

Cooperative Knowledge Management for Strategic Decision-making

Jacques Lewkowicz, Institut d'administration des entreprises, Strasbourg

Myriam Lewkowicz, Laboratoire Technologies de la Coopération pour l'Innovation et le Changement
Organisationnel, Université de Technologie de Troyes

ABSTRACT:

After an analysis of the evolution of strategic thought, and a presentation of our conceptual model TRASTRA that represents the strategic trajectory of a firm. We propose then a cooperative Knowledge Management tool, the groupware Memo-net based on the collective problem-solving model DIPA, which permits the memorization of the strategic trajectory, as we show in an experimental example.

Introduction

The main object of this paper is to propose a new system for strategic decision-making, using the following three criteria :

(i) The overall strategy is viewed as a process, (ii) Strategy is examined from the perspective of the ongoing implementation, rather than for its content or ideation, (iii) However, the 'implementation' is considered to be the determining factor, in the process of formulation and determination of the content.

Traditionally, decision-making is interested by Group Decision Support System, meeting rooms, and computer conferencing, which refer to synchronous groupware. If we refer to Bernard Roy problematics (Roy, 1990), they correspond to choice, sort or arrangement. But we can't forget the description of the problem, of its context, of the whole project and the argumentation prior the decision, especially for our case. Indeed, strategic decision-making situations imply long-term consequences of the decisions taken at a given time, and an evaluation of these consequences as the discussions preliminary to the decision-making as well as their implementation take place. To understand a decision-process afterwards and to reuse its solutions, it is then important to memorize all the evoked

solutions and not only the ones that have been selected for the meeting. Our interest focuses then on another kind of groupware, which enables idea generation or issue analysis.

Having established our work in the field of strategic thought evolution and revealed our own conceptual system, we will show how this kind of groupware could help the decision-making in strategic management problems (according to the perspective stated above). We shall use an experimental example.

The Current Situation In The Evolution Of Strategic Thought

It is generally accepted that the concept of strategic thought begins with the LCAG model (Learned and al, 1965). In this model, there is essentially an element of dichotomy : strengths/ weaknesses on one side, and opportunities/ threats on the other. The others works, ultimately, concern an exclusive approach by the market that will be taken up again by Porter (1980, 1985). From this paradigm, the competitive advantage comes through the ability of the enterprise to position itself well relative to its competitors; it provides itself with market power by introducing monopoly factors. The concept of the 'value chain', meaning the investigation of those

practices which specifically are connected to the competitive advantage, is the most important contribution.

The school of strategic thought based on resources and capabilities (Barney, 1990, 1995, 1996, Grant, 1991, Hamel and Prahalad, 1994) is very different since it places the competitive advantage on an idiosyncratic combination of both intangible and tangible assets, which presupposes training. However, the consequence of this training is the concept of evolution in a process of punctuated equilibrium. It would be characterized by an alternation between phases when the business maintains the same orientation as before, and other periods when crises call into question the previous trajectory or path (Tushman and Romanelli, 1985; Adizes, 1988). The evolutionist theory showed from its standpoint how the implementation of a technology can bring in irreversibilities, which will impede the development of businesses who use it (Dosi, 1982).

Punctuated equilibrium assumes the corporation is driven by an autopoietic process (Von Krogh, Roos and Slocum, 1994). In the autopoietic approach, the organization is seen as a complex and interconnected action circuit. In this approach it is essential to identify emerging phenomena, which prompt the organization to self-produce.

Nature of approach	RATIONALIST AND PLANNING	AUTOPOIETIC
CHARACTERISTICS	In terms of the relationship between action and uncertainty	
	Lower uncertainty and complexity of the decision to act by means of : - retrieval of information; - analysis of means related to goals.	Action is, by its nature, random : systematic research of causality fails to eliminate chance
	In terms of the relationship between conception (direction) and implementation	
	Centralized conception of implementation at the operational level	It is essential to identify emerging phenomena, which prompt the organization to self-product.
	In terms of the nature of information used to make the decision	
Normative and scientist approach.	Information is never “merely observed” but built.	

Tableau 1 : Comparison between rationalizing and planning approaches and autopoietic approaches

We place ourselves within this autopoietic current. We seek to determine those concepts that are conducive to strategic decision-making :

- Strategic planning is the result of an exchange of argumentation among the actors
- Strategic planning is not conducted once and for all : it is a process of systematic renewal, independent of any predetermined agenda.

In this context, the exchange of argumentation is constantly renewed and thus nurtures a living process of organizational learning.

