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A social approach of the individual decision making process by the search for a dominance structure: risk management by a business process manager

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ABSTRACT. We focus on the way a business process manager treats the risks affecting a supervised business process. A descriptive model of the individual decision making process is proposed. This model mainly results from the integration, in the model of decision making by the search for a dominance structure, of the social aspect of the business process manager activity. In order to do this, we adopt a constructive and constructivist approach concerning the definition by the business process manager of his representation of the risk treatment strategy that has to be implemented.

RÉSUMÉ. Nous nous intéressons à la manière dont le responsable d'un processus métier traite les risques affectant un processus métier non complètement automatisé. Un modèle descriptif du processus individuel de décision est proposé. Il résulte principalement de l'intégration, dans le modèle de décision basé sur la recherche d'une structure de dominance, de la composante sociale de l'activité d'un responsable de processus. Nous adoptons pour cela une approche constructive et constructiviste concernant la définition par le responsable de processus de sa représentation de la stratégie de traitement du risque à mettre en œuvre.

KEYWORDS: Risk Management, Multicriteria Decision Making, Decision Process, Dominance Structure, Constructive Approach

MOTS-CLÉS : Management des risques, Décision multicritère, Processus décisionnel, Structure de dominance, Approche constructive

1. Introduction

In this paper, we address the problem of designing a strategy to mitigate a risk in a supervised business process. Reasons for risk mitigating can come from the discovery of a new risk, due to previous incomplete risk assessments or due to activity changes. It also can come from the acquisition of new information implying the management of a known risk. Our aim is to provide a decision support system to a business process manager (BPM), that takes into account organizational aspects to allow him to more accurately control his risk management task, risk treatments and therefore the business process evolution. In order to reach this goal, we define here the descriptive model of the BPM decision making process. This model will allow us to specify which kind of support can be provided to the BPM. In particular, the present model takes care of the multicriteria and social aspects of such an organisational problem.

In section 2, we give a description of the BPM's activity. The section 3 focuses on the social dimension of the BPM's risk management task. The section 4 presents a model of individual decision making corresponding to our hypothesis concerning the way the BPM treats information in order to decide. The last section presents the adaptations of this decision making model in order to take care of all of our hypotheses.

2. The business process manager's activity

We first introduce our hypotheses on the BPM's activity. We then introduce three main aspects we have to take into account in order to understand the way the BPM manages risks.

2.1. Managing relationship between people and managing the business process model

The role of the BPM is to ensure the quality of the operations of his business process according to fixed business process objectives. In order to reach this goal, the BPM has to take into account various people involved in the part of the organization activity he is responsible of. These people can be for example suppliers, customers, employees of the organization or seniors in rank. All of them express specific needs, wishes, expectations, constraints, etc., that the BPM has to take care of in order to ensure the right operation of the organization activity he is responsible of. We suppose that the resulting structure of the organization activity is described in a business process model that the BPM must maintain up to date. This business process model describes the activities of the business process and the objectives, occurrence conditions, resources and employees' roles associated to each

activity, or at least to the whole business process. So, the complexity of his task lies in the need to influence course of things while giving the possibility for the business process actors to initiate new courses of action during process occurrences. This task implies for the BPM to take into account technical and social aspects.

The BPM's task can be related to the crew management task of cockpit commanders. Ginnett notices that commanders appointed as excellent leaders by crews and inspectors of aviation spend more time structuring the team (Ginnett, 1993). During this, they devote much time to the unusual tasks, and little time on routine tasks that the crew may be confronted with. They open the group to actors who play a role in his performance, not only the cockpit crew. They clearly explain that each member of the crew must contribute to the safety of all and support effective communication and cooperation. They can play all types of leadership behaviours, from a democratic mode during consultations to an autocratic style during operating phases. Thus, we consider that a BPM should be helped in order to express such leadership abilities.

2.2. Dealing with risk

As Slovic notices, in the modern world we can deal with risk in three fundamental ways: risk as feeling, risk as analysis and risk as politics (Slovic, 2002).

The first way deals with human factors involved in the emotional and automated schematic cognitive treatment level and in biases generated by wrong uses of information processing heuristics (Kahneman *et al.*, 1974).

The second way deals with human factors involved in the rationalizing analytical cognitive treatment level and with the use of risk assessment methodologies, models or theories. We have pointed out the fact that faced with various risks, the BPM may use various existing methods adapted for specific types of risk (Uguen *et al.*, 2007).

The third way deals with the fact that, faced with risk representation in complex systems, experts can provide conflicting points of view. Communication and negotiation are the central aspect of this approach. The need to consider risk as politics is particularly true when dealing with major risks (Peretti-Watel, 2003). In the next section, we extend this third way to all risks perceived by the BPM.

So, our problematic addresses the three ways distinguished by Slovic. We focus on a unique individual who has specific abilities and knowledge, can use various tools to assess a situation and is politically, or generally speaking, socially situated. In particular we are interested in the problem of knowledge transfer between two activities. Indeed, on the one hand we consider the BPM as an expert of past encountered risks and problems that lead to the actual business process model. On the other hand, the BPM identifies the need to focus on one risk. He therefore points out his difficulty to manage the new or too complex situation involved by the

identification of this risk. So, he points out his need to change his mental representation of the situation, to be able to design an efficient strategy to treat this risk.

