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BUSINESS INTELLIGENCE : CREATING COLLECTIVE INTELLIGENCE WITHIN THE COMPANY

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Business intelligence (Environmental Business Scanning Intelligence) is the informational process used by organization to detect and analyze first signals announcing important events for its future, even for its survival. Business intelligence aim at enabling organization to reduce uncertainty, notably by anticipating breakage in both socio-economic and technologic environments.
Taking into account the nature of the information to deal with, Business intelligence has a great deal in common with the signal process. Business intelligence is then a " strategic decision process support tool " as termed by Laroche and Nioche (1994).

According to Simon decision-making process model, Business intelligence is located in the "intelligence" stage of organization environment. It is therefore a stage for information seeking, for interpretation and for " vision building ".

This article tries to understand the process of Business Intelligence. We believe that this attempt is valuable, especially when we consider the actual paradoxal situation of Business intelligence in French organizations.

I- Paradox in business intelligence

I - 1. Paradox between theory and reality

There's a long way from theory to practice. According to management theory, managers know and evaluate changes in their socio-economic environment and jump at opportunities. In practice, managers use not much information having anticipatory nature. This gap between theory and practice rooted of the works of our research team.

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I - 2. Interpretation of the paradox

The following cases illustrates and allows to explain the paradox (Lesca, 1986).

A manager has to take a decision or to solve a problem. He tries to find useful information. In this case, there's a need for information and this need is relatively easy to word. The manager is an information seeker. If he get some, he will utilize them. The decision to take or the problem to solve is located upward the business intelligence information collect process.

[Some colleagues of the manager give him pieces of information they got and which, they think, could have anticipatory nature. However, such information is not supposed to be part of the immediate worries of the manager. He don't need them immediately and consequently, leaves them aside for a moment.

Business intelligence information is upward the use that could be done of them. They will probably never be utilized afterwards. ~~It is the " closet problem " discussed in the above testimonies. Our study domain concern this latter case~~. We believe it explains a great part of the paradox we have just mentioned.

According to observations and testimonies collected during our previous researches, this situation occurs frequently, both in the small and medium industries and large companies. In fact, every organizations collect information anyhow and from many or few, and more or less specialized, tracking people. Information don't come up from itself just at the exact time we need it. The transmission of interesting information or signals forerunning changes, is totally beyond our manager's expectations and immediate preoccupation. He has to know how to catch it when the case arises and to use them later, at the right moment. But, this involves to be well organized to be able to catch information and not to loose it.]

I - 3. Assumptions, inference and purpose of this paper

It's probably because there's no immediate use for information brought by collaborators that some managers are not interested in business intelligence. They would rather prefer to receive information from their environment just at the time they need it. They don't understand there's necessarily a time lag between the moment of the capture and the moment of the use of information with anticipatory nature. During this delay, information has to be gathered in a right way.

Assumption
Because they don't perceive obvious significance from gathered pieces of information (between the time of their capture and the moment of their potential utilization), many managers don't feel tempted to utilize and to take advantage of them. These pieces of information don't " speak " to them. When there's no urgent problem to workout, they don't know what to do with such information and don't know neither how to " create a vision " that could engender reflection and strategic action. The time required to

examine them is evaluated as wasted time because not creating something useful. They feel that such information is dead weight and forget it easily.

[*Inference*   ~~ale~~
If our assumption~~s~~ is right, there should be general acceptance, from good many managers, if they get a working method to " make speaking " information and to produce significance, individually or collectively into the organization, even if at that moment, there's no rush to solve a problem or to take a decision.

Aim of this paper
The following parts deal with the foundation of a method aiming at producing, from signals forerunners of changes, helpful knowledge to lead manager's actions. The next step will be to make sure that managers effectively perceive this method really helpful and that it approximates to their natural thinking process.]

II.- Draft of a method to produce collective intelligence from sparse pieces of information

According to Gorry and Scott-Morton (1971), one of the missing constituent of information systems is their capability to show models which fits with the way manager see his organization and it's environment. The understanding of manager's cognitive process is supposed to be an essential condition preceding the conception of an efficient decision support system. We do agree with this view point and take it as one of our assumptions. Consequently, we admit that progress could be done for business intelligence information handling, if we utilize human cognitive process.

Many authors (Miller, 56; Mintzberg and al, 76; Goldhar, 76; Taggart and Robbey, 81) have been attempt to represent human cognitive process. Two main ideas are emerging from their models : the regrouping of information and the creation of links between pieces of information. In the following, we will argue both ideas.

II - 1. Regrouping of pieces of information

McKenney and Keen (1974) suggested a model to describe the way people structure information (either oral or visual), captured in their environment. The model propose that information utilize a regrouping process. But how is done the regrouping? This aspect has to be precise.

Weber (1984) also analyzed the human cognitive process relating to regrouping. When faced to ambiguous situations, people try to build a meaningful representation of their environment by placing side by side and regrouping their pieces of information. The regrouping method has also here to be precise.

Also, there comes the necessity to formulate assignment criteria to be able, under everyday pressure, to make easy classification of new pieces of information, in

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existing groups or new one. And this criteria must be not only for individual use but also explicit and communicable to others, to create collective intelligence.