However, is this to say that we are abolishing any standard ? As Levinthal and Warglien pointed out (1999), “planning the auto-organization” may seem a paradox. Indeed, a distinction must be made (from the most constraining to the least) between three levels of standards :

1. Standards in the content of strategic maneuvers (BCG (Boston Consulting Group, 1968) or Porter types)
2. Standards in formulation and control procedures (strategic planning and goal-oriented management types)
3. Standards in concepts used for strategic organizational learning (such as that occurring in strategic management, where a solution develops gradually, instead of being a momentary choice between various alternatives, and where another factor is the pattern of relationships among participants whose roles are not interchangeable)

Our work falls into this third category and therefore does not rule out the prospect of auto-organization.

TRASTRA – a conceptual system

In the TRASTRA conceptual system (Lewkowicz, 1992), the development of companies can be regarded in terms of a Strategic Trajectory. To describe it, certain concepts need to be defined first.

Firstly, strategy is a concept that features two elements, namely the strategy itself and the field of strategic forces. (1) Strategy itself is defined as the search for consistency between the perception of external stimuli and the maintenance of control of the future by the company; (2) The field of strategic forces is the structure of the set of forces that are likely to influence strategy (most importantly: customers, suppliers, human resources, real and/or potential competition, finance providers, institutional partners, groups with an impact on public opinion). These forces exhibit two characteristics : (1) their system of goals is only in part controlled by the enterprise; (2) their development in time depends in part on logic that is external to the enterprise.

Secondly, The “know-how” represents the existing and potential competence in the enterprise that is likely to propel it into a field of strategic forces.

And finally, regarding strategic maneuvers, with the due distinction between cost and differentiation maneuvers, the starting principle is to reject the idea that commitments are irreversible. The goal is to acknowledge the conditions for a potential reorientation in view of a different maneuver.

Thus, operations that are likely to contribute to the survival of an enterprise in a given field of competition forces are selected under the constraint of the “passed-down know-how” (available acquired skill) stemming from past decisions. These maneuvers contribute to the establishment of a “searched know-how.” A trajectory is therefore born out of the ongoing tension between these two dimensions of the know-how (see figure 1). The trajectory itself can be divided into “sequences,” each of them characterized by the alternative domination of the searched know-how or the passed-down know-how in the decisions that have a bearing on the choice of maneuver. The know-how, whether searched or passed-down, changes managers’ vision of the field of competition forces the enterprise is plunged into. It is therefore necessary to observe and describe the manner in which this constraint influences decision-making.