As a result, we have been interested in designing a descriptive model of individual decision making that would take care of the social dimension of the BPM activity.

3. The social dimension of the BPM risk management task

In this section, we highlight the need to take into account the social dimension of the BPM activity as a main aspect of the way he deals with risks. Then, we show how our approach can be linked with the work of two authors from the domains of sociology of organization and psychosociology of organization.

3.1. *Communicating with agents*

Generally speaking, during his activity, the BPM has to deal with various points of view. These points of view can be expressed by various agents: single persons or groups of persons providing subjective, expert or not, judgments, or results of the application of a risk assessment technique. These agents can express hierarchical (top-down or bottom-up), societal or legal constraints, or just express an advice. More over, as they may not have a clear or complete representation of the situation, these agents and the BPM can express multiple points of view. The need for the BPM to consider various constraining agents' point of view comes from two reasons. First he has to clarify his representation of the situation in order to obtain a unique coherent personal point of view. Second, these agents are implicated in the risk scenarios or in one of the possible treatment strategies. For example, although a treatment strategy may satisfy the BPM's senior in rank, if it doesn't also satisfy the employees of the business process, the strategy will never be applied as it is designed in the business process model. As a result, contexts of the risk assessment and of business process occurrences play an important part. Therefore, the re-use of past strategies and the design of generic strategies must be made carefully. Consequently, we identified the need to adopt a constructive approach for the representation of a risk and the design of a risk treatment strategy (*cf.* 5.3.1.).

3.2. *Sociology of organization and power games*

We consider that the individual decision criteria and objectives of the BPM strongly reflect the social context of the organisation he works in. Our approach can

be related to the notion of power games introduced by Crozier and Friedberg (Crozier *et al.*, 1980).

Crozier and Friedberg start from the individual in order to explain organizational phenomena. They define the notion of power as the ability of an agent to act on another agent or, at the opposite, to refuse to do or provide what the other agent asks. It's therefore an attribute of a relation between two agents rather than a constitutive attribute of an agent or an agent's role. The four main sources of power are linked to:

- Agents competences;
- Relations between the organization and its environments;
- Communication and information;
- Organizational rules.

As the BPM has the power to modify organizational rules through the business process model, the uncertainty zone notion explained by Crozier and Friedberg can be faced with objectives defined as value intervals on decision criteria. A specific risk management can be seen as a new power game, and the initial risk description can be seen as the result of past and present power games in which the BPM took or takes part in. Consequently, the BPM doesn't first try to treat a risk. He treats the power game resulting from the risk consideration and this treatment can pass through risk specific treatments, or not. We have already pointed out this aspect distinguishing two main types of risk treatment strategies: perceived uncertainty control strategies and perceived uncertainty modification strategies (Uguen *et al.*, 2007). Uncertainty control strategies deal with business process modifications in order to avoid or limit the risk appearance (ex: protection and prevention), while perceived uncertainty modification strategies (monitoring, acceptance and assessment) deal with changes of the perception of uncertainty. However we also here highlight the fact that the acceptance of risk can pass through compensation mechanisms of risks taken by some agents.

3.3. Psychosociology of organization and sensemaking process

As March summarizes it (March, 1989), various authors argue that:

- Decisional preferences are often incoherent, unstable, and defined by external influences;
- Decisions and actions are slightly coupled and bound in an interactive way rather than a linear way;
- The past is not very reliable as a guide for the present and the future;

- Political considerations and symbolic systems occupy a central part in decision making.

Weick identifies three ways to deal with decision making that propose some answers to such a review (Weick 1993):

- Naturalistic decision making models and the sensemaking process;
- Models based on the notion of power;
- Models that better take account of social relationships.

Weick has worked for years on the notion of sensemaking process (Vidaillet, 2003). From his point of view, the sensemaking process starts with the unexpected, is directed toward action, and is context sensitive. People try to represent things under a rational way for themselves and for others. Problems come from the possibility of various personal or inter-individual interpretations of the situation rather than the lack of information about the situation. Weick highlight the importance of the social dimension in information processing at a collective level but also at the individual level.

The collective sensemaking process in organizations is a process aiming at collectively reducing perceived equivocality of a situation. This is an activity allowing members of the organization to establish priorities and preferences between actions and, thus, to constitute a system of organized actions. However, the collective construction of sense does not lead to the construction of a collective sense. Maintaining a system of collective actions does not require for each member of the team to understand behaviours of other members. Each one only has to foresee these behaviours.

We consider that during the sensemaking process, the BPM is faced with various decisional tasks aiming at partially removing the perceived uncertainty, so as to be able to give sense for him to the situation while preserving freedom margins for him or other agents, and thus, to be able to act.

4. The individual decision making process

In this section, we present a model of decision making that is in agreement with our hypothesis of a multicriteria descriptive model of individual decision making. This model can be related to naturalistic decision making (Lipshitz *et al.*, 2001).