Two criteria have been mentioned in literature.

Similarity criterion :
Pieces of information can be grouped by similarity. We try to connect together good likeness information whether they express the same idea or concern the same theme. Kawakita-Jiro (in Hogarth, 1980) use this criterion. Each piece of information is assigned to the group with which there is a link. Afterwards, user find himself in front of small groups of information which can be handled separately.

According to Moles (1990), when somebody is confronted with a " sketchy set of ill-matched elements ", he tries to find similarity between these elements. Faced with a new piece of information, he tries to find similarity with an existing group (Conklin, 1987). Behling and al. (1980), suggested a method to connect a piece of information to a regrouping. Pieces of information are assigned to a group if they have common characteristic with this group. So, every new piece of information, either perceived or received, is analyzed. After this, it will be whether rejected or assigned to a group. Inside the box illustrating the regrouping of pieces of information, they are placed side by side an non-ordered, at least for beginning (Weber, 1984).

Proximity criterion :
This criterion is less restrictive than the first one, but also more approximate. A way to assign pieces of information to an existing group is to use the proximity criterion. " Proximity " means that information look close to the theme which it will be connected to. The recognition of a common characteristic is a proximity criterion. Pieces of information are relatively different one from another, but individual can bring them closer by using common point of view. According to Moles (1990), this assignment can be done easily because coming naturally :facing a new piece of information, he put it closer to the appropriate existing group because he feels its proximity. This regrouping is subjective. It is probably done when taking into account the major preoccupation of the individual. But, while processing the most familiar signals, people are not careful enough about other signals announcing changes (Barr and al. 1992).

Then there is a risk of bias arising from subjectivity. This risk is reduced if the regrouping originate from collaborative work.

After this first step, pieces of information are put together, side by side, and non-ordered at least for beginning. But this step is not sufficient to produce good meaning. This is the reason why a second stage of the process pay attention on the structure process into each information group. This is what we will discuss now.

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II - 2. Connecting pieces of information into each group.

A next step can be done while creating connections between pieces of information into the same regrouping.

Kawakita-Jiro proposed a creativity technique to build significant structure, from non interconnected pieces of information at least, at the moment they are gathered (Hogarth, 1980). The basic idea of the technique is to interconnect pieces of information of each regrouping. He specifies that these pieces of information has to be compared one to the others and matched to produce significant construct for user.

Lee and Lai (1991), proposed seven types of links : logically implies link, support link, denies link, qualifies link, presupposes link, object to link and answer link. We will deal with some of these links and call them by their most common name.

<u>Causality link and influence link.</u>

Bougon and al. (1977), showed with an observation study, that individual use causality connection to class knowledge in his mind. Information A is connected to information B if A is the cause of B. In fact, causality relation is the one mostly used by authors (Barr and al., 1992) (Narayan and al., 1990) for example. (Laroche and Nioche, 1994).

Critical : Causality relations are very interesting because really meaningful. But it assume the problem already resolve, supposing that the set of pieces of information to be used in causality chain have been identified. It's not the case in the strategic observance domain. In fact :
- we just have few of the pieces of information constituting the chain (incomplete information);
- pieces of information are not ordered : a cause without it's effects or an effect without it's   causes.

Then we can consider the causality relation as an ideal to achieve. This ideal is probably inaccessible especially in a short time, under daily pressure and also with restricted means. We have then to otherwise and, to do so, we could consider more " soft " connections which would be more usable in this case.