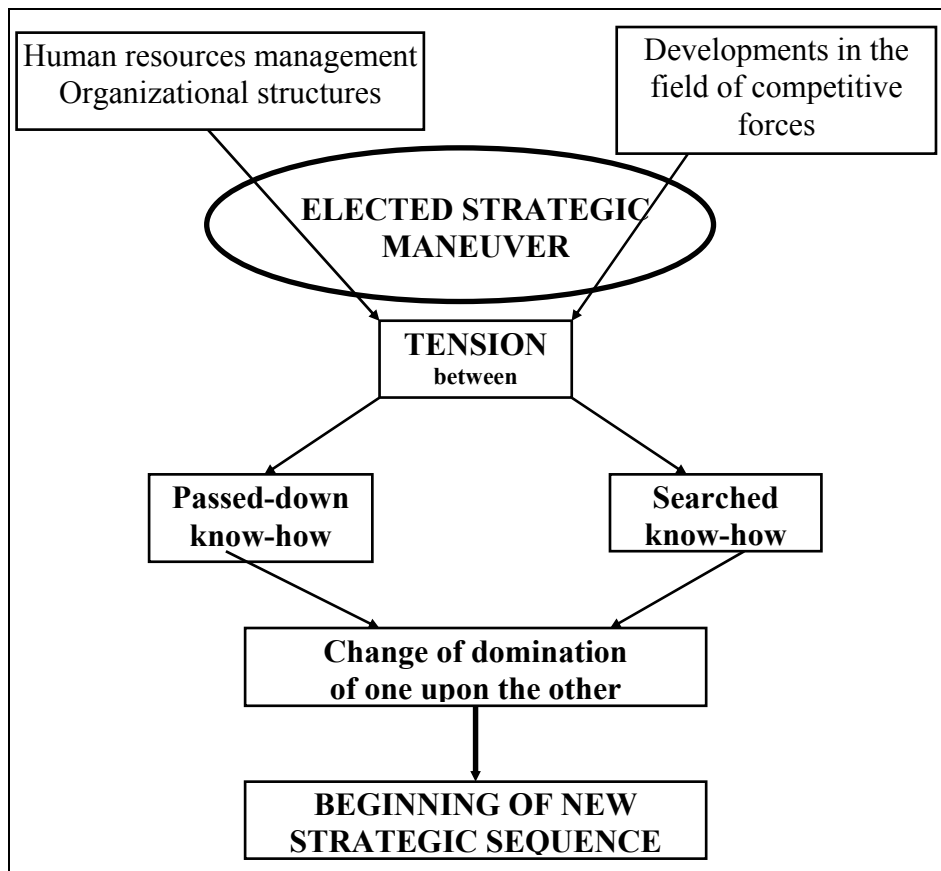


Figure 1 : The jump from one strategic sequence to another

The appeal of this conceptualization resides in the idea that a conscious, articulated and explicit inventory, complete and achievable, of the strategic trajectory pursued by an enterprise, given adequate internal communication, enhances the creativity needed both in devising and implementing new strategic decisions. This statement relies on the following hypothesis: the enhancement resulting from an explicit strategic trajectory originates in the

best mobilization of internal enterprise resources that can be afforded by this explicit character.

Indeed, producing a strategic trajectory is a way of summarizing past developments. Based on this synopsis, a new and more efficient process of knowledge creation can be built, oriented toward the future and aiming to “invent” a new strategy. The fundamental issue is not merely knowing who, why, under what circumstances and when has argued in favour of a particular strategic action. It is to grow awareness of the following phenomenon : each time the enterprise determines to implement a particular plan, it enforces on itself a number of constraints, which are necessarily cumulative. It thus forges a specific identity resulting from tangible and intangible assets : organizational routines (in the sense defined by Levitt and March, 1988), and resource and competence bases it must take into account for future strategic action. This identity can be viewed either as an opportunity given a supply of complementary actions, or as an obstacle to be removed in the future. A “truth” would thus come up from the past trajectory and from the range of future trajectories that are possible in view of the passed-down know-how. Within this hypothesis, each particular tactical decision is more easily merged into the global strategy of an enterprise once this “truth” is acknowledged. It also helps to mobilize

internal resources as it strengthens the cultural and symbolic identity of the organization among its members. The goal, metaphorically speaking, is to transform the “know-how constraint” into a resource, through a better understanding of the origins of this constraint. This calls for a formalized process of strategic elaboration that nurtures a diversity of standpoints among the actors, leading to choices of strategic maneuvers that make up the sequence-based development. This is an area where research in cooperative Knowledge Management can be of help.

Cooperative Knowledge Management for strategic decision-making ?

Cooperative Knowledge Management

One attempt to classify styles of knowledge management (Zacklad, Grunstein, 2001) led to distinctions between three complementary approaches: *Top-down*, where models are used to formalize the knowledge exposed by an expert (knowledge acquisition methods for example), *Bottom-up*, where a corpus is used to build up a thesaurus (such as text or data-mining methods), and *Cooperative* where the hypothesis is that the critical knowledge of organizations results, above all, from a collective

competence that is poorly or badly formalized; the organization of interaction is scrutinized to come up with tools and methods for structured information, allowing better use of exchanged knowledge and facilitating reuse.

In light of our autopoietic stand, we will pursue this cooperative approach.

The development of systematic use of groupware, electronic-mail services, newsgroups, workflow, embodied in Intranets and particularly used in design projects would seem to explain that these tools are indeed considered potential aids for the knowledge capitalization process.

If groupware mediatizes interactions, the best way to locate and protect crucial knowledge exchanged through these nets is to study the interactional structure and to suggest information structuring tools and models for highlighting exchanged knowledge and enabling easier future access. Most of the time in knowledge capitalization projects, there is a lack of quality rather than quantity of information; quality regarding the structure of memorized materials.

Von Krogh, Roos and Slocum (1994) noted that organizational knowledge depends on “language implementation.” It is a limiting approach to conceptualize the organizational language as a static set of syntax, signs and

codes that require consistent usage in time and space. In fact, the structural language of organizational knowledge is always able to create the reformulations it engenders, due to its capacity to phrase increasingly specific analyses. Nevertheless, as noted above, this ever-changing character of organizational knowledge must not impede efforts to formalize its constitution. Indeed, this formalization does not deny the autopoietic character of the constitution. It merely shows the possible shift from its implicit to its explicit nature (Nonaka, 1994).

