Environmental Scanning : Designing A Collective Learning Process To Track Down Weak Signals

Actes de la 3e Conférence de l'AIS Amérique (Association for Information Systems), Indianapolis, USA, 1997

Sylvie BLANCO and Humbert LESCA
Graduate Business School of Grenoble - CERAG
University Pierre Mendès France, France

Abstract

According to management science, organizations use environmental scanning processes to capture signals announcing major events for their future, even for their survival. Nevertheless, taking into account the nature of information to deal with, recent research highlights potential difficulties for managers to gain access to weak signals. This statement has been empirically validated. Such a problem emphasizes the need for aid to improve environmental scanning efficiency and viability. In this paper, authors suggest a collective learning process for the capture of weak signals. After describing ongoing experimentations and preliminary findings, potential contributions are presented.

Introduction

Environmental scanning can be defined as "the information process through which companies prospectively monitor their environment in order to create opportunities and to reduce their uncertainty" (LESCA, 1994). As a support tool for strategic decision-making, the environmental scanning process (Figure 1) has special features that have to be taken into account by information systems researchers :

- the nature of information which can be assimilated to weak signals (ANSOFF, 1975). They have no intrinsic relevance, cannot be defined in advance (MARCH and FELDMAN, 1981), they are vague and their future course is unclear (ANSOFF, 1990) ;
- the uniqueness of decisions which implies bounded rationality and approximative reasoning (SIMON, 1983) thus limiting the relevance of algorithm-based and expert systems approaches ;
- the cross-functional nature of the process which involves numerous actors and interactions (GOSHAL and KIM, 1986).

Hence, a major task within the process is achieved by environmental scanners who capture weak signals within huge amounts of external raw data. Our purpose is to construct a practical aid for environmental scanners in order to acquire further knowledge in this area. This research relies on the following steps :

- proposal of a collective learning process improving the capture of weak signals ;
- implementation within various organizations to assess both its internal and external validity ;
- interpretation of results to improve our knowledge about weak signals, information relevance and cognitive processes affecting tracking down.

Finally, we come up with recommendations for future research in the field of information systems designed for environmental scanning.

An Emerging Issue

Most authors in strategic management take managers' knowledge of their company' s environment for granted. Nevertheless, recent publications point out difficulties in discerning weak signals within huge amounts of external raw data, suggesting the need for collective learning processes (KOENIG, 1996 ; HUBER, 1991).

So far, this area has been neglected by information systems researchers who mainly relies on IT-based approaches focused on improving data accessibility, sharing and retrieval. Only a few authors specify criteria to identify weak signals but they do not give insights about their implementation and their utility (LESCA, 1996 ; GILAD, 1988). Among specified criteria we retain "information relation to target", "anticipatory nature of information", "significance", "reliability" and "timeliness". Nevertheless, as these criteria are not clearly illustrated, further explanations may be required to conceive a support tool for environmental scanners.

Beyond the theoretical relevance of our topic, empirical observations (Table 1) show that environmental scanners do need training to be able to capture weak signals.

Figure 1 : Environmental Scanning Process

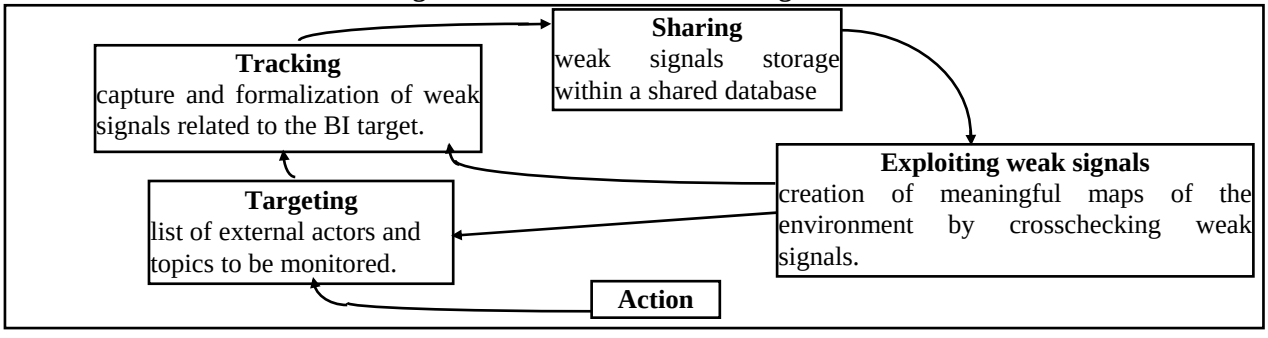


Table 1 : Main results of a survey towards French high technologies companies

Assertions	++	+	-	--
Weak signals detection is a problem we often come up with (66 answers)	38	19	5	4
A support to help managers detect weak signals would be useful (33 answers)	23	10	3	1

