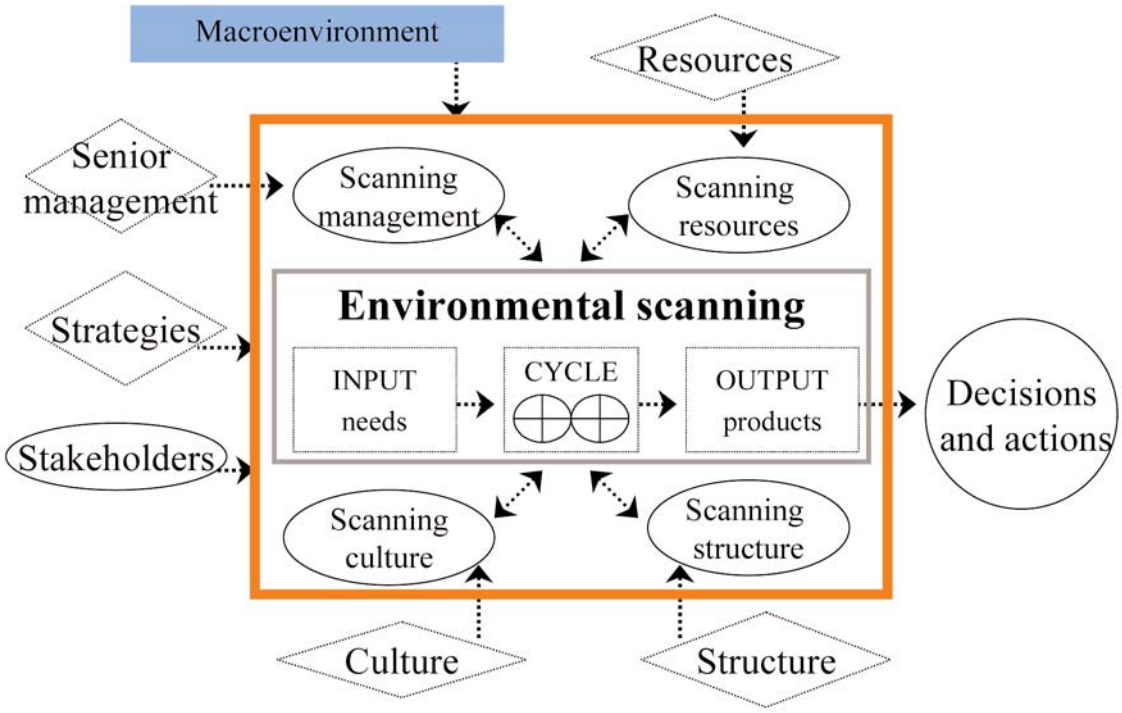
4. Socio scanning is concerned with all other elements, including demographic, economic, socio-cultural, political and others.

Since environmental scanning is a relatively new area of research (approximately 30 years old), no generally accepted conceptual framework exists (Bergeron 1997; Choudhury and Sampler 1997; Ganesh, Miree and Prescott 2003; Zou and Cavusgil 1996). Ganesh *et al*. (2003) describe the need for a conceptual framework to facilitate progress in this emerging field of research. Other research proposes some conceptual frameworks (Choo 1999; Ganesh *et al*. 2003; Jacob, Julien and Raymond 1997; Liu 1998).

Based on the previous research studies since Aguilar (1967), it is possible to articulate a vision of environmental scanning. The development of the knowledge base that synthesizes existing knowledge on environmental scanning will allow to organize and structure the expert system.

Environmental scanning is a system that includes subsystems. These systems are influenced by information flows coming from the macroenvironment, stakeholders, and the organization itself. The macroenvironment has many dimensions, including demographic, economic, technological, political, legal, ecological, physical and sociocultural. Stakeholders are clients, suppliers, employees, unions, partners, competitors, governments, media, lobby groups and networks. An organization's internal environment includes its resources, culture, strategies, management leadership and structure. All these internal dimensions influence scanning subsystems such as scanning resources, scanning culture, scanning management and scanning structure. Figure 1A broadly illustrates environmental scanning systems and influences that affect them.