For our part, we seek to provide certain suggestions as to the formalization of the constitution of organizational language. This constitution assumes a collection of information that can be broadcast by software tools issued from the field of CSCW (Computer-Supported Cooperative Work).

Still, while groupware can provide a record of the search for solutions (some of which are part of strategic management), to achieve effective knowledge management this alone is insufficient. Structured information must be added to the picture, and this can be attained by two different approaches: *a posteriori* where the structure of concepts produced is sought among traces of past interactions, and *a priori* where interactions are enhanced “in real time” so as to facilitate subsequent utilization.

We choose to investigate the latter approach in order to guarantee both an enhanced quality of interactions and an enhanced quality of recorded traces of interactions that allow for easier subsequent use. We also seek to avoid the proliferation of messages that tend to pollute exchanges.

This interest in a priori structuring of problem-solving processes in order to guarantee an exploitation is not recent. Several authors in CSCW (Conklin, 1993, Conklin and Burgess-Yakemovic, 1996) have already expressed wish to switch from a “object-centered paradigm to a “process-centered” paradigm. In the last one, interactions (that is to say questions, decisions and conversations that form the elaboration environment of the objects) would be memorized as well as objects and design process results.

Following this paradigm, our previous works dealt with Design Rationale. This research aims to develop methods and computer-assisted representations that can be used to extract, maintain and reuse the reasons that led to conception decisions (i.e. the goal is to memorize the chain of reasoning as realistically and inexpensively as possible, but also in a structured and clear manner) (McLean and al., 1989). Thus, that which was memorized can be understood and used by an outside person attempting to grasp the chartered object. Given that meetings consist centrally of unveiling and criticizing arguments, the purpose of Design Rationale is to

develop schematic representations that use computers to create, evaluate and modify arguments. The principal hypothesis is that when one devises arguments in this more explicit way, they can be more effectively utilized. In previous papers we have criticized classical Design Rationale methods for being poorly adapted to complex scenarios of collective conception, such as strategic management projects, and proposed a new formalism, ABRICo (Lewkowicz, Zacklad, 1998). In this paper, we present DIPA, an evolution of this formalism thanks to our interpretation of knowledge engineering results on problem-solving methods, and its implementation in a groupware, MEMO-Net.

A groupware for strategic decision-making

DIPA

We have therefore proposed a new model called DIPA (from the French words Données, Interprétations, Propositions, Accord, meaning facts, interpretations, propositions, agreement) (Lewkowicz, Zacklad, 2000) that attempts to formalize the process of strategic decision-making based on organizational learning., and which is characterized by :

- the formalism is inspired by KADS one (Wielinga, Schreiber, Breuker 1991) which pertinence for analysis and modeling of problem-solving methods is admitted;
- the model has two declinations according to the situations that lead the actors to give importance to analysis or synthesis processes (in the sense for example of KADS methodology) (table 2).

This link with problem-solving method is, to our point of view, a natural evolution in our researches of more realistic Design Rationale models that fit to real projects' complexity.

The requirements of our goal to present both analysis and synthesis models to designers' teams that we were confronted to may seem amazing. Actually, it may appear natural at first glance to propose only synthesis models and their variants (routine design, configuration...). But our practical experience of design meetings showed us that analysis activities are also frequent. For example, as soon as a prototype has been developed, its functioning analysis will give important information that will be reintroduced in the process of solutions' generation.

These observations are also in accordance to cognitive ergonomic psychology results that teach us that design situations in the organizational sense in fact generate two distinct phases in activity: solutions' generation and evaluation of these solutions phases (Darses, 1994). The first

corresponds to synthesis problems in KADS sense and is close to design models in this method. The second corresponds to analysis problems whose diagnosis models are the most known.

It is also in accordance with an interpretation (Zacklad, Fontaine, 1996) of the Heuristic Classification of Clancey (Clancey, 1985). These authors expose that analysis and synthesis are based on an heuristic reasoning that constructs a solution that is a justification of the possible causes of a state (analysis) or a justification of the compatibility of an outline with design constraints (synthesis).

The formalism used to describe DIPA is inspired by KADS' one without strictly following these method's conventions on the way to represent inference structure (figure 2).