Interpretation of the problem : because of the nature of weak signals, environmental scanners rely mostly on their mental representation to capture signals from their environment. Literature on crisis perception widely emphasizes the importance of biases entailed by the use of individual heuristics to select pieces of information (STARBUCK, 1988 ; BILLINGS, 1980 ; KIESLER, 1982 ; SCHWENK, 1984). These biases are linked to managers' cognitive features but also to their organizational and environmental context. Major consequences are neglected, deformed and ignored signals (DAVIS, 1986).

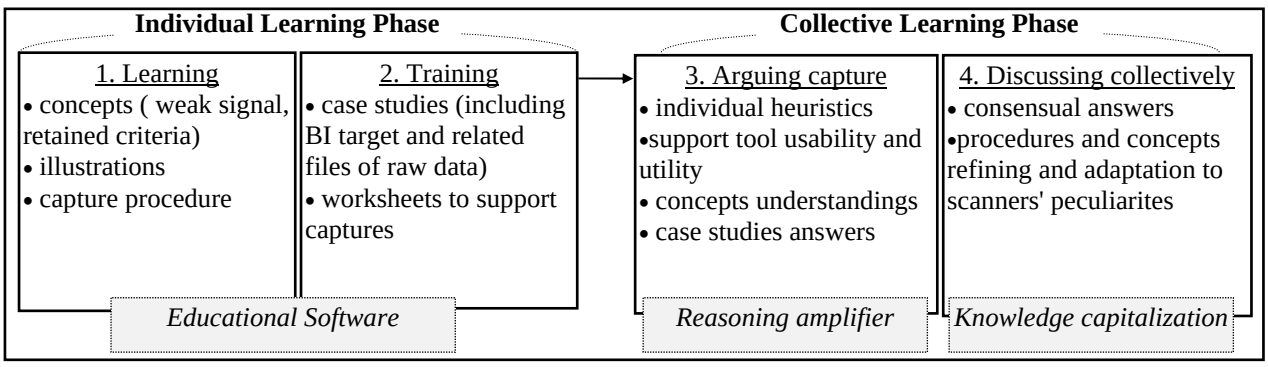
Research hypothesis : Because of weaknesses of the tracking phase, business intelligence (BI) efficiency and viability can be questioned : without support, environmental scanners may be reluctant to track down weak signals ; they may fail to capture them because of their intrinsic nature.
Deduction : a support tool for the capture of weak signals should be well-accepted by scanners. It should improve the tracking phase at both individual and collective levels by reducing biases and by fostering mutual enrichment.
Research question : how to design a collective learning process improving the capture of weak signals and reducing individual biases ?

Draft Of A Collective Learning Process For The Capture of Weak Signals

Previous explanations indicate that a support should include the following features :
- educational support for individual learning ;
- collective learning support to highlight individual differences in the use of criteria and to adapt them to scanners' peculiar situations ;
- reasoning amplifier to understand scanners' individual heuristics ;
- capitalization of experience resulting from practice.

Moreover, the support tool must be simple to be accepted by managers. Considering previous theoretical recommendations, our conceptual model (Figure 2) relies on a collective learning process which includes a criteria-based procedure for the capture of weak signals. This model is implemented during sessions where environmental scanners are brought together for collective work.
The first phase consists in transferring theoretical knowledge included in the educational software to scanners : weak signals are defined as future-oriented information, premises of potentially important changes. An example is related to the hiring of highly specialized engineers by an enterprise 's competitor : it may mean that this competitor is at the beginning of the development of an innovative product. Then the procedure for the capture of weak signals is presented and applied individually to case studies. It contains three steps : selection of signals which relevance depends on both their "relation to target" and "anticipatory nature" ; argumentation of selected signals leading to specifiy potential future events ; assessment of signals quality which depends on their reliability and timeliness. Case studies are designed to validate environmental scanners' understanding.
Then, the second phase is implemented in order to reach a collective learning of the capture of weak signals. Relying on "selection worsheets" that is to say answers given to case studies, individual argues their capture. This step is useful to amplify individual reasoning and to help scanners become aware of their own biases. Then a collective discussion about individual differences takes place. It leads to both consensual answers about case studies and knowledge capitalization about the procedure used to capture weak signals.