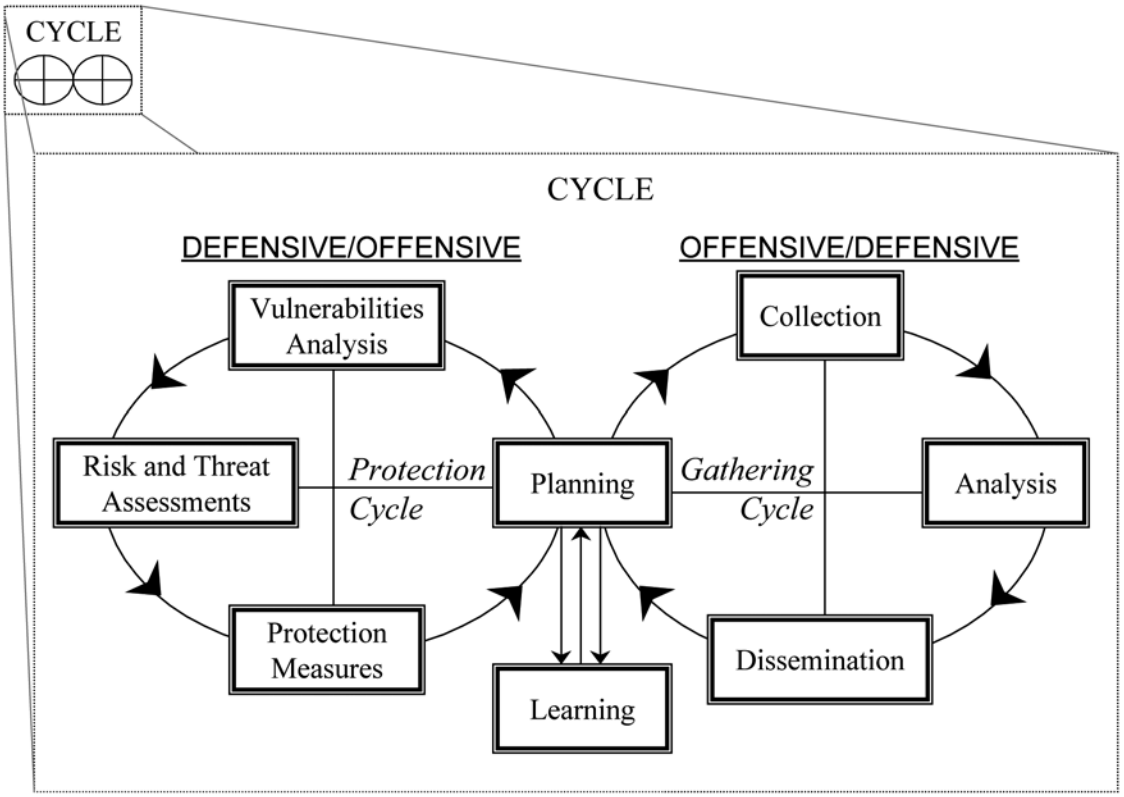
Figure 1A - Environmental scanning process and flows



The environmental scanning process itself includes three components: input, cycle and output. The inputs are the needs of the information users. The scanning process itself, called the intelligence cycle, has four phases: planning, collection, analysis and dissemination (see Figure 1B) (Kahaner 1996; Ghoshal and Westney 1991; Hambrick 1982; Miller 2000; Peyrot, Childs, Van Doren and Allen 2002). In the planning phase, the organization identifies the intelligence needs of its management team. Collection is the

acquisition of relevant data. Analysis creates information by linking data together and identifying patterns and trends. During the dissemination phase, results are transmitted to decision makers.

Figure 1B - Intelligence Cycle



Another important component of the intelligence cycle is the protection cycle (Nolan and Quinn 2000; Pattakos 1997), which is also shown in Figure 1B. During the planning phase of this cycle, organizations, knowing that it is impossible and costly to protect everything, identify critical assets and determine their protection requirements. Vulnerability analysis assesses the weaknesses that may exist in relation to protection needs. Risk and threat assessments estimate the potential effects of vulnerabilities on organizational activities and serve as a basis for designing protection and security measures. Protection includes counter-intelligence to safeguard information from others (including terrorists), and security to enforce the laws and protect against criminal attacks (Francq 2001). Both the gathering cycle and the protection cycle include a learning component at the end to evaluate past actions and react accordingly for the future.

This global intelligence process, comprising the gathering and protection cycles, can act offensively or defensively. Examples of offensive action include collecting data oriented towards identifying opportunities and using disinformation as a means of protection. An example of a defensive action that applies to most protection and safeguarding measures is collecting data oriented towards identifying existing threats. These two dimensions are linked in their application and create a continuous, dynamic flow. They may be viewed as two sides of the same coin, or as the yin and yang of the intelligence process. For example, increased dissemination within an organization provides more information to competitors unless protection measures are in place to control or limit this information dissemination. The outputs of the system are products oriented towards decisions and actions. Depending on the cycle phases, these products can be data, information or knowledge.

The proposed conceptual framework illustrated in Figures 1A and 1B is based on diverse theories, including organizational information theory, resources based theory, economic theory and contingency theory (Choudhury and Sampler 1997; Liu 1998; Zou and Cavusgil 1996). This conceptual framework is a synthesis of previous research and the integrated main components of other frameworks proposed by Auster and Choo (1994), Choo (1999; 2001), Elenkov (1997), Julien *et al*. (1997; 1999), Liu (1998), and Vandenbosch and Huff (1997).

Research Method

In the absence of a generally accepted conceptual framework for environmental scanning, it is appropriate to use a qualitative research strategy and a field strategy (Audet 1998; Bergeron 1997, 2000; Ganesh *et al*. 2003). A qualitative approach is an "appropriate methodology to study an emerging and ill-defined concept like environmental scanning" (Bergeron 2000, 5 [translation]).

Action Research and Prototyping

Because the research questions focus on understanding and intervention, the preferred research method is action research, specifically prototyping of an expert system. Action research can be defined as follows: "Action research simultaneously assists in practical problem-solving and expands scientific knowledge, as well as enhancing the competencies of the respective actors, being performed collaboratively in an immediate situation using data feedback in a cyclical process aiming at an increased understanding of a given social situation, primarily applicable to the understanding of change processes in social systems and undertaken within a mutually acceptable ethical framework" (Hult and Lennung 1980, 247).