Within the DIPA model, reasoning unfolds in three major stages :

1. In the first stage, the problem is described and data are collected, viewed as symptoms in analysis situations- or as needs in synthesis situations
2. The second stage uses input data to find a matching interpretation that acts as possible cause in analysis situations or as a functional solution in synthesis situations

- The third stage, implementation, uses the interpretation (cause or functionality) to devise a plan that serves as a reparation suppressing the causes of the symptom (analysis) or as a means consistent with the expressed functionality (synthesis)

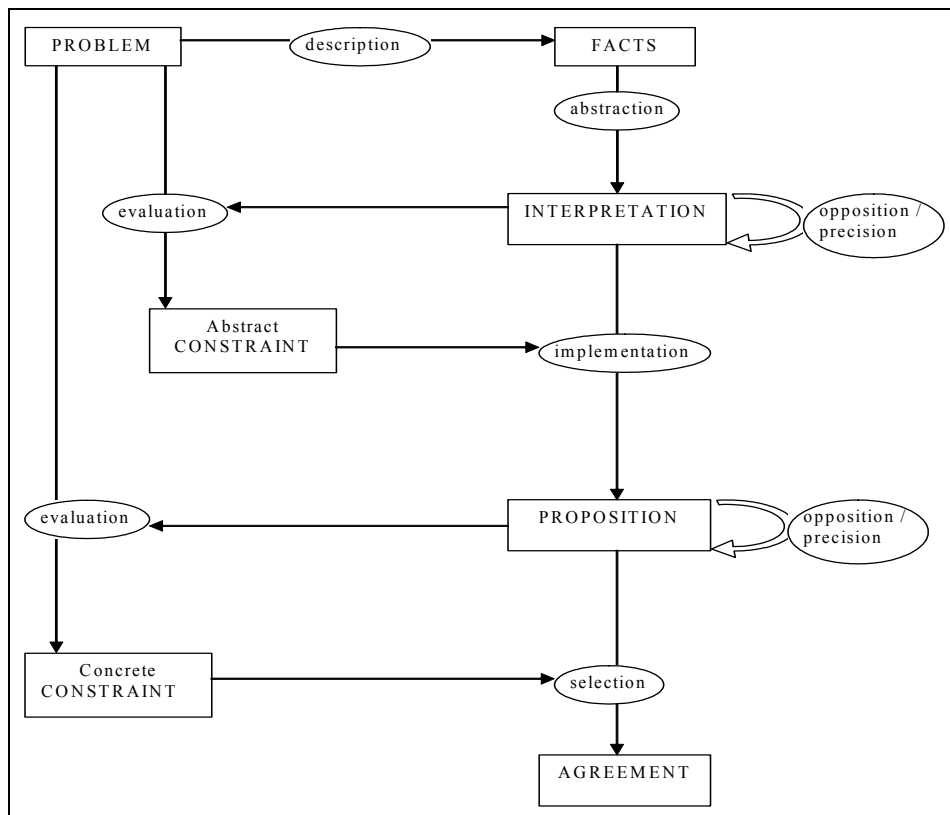


Figure 2 : DIPA, a heuristic meta-model of reasoning and conception for analysis and synthesis

DIPA	DIPA synthesis	DIPA analysis
Problem	Goal	Malfunction
Input	Need	Symptom
Interpretation	Functionality	Cause
Abstract constraint	Abstract constraint	Abstract constraint
Plan	Means	Reparation
Concrete constraint	Concrete constraint	Concrete constraint
Approval	Choice	Choice

Table 2 : Implementation of the meta-model for synthesis (conception module in MEMO-Net) and analysis (diagnostic module in MEMO-Net)

The use of Memo-net for strategic decision-making – an experimental example

We have implemented the DIPA method to build a groupware product: MEMO-Net (Lewkowicz, Zacklad, 2000). This software tool comprises two modules, one for the synthesis stages (referred to as “design” in the software interface), and one for analysis stages (“diagnosis” in the interface). It allows a group to deal with issues that come up in the process of strategic planning by alternating the two activities in a cooperative way. Our vision is that strategic planning scenarios encompass two types of activities : one generating solutions in the form of strategic maneuvers, and another evaluating these solutions as a diagnosis of the strategic situation. Structured exchange allows users to control the decision making process and organize

the principal arguments in a manner that improves their traceability and capitalization.

In the diagnostic module, the actors of the project group identify a malfunction and describe the symptoms, causes and reparations. In the conception module, once a goal is set forth, actors describe the needs, functionalities and means. In either situation, they can describe constraints or submit proposals to choose from. In this case, each user can input his opinion on the proposal and the person in charge can determine, in view of these opinions, whether the choice is final. Exchanges can be retrieved in chronological order or rated by concept name, author name, their role and services. Users contribute to the process by clicking on screen buttons and creating the appropriate records.