This fits with relations named " influence relation " (Roos and Hall, 1980). In this case, information A is connected to information B if A has influence on B, without considering A as the single cause of B and without requiring A to be the direct cause of B. This type of relation has been utilized many times (Lesca, 1989).
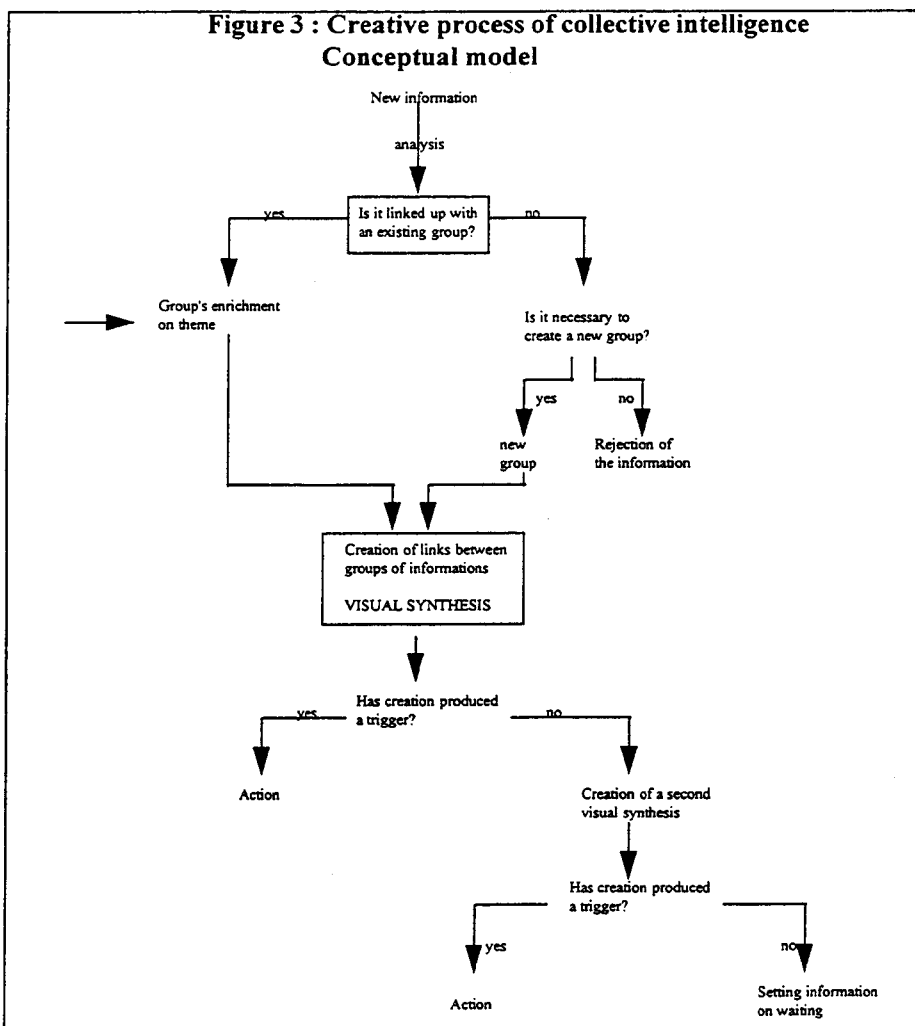
<u>" Object to " relation.</u>

Faced to inaccurate and ambiguous data, when not able to make connections using causality or influence relations, individual can try to put them into opposition. This dialectical argument has been analyzed by theorists of the psychology domain.

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They stated that people understand better the opposition , the difference between two concepts, than each of them evaluate separately (Moles, 1990). Lee and Lai (1991) proposed this type of relation considering it is a good way to pull out significance from raw information. The software Sibyl utilize opposition relation to support group decision (Lee, 1990). In business intelligence domain, the process deal with signals forerunners of changes and then the relation of opposition could be used to bring out inconsistency or incoherency between pieces of information included in a regrouping.

Critical : whatever the kind of link we choose to create signification from sparse pieces of information, a ticklish problem has to be solved : how to set up the choice of a link between two pieces of information?

III.- Skeleton and set up of the suggested method

We can now sum up our knowledge and integrate it in a method to create collective intelligence of the organization's environment. Of course, it is just a skeleton (framework)- see figure 3- until the moment many problems cited above, will be solved. Meanwhile, this method, as it is now, has already been utilized in many organizations for collaborative works.

Figure 3 : Creative process of collective intelligence
Conceptual model

New information

analysis

Is it linked up with an existing group?

yes — no

Group's enrichment on theme

Is it necessary to create a new group?

yes — no

new group — Rejection of the information

Creation of links between groups of informations

VISUAL SYNTHESIS

Has creation produced a trigger?

yes — no

Action — Creation of a second visual synthesis

Has creation produced a trigger?

yes — no

Action — Setting information on waiting

1. Collective intelligence.

The suggested method takes full meaning when utilized for collective use into the organization. Efforts to make clear steps, aiming to create collective signification from sparse pieces of information, become very important in the context of supporting workgroup. Then, the method we suggest is an objective support, open to criticism and perfectible. The creation of collective vision support is really the main goal but is not the only one.

2. Remedying to individual cognitive divergence

Another objective is the reduction of individuals divergence. As a matter of fact, when individuals faced alone to signals anticipating changes (business intelligence information), he has to do a good reading of them. As mentioned above, these signals are fragmentary, incomplete, ambiguous, and so on. This interpretation will be fully subjective and will be led by individual's cognitive preference (Laroche and Nioche, 1994). It will be subject to the influence of each individual's specific experiences. The creation of a collective vision, on the other hand, will notably reduce individual's cognitive divergence and subjectivity.

3. Raising up of a consensus and collective action

The creation of a collectively accepted vision and the reduction of subjectivity and cognitive divergence, can be considered at the same time as goals and means. They are means to raise up collective action quite agreed by members, aiming to succeed in adapting the organization to it's moving environment. It's preferable that everybody share the same vision of the moving situation and that an agreement emerges about efforts to put forth.

4. Application domain and first examination

As it is now, this method has been used for examination purpose. It is part of " research-action " process. It has been used many times to animate and to structure collective thought aiming to interpret some business intelligence information, and to produce assumptions on what will probably occur. The number of people who took part to each workgoup varied from four to eight. It has been applied in both small and medium industries and large companies. Result shows general acceptance of the method which seems close to the natural intuitive approach of good many people we met. But some other cases will help us to highlight various gaps that will have to be analyzed subsequently. Then we have good hope to be able to play a great part in exploring the process of collective representations building, from weak signals anticipating changes.The skeleton of method can be consider as the first prototype to be developed further, taking into account practical experiences and new discoveries coming from future publications in various scientific domains.

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