Greenwood and Levin (1998) positioned action research within the pragmatism paradigm and systems theory. Action research is founded on the assumption that research and action can be united and can lead to relevant knowledge for practice (Baskerville and Myers 2004; Eden and Huxman 1996). "Prototyping is an approach to building information systems which uses prototypes" (Beynon-Davies, Tudehope and Mackay 1999, 108). A prototype is a preliminary working model of an information system (or part of it). Prototyping is a relevant approach for expert systems when problems are unstructured (Zahedi 1993).

Successful system development through prototyping justifies the choice of this approach.

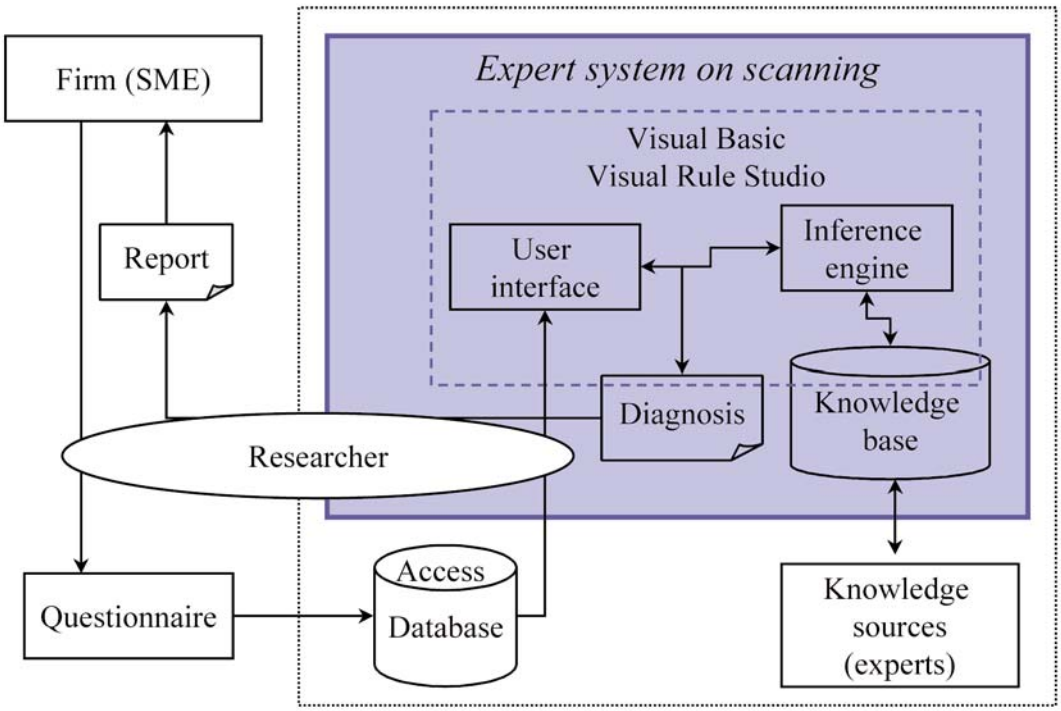
Baskerville (1999) lists some factors that indicate that a prototype is successful, such as immediate artifacts that would gratify management's need for prompt and visible results; the building of expertise through experience; constantly and interactively validating specifications in response to specific user feedback; and improved user-designer communications that lead to shared understanding, increased user participation in the design process, and heightened initial acceptance and effectiveness of a new system. A prototype also facilitates participant awareness by demonstrating an abstract concept, such as environmental scanning, with a concrete and practical application (Raymond and Lesca 1995).

Expert System Development

The tool developed is an expert system that performs a diagnosis of environmental scanning practices in SMEs. An expert system is a computer program that creates solutions to problems using the human knowledge integrated in a knowledge base. A prototype is a preliminary version whose development is not complete. An expert system has four main components: a knowledge base, an inference engine, a user interface, and a knowledge-acquisition interface (Benfer, Brent and Furbee 1991). When an expert system is being developed, the primary focus is on elaborating the knowledge base and rules that will govern the system, and, in this case, a questionnaire to bring data into the system.

The expert system architecture designed for this study uses a questionnaire to collect data on each organization included in a database. The diagnostic tool developed uses an expert system shell, Visual Rule Studio 2.5 by Rules Machine Corporation, and the programming language associated with it, Visual Basic 6.0 by Microsoft. The expert system provides a diagnosis of environmental scanning practices of the organization studied. Figure 2 illustrates the expert system on scanning architecture.