For Mintzberg (1994), separating the production of strategy from its implementation is absurd. In fact, only the implementation of a strategy truly reveals its strength and weaknesses. The example we will present here is therefore deliberately related to the implementation of strategy within the autopoietic approach we have elected as our own.

The company where we have conducted our experiment is in the metallurgical industry. More specifically, it manufactures metal joints for

the oil and nuclear industries. It also has a mechanics and boiler section, and markets its products worldwide. This company, in the status of cooperative, was created in the course of 1980's following a bankruptcy. If a lot of cooperative companies of this type were created then disappeared in the years who followed, in this time, this company owed its longevity to its specific skills. These are given evidence notably by markets connected to the French nuclear industry, on which the company intervened successfully, on very numerous occasions. It is so about an organization provided with a power steering beneficiary of a very strong legitimacy, moreover regularly verified during general assemblies.

The session of the board of directors the data of which served as base in this evaluation, revealed a problem : the need of reorganization of premises consecutive to a change of strategic sequence. The company is indeed in the course of evolution, from a step where technological skills essentially dominated, towards a step where asserts themselves the administrative and commercial competences. The latter take henceforth a crucial part in the implementation of the competitive operations of the company.

This session began a process which led to a meeting of the General Assembly, which decided on the construction of new buildings, with all the implied long-term consequences, that it is in financial subject or in priorities

of use of the new premises. The question more exactly discussed concerns a commercial employee (represented by “B” afterward) whose work is disrupted, what decreases its efficiency. During the debate, we distinguished the alternation of two phases :

- The diagnosis of the problem of B, during which four decisions are taken, three of the organizational order and one which concerns the physical movement of B,
- The design of the new place of the office of B : by modifying the existing or by building new things.

Further to an informal contact with the leaders of the company, we obtained the license to attend a board of directors, which we recorded in its entirety in passive observation. We interpreted then this corpus by identifying the stages (diagnosis and design) and the various categories of intervention (goal, facts, interpretations, propositions, constraints, approvals). We represented then the result of this interpretation in Memo-net, then we confronted these representations of the argumentation to the members of the board to collect their opinions on the exhaustiveness and the coherence of the result.

We will firstly present the diagnosis phase (figure 2). One can notice, for example, by observing this process, that a possible cause of the dispersal of the work from the commercial employee is the place of its workstation. Another possible cause is connected to the fact that B concentrates numerous skills. It is then suggested that he could teach the rest of the staff.

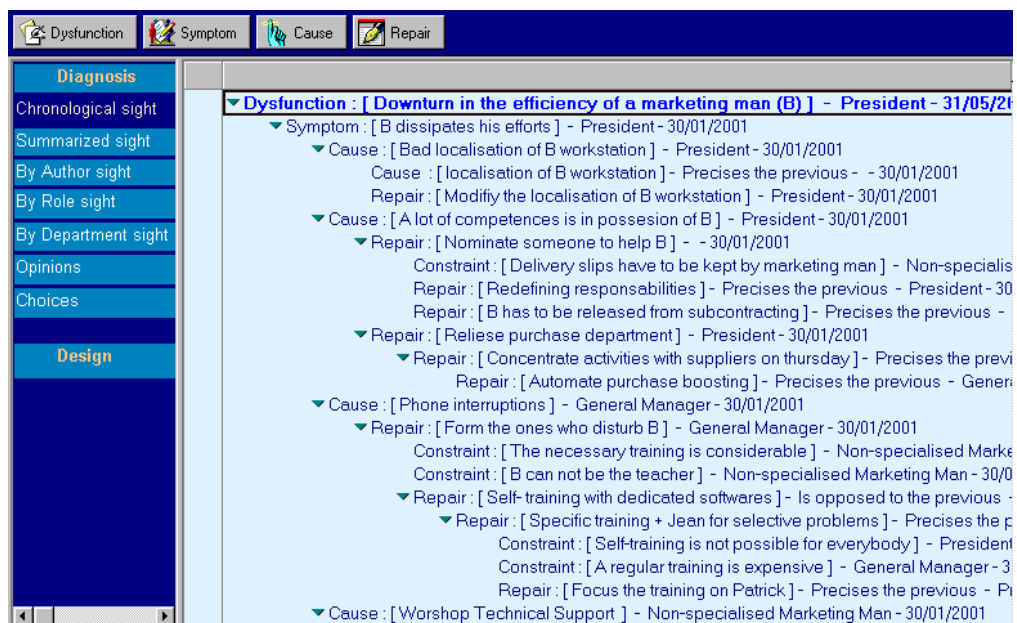


Figure 2 : Unfolded chronological sight of diagnosis phase

We present then the design phase (figure 3), where one can observe the argumentative process about the modification of a workstation. Two average means are proposed to enlarge premises : a modification of the existing or a new construction. Several constraints are evoked, as the fact that the company is not owner of premises.