Figure 2 : A collective learning process for the capture of weak signals - Conceptual Model



Experimentations And Preliminary Findings

The exploratory nature of this research led us to choose a qualitative methodology, close to action research (GALLIERS, 1992). We aim at both helping practitioners and improving our knowledge about environmental scanning. Support tools we conceive enable us to make interesting observations about complex organizational processes.

Ongoing experimentations are taking place within four companies, all concerned about having an efficient environmental scanning system. Collaborations consist in phases of collective work between which practitioners capitalize experience on a continual basis. First sessions lead us to specify the BI target : it takes about two three-hours sessions. Then, next sessions rely on our support tool and intend to help environmental scanners become collectively effective. Observations are essentially made through collective sessions. Environmental scanners' worksheets, remarks and questions are carefully collected to assess both internal and external validity of our support tool.

Preliminary findings are quite encouraging as for likely contributions of this research. Major findings are :

- the need for a support tool to become aware of existing tracking down weaknesses and to be able to capture weak signals on a daily basis ;
- the usability of the tool which is perceived as pragmatic and in accordance with empirical situations ;
- the utility of the support tool as : a communicative tool fostering mutual enrichment by dialogue ; a training tool to solve difficult situations.

As experimentations are still taking place, there will be further results to present in a few months.

Conclusion

Likely contributions of this research are substantial. Major ones concern : better intelligibility of the environmental scanning process ; further knowledge about concepts such as weak signals and information relevance ; further knowledge about cognitive processes affecting the environmental scanning activity. For instance, identifying a link between a signal and its relation to the BI target often requires a very precise explicitation of the target and a high level of expertise. Hence, we can say that information relevance is here a complex construct we are trying to understand. Moreover, weak signals seem to be of two kinds : the ones are alerting of future events, the others are informing about external actors' resources and potential to make important changes.

However, further experimentations are required to generalize our model, to identify conditions under which it can be used and to improve our prototype.

Research propositions are already emerging from this work. They deal with using this research as a framework for the development of environmental scanning information systems. For instance, the use of intelligent agents to automate some aspects of environmental scanning could lead to rich results.

List of References

AGUILAR F.J. (1967) : "**Scanning the business environment**", McGraw Hill, New York

ACKOFF R.L. (1967): "Management misinformation systems", *Management Science*, (14)4 p147-156

ANSOFF I. (1975) : "Managing strategic surprise by response to weak signals", *California Management Review*, 18(2) p.21-33

ANSOFF I. (1990) : **"Implanting strategic management"**, Prentice Hall International Ed. (UK)

BILLINGS R.S. (1980) : "A model of crisis perception : a theoretical and empirical analysis", *Administrative Science Quarterly*, 25(2), p.300-316

DAVIS G.B. et al. (1986) : **Systèmes d'information pour le management stratégique - les approfondissements**, volume 2, Economica

GALLIERS R.D. (1992) : "Choosing information systems research approaches" in *Information Systems Research - issues, methods and practical guidelines*, R. Galliers Ed.

GOSHAL S., KIM S.K. : "Building effective intelligence systems for competitive scanning", *Sloan Management Review*, (28)1, p.49-58

GILAD B, GILAD T. (1988) : **The business intelligence system : a new tool for competitive advantage**, Amacom

HUBER G.P. (1991) : "Organizational learning : the contributing processes and the literatures", *Organization Science*, (2)1, p.88-115

KIESLER S. (1982) : "Managerial response to changing environments perception on problem-sensing from social cognition", *Administrative Science Quarterly*, vol.27, p.548-570

KOENIG G. (1996) ; "**Management stratégique: paradoxes, interactions et apprentissage** », Paris, Ed Nathan

LESCA H. (1986) : "**Système d'information pour le management stratégique de l'entreprise: l'entreprise intelligente"**, MacGraw Hill

LESCA H. (1996) : "Comment sélectionner les informations de veille stratégique", *Communication AIMS, Lille*

MARCH G.J., FELDMAN M. (1981) : "Information in organizations as signal and symbol", *Administrative Science Quarterly*, vol.26, p.171-186

SCHWENK C.R. (1984) : "Cognitive simplification processes in strategic decision making", *Strategic Management Journal*, vol.5 p111-128

SIMON H. (1983) : **Models of bounded rationality**, Cambridge, Harvard University Press

STARBUCK W.H. (1988) : "Responding to crisis" in QUINN J.B., MINTZBERG H., JAMES R.M., The strategy process, Englewood Cliffs, p. 687-697

WANG P. (1991) : "Filtering strategic environmental information processing using EIS", *System Science, actes de la 27ème conférence de l'IEEE*, vol.3 p.126-134