Figure 2 - Expert system on scanning architecture

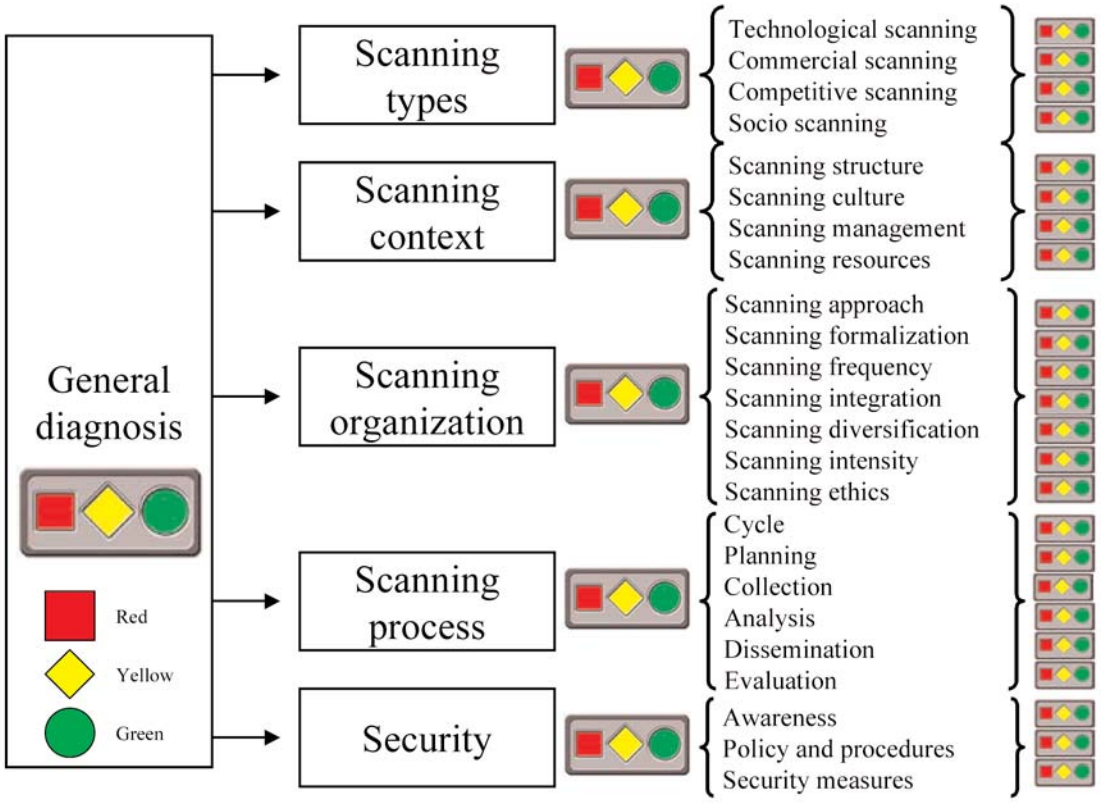


The main output of this expert system is a diagnostic report that includes a series of traffic light indicators (red, yellow, green). These indicators, which are three-level codes, are well recognized and understood. The diagnostic report also includes recommendations to improve environmental scanning practices and advice on how to implement them. Also provided are general explanations of environmental scanning to give clients a better understanding of the environmental scanning concepts.

Programming involves the development of a set of rules. A rule is a statement about knowledge that links a condition and an action. For example, a rule could look like: "IF condition happens THEN action X appears ELSE action Y appears" (IF-THEN-ELSE) (Turbanand Aronson 1998). Globally, the expert system on scanning developed in this study has 588 rules.

Based on the conceptual framework developed, this expert system diagnoses five main components of environmental scanning: scanning types, scanning context, scanning organization, scanning process and security. These components are subdivided into a total of 30 components (see Figure 3).

Figure 3 - Environmental scanning diagnostic structure



Research Design and Sample

The case study was the preferred research method to validate the different versions of the prototype, enrich the knowledge base, and evaluate the expert system developed. The methodology of choice was to involve many organizations, i.e., the multiple case study, to validate the diagnostic tool using a variety of situations (Eisenhardt 1989; Yin 1994). The unit of analysis was the organization, especially its environmental scanning practices. Three main collecting tools were used: interview, questionnaire and document analysis. Data collection on the environmental scanning practices of a specific organization was done via a questionnaire.

The research method used required two different samples, organizations (SMEs) and experts. Organizations were used to develop case studies of their current practices and to evaluate those practices. Experts contributed to the validation of the tool developed and refined during each iteration. During the prototype development, six Canadian SMEs and 33 experts were involved in the three iterations to prepare the final version of the prototype.

Because of their characteristics, SMEs were used in this study. Each of the six SMEs was the subject of an individual case study. Three SMEs are service organizations—medical analysis (P02S), personnel placement services (P04S), chartered accounting firm (P06S)—and three SMEs are manufacturing organizations—small electrical appliances (P03M), metal products (P05M), specialized machinery (P07M)). The number of employees involved varied from 60 to 410 employees. Another firm (P01S) also participated in the development of the initial questionnaire.

Experts evaluated the environmental scanning practices of SMEs as described in each case study and commented on the process and the results of the diagnosis. Thirty-three experts participated in one or more steps of the research; 15 experts participated during the iterations using the case studies. For each case study, between seven and nine experts returned a completed questionnaire.

Discussion Of Results

In an action research study, results include a description of the work accomplished. Since the final results of this research project are the development and validation of a prototype of an expert system, a description of the process is presented below. This process involved research phases and iterations.

The development was divided into five phases: (1) development of the knowledge base, (2) development and preliminary validation of the prototype, (3) development and validation of the prototype, (4) testing of the prototype, and (5) analysis of the prototype. These phases are not linear; they correspond to the spiral described in Susman and Evered's (1978) action research model.

The results presented for each phase are the results for the whole development and not only for the main period of development. Given the cyclical nature of the action research method and prototyping, it is normal to modify initial results following further study.