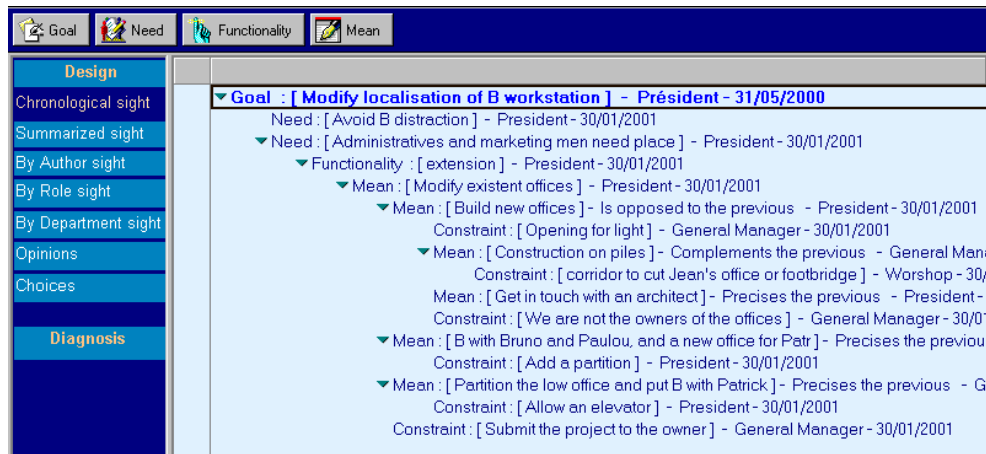


Figure 3 : Unfolded chronological sight of design phase

In fact, this exchange appeared as a process of making an emerging strategic decision because in the subsequent weeks the company determined to significantly broaden its plant space, a decision that not only comprised the one in question but also exceeded it. It really was a strategic decision because it involved the purchase of additional land, financed by a long-term loan.

The modelling of the argumentation processes during the board of directors was presented to the actors. The main director considers that the exchanged information was faithfully retranscribed, without division because of the tree presentation which allows to establish a synthesis at first glance. It allowed the general manager to understand the potential utility of a tool mediatizing this representation. This company is so in the course of experiment of Memo-net, after the persons called to deliberate were formed.

They use Memo-net in an asynchronous way, before the boards, to prepare the debates. We are not able to present here the results of this experiment, because it is only its starting up.

Discussion

Regardless of the fact that the experiment must be extended to other fields for more validity, two other new steps are required to achieve our goal of building a tool for strategic decision preparation. The first attempts to verify the capability of DIPA and Memo-net to be used by the participants of strategic decision themselves in real time (during the time of argumentation exchange). The second attempts to measure what degree of satisfaction is determined by using DIPA and Memo-net in the production of a strategic decision.

References

Adizes, I., *Corporate Life Cycles: How And Why Corporation Grow And Die And What To Do About It*, Prentice -Hall, Inc., Englewood Cliffs, New Jersey, 1988.

Barney, J. B., Firm Resources and Sustained Competitive Advantage, *Journal of Management*, 1, pp. 99-120, 1990.

Barney, J. B. (1995) Looking Inside for Competitive Advantage, *Academy of Management Executive*, 4, pp. 49-61.

Barney, J. B. (1996) The Resource-Based Theory of the Firm, *Organization Science*, 5, September-October, pp. 469.

Boston Consulting Group, Perspectives on experience /by the staff of the Boston Consulting Group, Inc, 1968.

Clancey, W.J. (1985). Heuristic Classification, *Artificial Intelligence Journal*, 27, pp. 289-350.

Conklin, E.J. (1993). Capturing Organizational Memory, in Baecker, R. M. (Ed.) Readings in Groupware and Computer-Supported Cooperative Work, Morgan Kaufmann Publishers, Inc.

Conklin, E.J. and Burgess-Yakemovic, KC. (1996). A Process-Oriented Approach to Design Rationale, in Moran, T. P. and Carroll, J. M. (Ed.) *Design Rationale Concepts, Techniques and Use*, Lawrence Erlbaum Associates.