Research Phases

The first phase is the development of the knowledge base. The researcher attempts to acquire and represent the knowledge. Knowledge acquisition is done using a literature review and the knowledge of the researcher and other experts. This task involved the identification of management problems specific to the environmental scanning practices of SMEs. Knowledge representation uses a semantic network (Muhr 1997) and rules production. ATLAS/ti software was used to prepare the semantic network. Systematic

analysis of empirical studies yielded an inventory of 150 studies related to environmental scanning. In addition to completing the semantic network, this analysis allowed a look at the operationalization of environmental scanning variables. In total, 418 concepts and 539 relationships were listed in the semantic network. Concepts and variables were included in the questionnaire development and in the expert system rules. Relationships between concepts were also included in the rules. The variables in the questionnaire were chosen based on the expertise collected at this stage.

The second phase was the development and preliminary validation of the prototype and the research process. This phase was the first attempt to develop an actual expert system prototype. One task involved designing and developing a questionnaire that would collect data that revealed the SMEs' environmental scanning practices and provided input to the expert system. The second task in this phase was programming. Finally, validating the research process was required to determine whether the project was useful.

A 32-page questionnaire covering all environmental scanning themes was developed (see Appendix for examples of questions). The questionnaire was based on the concepts and variables identified in the first phase of knowledge acquisition and included sections representing the components identified (see Figure 3). Answer formats were mostly 5-point Likert-style questions (1, 2, 3, 4, 5), dichotomous (yes/no) or multiple-choice.

The third phase was the development and validation of the prototype. To get a working prototype, three iterations using the six case studies were performed to validate the expert system and improve it by modifying the program. This phase used organizations and experts simultaneously. Essentially, improvements came from the comments on the case studies elicited from SME executives and experts. Analyzing the results after each case made it possible to improve the prototype and revise the knowledge base and rules.

The purpose of the first interview with the organization was to obtain additional information about the organization, in order to better understand the context of the questionnaire responses, and to collect the completed questionnaire. A case study was then written based on the completed questionnaire and submitted to the organization for content validation, after which a diagnosis was performed using the expert system. A second interview was held to present the diagnostic report to the organization and obtain comments on it.

Developing an expert system prototype relies on human experts validating the expert system. The task of the experts was to assess the environmental scanning practices documented in the case study of an SME. This assessment was done using comment sheets. Each expert prepared a personal evaluation of the organization's environmental scanning practices; no specific framework was provided. These experts were asked to note the level of each practice, provide relevant recommendations, and note missing or irrelevant information in the case study. They then prepared a second personal evaluation of the client organization's practices using a 30-component framework (see Figure 3). They circled the colour of their evaluation (red, yellow or green) for each component. These experts were then given the diagnostic report produced via the expert system and asked to compare their own evaluation with that of the system, and to comment on the system's evaluation if they wished.

The diagnostic report on environmental scanning practices is the main output of the expert system. This 22-page report includes a general description of environmental scanning and the tool being used in this study, a summary of the traffic light signals, a brief description of the organization being analyzed, sections on each diagnostic component (general, scanning types, scanning context, scanning organization, scanning process, security), an action plan that includes prioritized recommendations, an outline of the perceived benefits of and barriers to environmental scanning, an appendix explaining the diagnostic process, and a table of contents.

Using traffic lights that combine the use of geometric forms and colours (square for red, diamond for yellow and circle for green) allowed the report to be printed in black and white. The analysis of each diagnostic component includes general comments, facts and specific recommendations, including some suggestions for implementation. The report was prepared using Microsoft Word, so clients can modify the report based on their own assessment. The diagnostic report was submitted to the participating organization, which had the option of acting on it or not.

The fourth phase, which was conducted simultaneously with the third phase, was testing the prototype. During the second interview, each participating organization was asked to comment on the report. The case studies used for this testing were of the same organizations used in the prototype development and validation phase.

The fifth phase was analyzing the prototype and completing the evaluation of its development. Comments collected from the participating organizations in the second interview were used, as well as additional comments collected during a third interview.

In addition to the diagnostic reports on the organizations' environmental scanning practices, other reports produced using this approach were the summaries of the questionnaire data, the case studies, working documents with explanations used by the expert system, and the comment sheets used during the development of the system.

Iterations and Case Studies

This study used only three iterations, due to the limited availability of executives and the unexpectedly long time lapse between case studies, but more than three would also be appropriate. Within an iteration, any changes that are found to be necessary are made immediately. After each iteration, a global analysis of the changes required is done before the next iteration.

The first iteration was the longest one. During this iteration, procedures implemented were tested. Other iterations were smoother following the experience gained. Most of the changes to the prototype were minor ones and refinements to the programming. No major changes were required, but a number of minor changes affected results with the expert system. The experts were the main source of the changes required. For example, a bad code on a specific variable, or adding a variable to compensate for missing information, could have confusing results.

Specific Results on Case Studies

The environmental scanning practices of all the SMEs studied need improvement. Two organizations were found to be at the red level, four at the yellow level, and none at the green level. Previous studies have found that SMEs vary in their environmental scanning practices; the results of this study are in accord with those findings. Variations have been found (although not in this study) among organizations at the green level, with some SMEs using advanced practices. However, the proportion found in this study corresponds approximately to that found by Lesca and Raymond (1993). The results of the CNRC-ICIST (1999) study on environmental scanning practices of Canadian organizations found that some Canadian firms had world-class environmental scanning practices.

Overall, the general action plan and prioritized recommendations pertain to scanning organization, scanning process, security, and scanning context. Scanning types does not seem to pose a priority problem. The specific action plan and the prioritized recommendations vary among organizations, but the areas that most frequently require action are scanning formalization, protection and risk measures, and scanning resources.

Four of the SMEs used in this study judged environmental scanning as very useful, and another judged it useful.

Conclusion And Contributions

All organizations should scan their environment using action research and prototyping of an expert system in order to be aware of the next threat and be prepared to react quickly. The five main components of this expert system are scanning types, scanning context, scanning organization, scanning process and security. These components are broken down to form a total of 30 components. This type of research allows for a dialogue with SME executives on an abstract concept.

Given that this expert system is only a prototype, and in light of its complexity, the time required and the limited sample size, it is far from being a mature expert system (Delisle and St-Pierre 2003). Further development is needed.

SME feedback indicates that organizations find the prototype very useful. The data elicited by the questionnaire were useful with regard to the overall management of the businesses as well as to their environmental scanning practices. The diagnostic tool makes the existing environmental scanning practices and underlying processes more explicit and contributes to improved awareness of environmental scanning practices. The report balances the needs of the SME executives by targeting important information, providing concrete examples of action, and explaining the evaluation results.

This study contributes to knowledge and practice in many ways. The expert system that was developed is a global diagnostic tool covering all aspects of environmental scanning practices in SMEs. This tool improves organizations' awareness of environmental scanning and helps them operationally. The expert system includes a knowledge base—which is a synthesis of many aspects of environmental scanning practices—a questionnaire, and reports. The knowledge base and questionnaire combined are the central component of the expert system.

Experts found the 32-page questionnaire to be comprehensive. However, the time constraint (one hour only) imposed for answering the questionnaire restricted response to nuances. The research process was well accepted by both SME executives and experts. This study provides a tool that allows internal and external consultants to consider a new methodology and compare it to the one they currently use. The knowledge base and the 30 components provide a framework for organizing recommendations and actions.

This prototype is a first step towards developing environmental scanning practices for small and medium-sized enterprises and large corporations (Ghoshal and Kim 1986). The tool offers a base upon which to conduct a larger research project. In general, tools could be viewed as opportunities in a research program. These efforts will increase our knowledge in this area of expertise and provide executives with management tools that helps them deal with uncertainties.

References

Aguilar, F. J. (1967). *Scanning the Business Environment*. New York: Macmillan.

Audet, J. (1998). *La veille stratégique chez les PME québécoises : une étude de cas par comparaisons inter-sites.* Doctoral thesis, Université Laval, Sainte-Foy, Québec.

Auster, E., & Choo, C. W. (1994). CEOs, information, and decision making: scanning the environment for strategic advantage. *Library Trends*, 43, 206-225.

Baskerville, R.L. (1999). Investigating information systems with action research. *Communication of the Association for Information Systems*, 2 (19), 1-31.

Baskerville, R. & Myers, M. D. (2004). Special issue on action research in information systems: Making IS research relevant to practice – Foreword. *MIS Quarterly*, 28, 329-335.

Benfer, R.A., Brent, E. E., & Furbee, L. (1991). *Expert Systems.* Newbury Park: Sage Publications.

Bergeron, P. (1997). Use of a qualitative case study approach to examine information resources management. *Canadian Journal of Information and Library Science*, 22(3/4), 1-19.

Bergeron, P. (2000). *Veille stratégique et PME – Comparaison des politiques gouvernementales de soutien.* Sainte-Foy: Presses de l'Université du Québec.

Beynon-Davies, P., Tudehope, D., & Mackay, H. (1999). Information systems prototyping in practice. *Journal of Information Technology*, 14, 107-120.

Bourgeois, L.J. (1980). Strategy and environment: A conceptual integration. *Academy of Management Review*, 5(1), 25-39.

Brouard, F. (2000). Que la veille stratégique se lève : faisons le point sur la terminologie et le concept. *Proceedings/Actes du Congrès ASAC-IFSAM 2000*, 21, 22-33.

Bulinge, F. (2002). *Pour une culture de l'information dans les petites et moyennes organisations : un modèle incrémental d'intelligence économique.* Doctoral thesis, Université de Toulon et du Var, Laboratoire LePont, Toulon.

Bulinge, F. (2003). *L'intelligence économique comme instrument de développement autonome dans les PMO: Proposition d'un modèle de transfer*. Presented at IERA'2003 [conférence Intelligence économique: recherches et applications], Nancy, France, 14-15 April.

Choo, C. W. (1999). The art of scanning the environment. *Bulletin of the American Society for Information Science*, 25, 21-24.

Choo, C.W. (2001). Environmental scanning as information seeking and organizational learning. [electronic version] *Information Research*, 7, 29 p. http://InformationR.net/ir/7-1/paper112.html

Choudhury, V., & Sampler, J. L. (1997). Information specificity and environmental scanning: An economic perspective. *MIS Quarterly*, 21, 25-53.