Darses, F. (1994). *Gestion des contraintes dans la résolution des problèmes de conception*. Thèse de doctorat, Spécialité Psychologie Cognitive. Paris, Université de Paris 8.

Dosi, G. (1982) Technological Paradigms and Technological Trajectories: A Suggested Interpretation of the Determinants and Directions of Technical Change», *Research Policy*, 11, pp. 147-162

Grant, R. M. (1991) The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation, *California Management Review*, Spring, pp. 114-135.

Hamel G., Prahalad, C. K. (1994) *Competing for the Future*, Harvard Business School Press, Boston.

Learned, E., P. [and others], *Business policy: text and cases*, Homewood, Ill : R. D. Irwin, 1965.

Levinthal, D. A. and M. Warglien (1999). 'Landscape design: Designing for local action in complex worlds', *Organization Science*, 10, pp. 342–357.

Levitt, B., March, J. (1988). Organizational learning. *Annual Review of Sociology*, n°14, pp. 319-340.

Lewkowicz, J. (1992) Comment mieux intégrer la technologie dans la stratégie d'entreprise? *Revue Française de gestion*, no. 89

Lewkowicz, M., Zacklad, M. (1998) *A Formalism For The Rationalization Of Decision-Making Processes In Complex Collective Design Situations*, in Proceedings of COOP, Cannes.

Lewkowicz, M., Zacklad, M., (2000). A guide through the construction of a groupware for efficient knowledge management, in Dieng, R., Giboin, A., Karsenty, L., De Michelis, G. (Eds) *Designing Cooperative Systems The Use of Theories and Models Proceedings of the 5th Int. Conference on the Design of Cooperative Systems COOP'2000*, Sophia-Antipolis, France, May 23-26, 2000, IOS Press Volume 58 2000.

Mac Lean, A., Young R.M., Moran .P. (1989) *Design Rationale: The Argument Beyond The Artefact*, in Proceedings of CHI '89, Austin Texas, April 30-May 4 1989 ACM Press,

Mintzberg, H. (1994) *The Rise And Fall Of Strategic Planning*, Free Press, New York.

Nonaka, I. (1994) A Dynamic Theory Of Organizational Knowledge Creation, *Organization science*, 5:1, pp. 14-37.

Porter, M.E. (1980) *Competitive Strategy: Techniques for Analysing Industries and Competitors*, Free Press, New York.

Porter, M.E. (1985) *Competitive Advantage: Creating and Sustaining Superior Performance*, Free Press, New York.

Roy B.,(1990) , *Decision Aid and Decision Making*,EJOR, Vol. 45, pp 324-331

Tushman, M., Romanelli, E. (1985) *Organizational Evolution: A Metamorphosis Model Of Convergence And Reorientation*, in Cummings, L.L., Staw, B.M. (ed.) *Research in organizational behavior*, 7, pp. 171-222, JAI Press, Greenwich Ct.

Von Krogh, G., Roos, J., Slocum, K. (1994) An Essay On Corporate Epistemology, *Strategic Management Journal*, 15, pp. 53-71.

Wielinga, B., Schreiber, G., Breuker, J. (1991). *KADS : A modelling approach to knowledge engineering*. Esprit Project P5248 KADS-II-KADSII/T1.1/PP/Uva/008/1.0.

Zacklad, M., Fontaine, D. (1996). L'acquisition des connaissances classificatoires pour les systèmes à bases de connaissances, in Aussenac-Gilles, N., Laublet, P., Reynaud, C. (Eds.) *Acquisition et Ingenierie des Connaissances*, Cepadues-Editions

Zacklad, M., Grundstein, M. (Eds) (2001). *Système d'Information pour la capitalisation des connaissances : tendances récentes et approches industrielles*, Hermès Science Europe LTD, Stanmore.

Jacques Lewkowicz is post graduate from université de Paris I (Pantbéon-Sorbonne) and has a doctorate in business administration from Université d'Auvergne (Clermont- Ferrand). He can be reached at Institut d'administration des entreprises, 61, avenue de la Forêt Noire, 67085 Strasbourg Cedex, France, e-mail: jacques.lewkowicz@urs.u-strasbg.fr

Myriam Lewkowicz is postgraduate from Université de Paris IX (Dauphine) and has a doctorate in computer science from Université de Paris VI (Jussieu). She can be reached at Université de Technologie de Troyes 12 rue Marie Curie BP 2060 10010 Troyes Cedex ; France e-mail : Myriam.lewkowicz@utt.fr