CNRC-ICIST. (1999). *Une étude des companies canadiennes de recherche et de développement – Sensibilisation à l'information à valeur concurrentielle et utilisation de cette information dans l'industrie canadienne de la technologie – Rapport de deuxième étape: Entrevue et résultats finaux*. [electronic version] http://www.nrc.ca/cisti/ref/nrccis_f.html

Daft, R. L., Sormunen, J., & Parks, D. (1988). Chief Executive scanning, environmental characteristics, and company performance: An empirical study. *Strategic Management Journal*, 9, 123-139.

Delisle, S., & St-Pierre, J. (2003). An expert diagnosis system for the benchmarking of SMEs' performance. In *Proceedings of the First International Conference on Performance Measures, Benchmarking and Best Practices in the New Economy (Business Excellence '03),* 191-196. Guimaraes, Portugal, 10-13 June.

Eden, C., & Huxman, C. (1996). Action research for the study of organizations. In Clegg, S.R., Hardy, C.,& Nord, W.R (Eds.), *Handbook of Organization Studies.* London: Sage Publications, 526-542.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, 14, 532-550.

Elenkov, D. S. (1997). Strategic uncertainty and environmental scanning: The case for institutional influences on scanning behavior. *Strategic Management Journal*, 18, 287-302.

Fleming, R. S. (1998). Assessing organizational vulnerability to acts of terrorism, *S.A.M. Advanced Management Journal*, 63, 27-32.

Francq, A. (2001). The use of counterintelligence, security, and countermeasures. In Fleisher, C. S. & Blenkhorn , D. L. (Eds.), *Managing Frontiers in Competitive Intelligence*, Westport CT: Quorum Books. 40-50.

Ganesh, U., Miree, C. E., & Prescott, J. (2003). Competitive intelligence field research: moving the field forward by setting a research agenda. *Journal of Competitive Intelligence and Management*, 1, 1-12.

Garg, V. K., Walters, B .A, & Priem, R. L. (2003). Chief Executive scanning emphases, environmentals dynamism, and manufacturing firm performance. *Strategic Management Journal*, 24, 725-744.

Genelot, D. (1999a). Manager dans la complexité (1ère partie [part 1]), *Travail et méthodes*, 546, 5-19.

Genelot, D. (1999b). Manager dans la complexité (2ème partie [part 2]), *Travail et méthodes*, 547, 17-28.

Ghoshal, S. & Kim, S. K. (1986). Building effective intelligence systems for competitive advantage. *Sloan Management Review*, 28 (1), 49-58.

Ghoshal, S., & Westney, D. E. (1991). Organizing competitor analysis systems. *Strategic Management Journal*, 12, 17-31.

Greenwood, D. J., & Levin, M. (1998). *Introduction to Action Research.* Thousand Oaks: Sage Publications.

Hambrick, D. C. (1982). Environmental scanning and organizational strategy. *Strategic Management Journal*, 3, 159-174.

Hult, M., & Lennung, S. (1980). Towards a definition of action research: A note and bibliography. *Journal of Management Studies*, 17, 241-250.

Jacob, R., Julien, P. A., & Raymond, L. (1997). Compétitivité, savoirs stratégiques et innovation: les leviers de l'apprentissage collectif en contexte de réseau. *Gestion – Revue Iinternationale de Gestion*, 22, 93-100.

Julien, P. A., Raymond, L., Jacob, R., & Ramangalahy, C. (1997). Information, stratégies et pratiques de veille technologique dans les PMI. *Systèmes d'information & Management*, 2, 63-83.

Julien, P.A., Raymond, L., Jacob, R.,& Ramangalahy, C. (1999). Types of technological scanning in manufacturing SMEs: An empirical analysis of patterns and determinants. *Entrepreneurship and Regional Development*, 11, 281-300.

Kahaner, L. (1996). *Competitive Intelligence: How to Gather, Analyze, and Use Information to Move Your Business to the Top*. New York: Simon & Schuster.

Larivet, S. (2002). *Les réalités de l'intelligence économique en PME.* Doctoral thesis, Université de Toulon et du Var, Toulon.

Lesca, H. (2003). *Veille Stratégique La Méthode L.E.SCAnning*. Colombelles: Éditions EMS.

Lesca, H., & Raymond, L. (1993). Expérimentation d'un système-expert pour l'évaluation de la veille stratégique dans les PME. *Revue Internationale PME*, 6 (1), 49-65.

Liu, S. (1998). Strategics scanning and interpretation revisiting: Foundations for a software agent support system – Part 1: Understanding the concept and context of strategic scanning. *Industrial Management & Data Systems*, 7, 295-312.

Martinet, B., & Ribault, J. M. (1989). *La veille technologique, concurrentielle et commerciale. Sources, méthodologie, organisation*. Paris: Les Editions d'Organisation.

Miller, J. (Ed.). (2000). *Millennium Intelligence – Understanding and Conducting Competitive Intelligence in the Digital Age*. Medford, NJ: CyberAge Books.

Muhr, T. (1997). *ATLAS/ti Visual Qualitative Data Analysis Management Model Building in Education Research & Business – User's Manual and Reference.* Berlin: Scientific Software Development.

Nolan, J. A., & Quinn, J. F. (2000). Intelligence and security. In J. Miller (Ed.), *Millennium Intelligence*. Medford, NJ: CyberAge Books, 203-224.

Pattakos, A.N. (1997). Keeping company secrets secret, *Competitive Intelligence Review*, 8, 71-78.

Peteraf, M.A. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, 14, 179-191.

Peyrot, M., Childs, N., Van Doren, D., & Allen, K. (2002). An empirically based model of competitor intelligence use. *Journal of Business Research*, 55, 747-758.

Raymond, L., Julien, P.A., & Ramangalahy, C. (2001). Technological scanning by small Canadian manufacturers. *Journal of Small Business Management*, 39(2), 123-138.

Raymond, L., & Lesca, H. (1995). Evaluation and guidance of environmental scanning in SMEs: An expert systems approach. In *Proceedings of the Academy of Business Administration 1995 National Conference,* 539-546. Reno, NV.

Selmer, C. (1998). *Concevoir le tableau de bord.* Paris: Dunod.

Susman, G., & Evered, R. (1978). An assessment of the scientific merits of action research. *Administrative Science Quarterly*, 23, 582-603.

Thomas, J. B., Clark, S. M., & Gioia, D. A. (1993). Strategic sensemaking and organizational performance: Linkages among scanning, interpretation, action, and outcomes. *Academy of Management Journal*, 36, 239-270.

Tsoukas, H., & Shepherd, J. (Eds.). (2004). *Managing the Future: Foresight in the Knowledge Economy*. Oxford: Blackwell Publishing.

Turban, E., & Aronson, J.E. (1998). *Decision Support Systems and Intelligent Systems* (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Vandenbosch, B., & Huff, S. L. (1997). Searching and scanning: How executives obtain information from Executive Information Systems. *MIS Quarterly*, 21(1), 81-107).

Yin, R. K. (1994). *Case Study Research: Design and Methods*, 2nd edition. Thousand Oaks: Sage Publications.

Zahedi, F. (1993). *Intelligent Systems for Business: Expert Systems with Neural Networks.* Belmont: Wadsworth Publishing Company.

Zou, S., & Cavusgil, S. T. (1996). Global strategy: A review and an integrated conceptual framework. *European Journal of Marketing*, 30(1), 52-69.

APPENDIX - QUESTIONNAIRE (EXTRACTS)

Among the following elements of the external environment, circle on a scale of 1 (low) to 5 (high) the level of importance for each element of the organization.

	Low 1 2 3 4 5 High
Technology	1 2 3 4 5
Clients	1 2 3 4 5
Suppliers	1 2 3 4 5
Competitors	1 2 3 4 5
Social context (demography, ecology, political, legal, socio-cultural, economical)	1 2 3 4 5

For each statement regarding ethics of scanning activities, circle the appropriate answer.

Organization have elaborated their own internal guidelines and legal and ethical questions on scanning matters.	No	Yes
Organization follow a code of conduct for scanning activities (e.g. internal, SCIP).	No	Yes
Personnel know the procedures and guidelines regarding legal and ethical questions on scanning matters.	No	Yes

Indicate the importance of your needs for specific information. For each information, circle the appropriate answer.

Information on :	Not Applicable	Not Important 1 2 3 4 5 Very Important
Market and client segmentation	N/A	1 2 3 4 5
Client satisfaction	N/A	1 2 3 4 5
Suppliers	N/A	1 2 3 4 5
Financing sources	N/A	1 2 3 4 5

Indicate the importance of some decisions for your organization. For each decision, circle the appropriate answer.

Decisions regarding:	Not Applicable	Not Important	1	2	3	4	5	Very Important
Mergers and acquisitions	N/A		1	2	3	4	5	
Succession planning	N/A		1	2	3	4	5	
Training	N/A		1	2	3	4	5	
Pricing	N/A		1	2	3	4	5	
Risk Management	N/A		1	2	3	4	5	
Inventory Management	N/A		1	2	3	4	5	

Indicate if your organization use the following source of information. For each source, circle the appropriate answer.

Sources of Informatoin:	Not Applicable	Not Important	1	2	3	4	5	Very Important
Management or advisory board	N/A		1	2	3	4	5	
Friends	N/A		1	2	3	4	5	
Organizatoin personnel	N/A		1	2	3	4	5	
Competitors	N/A		1	2	3	4	5	
Universities, colleges, research centers	N/A		1	2	3	4	5	
Bankers and financial institutions	N/A		1	2	3	4	5	

NB: Questionnaire extracts reproduced with the permission of the author

About the Author

François Brouard
francois_brouard@carleton.ca

François is a faculty member in the Sprott School of Business at Carleton University in Ottawa, where he teaches in accounting and taxation. A bilingual Chartered Accountant, François earned his Doctorate in Business Administration (DBA) from Université du Québec à Trois-Rivières (UQTR). He previously worked as a consultant in training and strategic scanning, a professor at Université du Québec à Hull (UQAH), a project manager for the Professional Education Program of the Quebec Chartered Accountants Order and a lecturer in several universities. He also worked in auditing and tax for an international CA firm (Samson Bélair / Deloitte & Touche). He is involved with many organizations. His research interest includes SME, governance, business transfer, crisis management, social entrepreneurship and professional education in addition to competitive intelligence.

Key Terms

Action Research, Business Intelligence, Competitive Intelligence, Expert Systems, Environmental Scanning, Research Design.