4.1. *The search for a dominance structure*

We consider the decision making task as a decision process in the same way as Montgomery: “the decision process is seen as a search for good arguments [...] as a

search for a dominance structure, *i.e.* a cognitive structure in which one alternative can be seen as dominant over the others. [...] the final choice will follow in a self-evident way from the given structure” (Montgomery, 1989).

From this consideration, Montgomery proposed a multicriteria decision making process based on the use of various decision rules (conjunctive rule, disjunctive rule, addition of utilities rule...) in order for a promising alternative to satisfy the dominance rule. The dominance rule is expressed as follow: “Choose alternative A_1 over A_2 if A_1 is better than A_2 on at least one attribute and not worse than A_2 on *all* other attributes” (Montgomery, 1983). This approach can be related to the work of Payne, Bettman and Johnson on the adaptive selection of heuristic choice strategies in decision making (Payne *et al.*, 1993). A recent overview of the cognitive approach to decision making, following Montgomery’s work, can be found in (Barthélemy *et al.*, 2006).

4.2. *The model of Montgomery*

The use of various rules during the decision making process has been more precisely formalized by Montgomery. For a choice task, he proposed a dominance search model compounded of four main phases (Figure 1).

The process starts with a pre-editing phase consisting in selecting the considered attributes and alternatives from the whole initial sets of attributes and alternatives. The second phase consists in finding a promising alternative that is tested against other alternatives during the third phase, in order to identify whether or not it fulfills the dominance rule. If the promising alternative is found dominant over all other alternatives, the decision making process ends with the choice of the promising alternative. Otherwise the decision maker gets into a fourth phase labeled dominance structuring. During this phase, the decision maker tries to eliminate or neutralize the identified dominance violations. Four main strategies are described by Montgomery for this phase:

- De-emphasizing the importance of an attribute or of differences across alternatives on a particular attribute;
- Bolstering the promising alternative by enhancing its positive aspects or enhancing negative aspects associated with non-promising alternatives;
- Cancelling an attractiveness difference in one attribute by the attractiveness difference in another attribute;
- Collapsing two or more attributes into a new and more comprehensive attribute.

If dominance violations are not eliminated, the decision maker goes back to the search of a new promising alternative.

To finish, it is interesting to note that the two first phases of the process consist in information processing relative to all alternatives whereas the two last phases consist in information processing relative to the specific promising alternative.

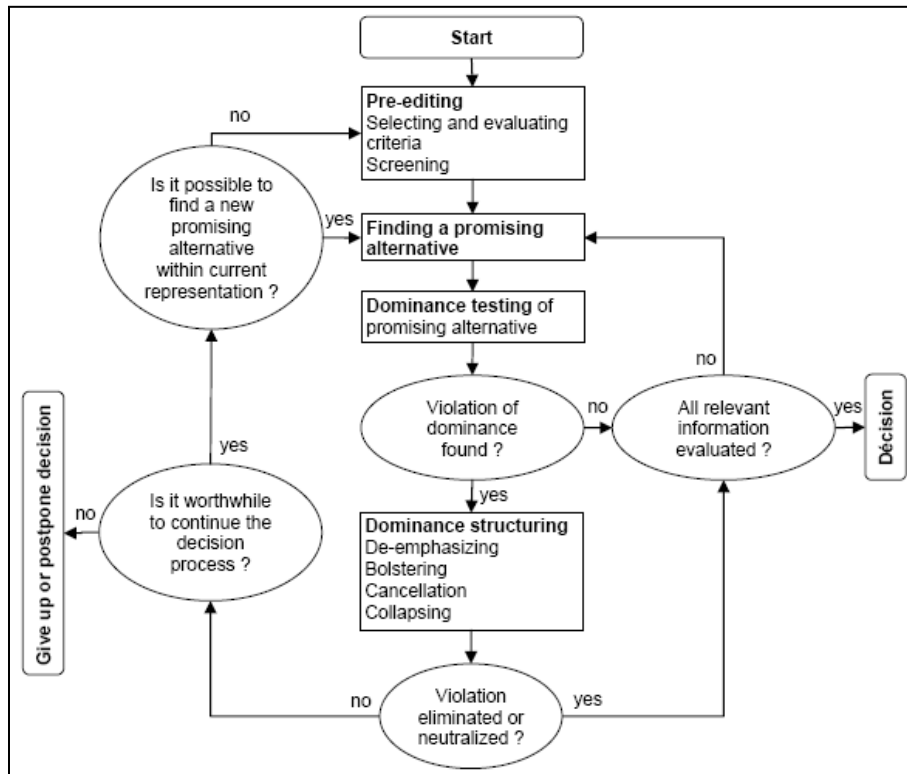


Figure 1. A dominance search model of decision making (Montgomery, 1983)

5. Adaptation of the dominance search model

We propose some adaptations to this dominance search model of decision making in order to take into account our task specificities previously presented. We especially consider this process as a socially situated one. This approach can be linked with the considering of decision making as a social representation (Laroche, 1995).

5.1. Tacking stock of agents' points of view

5.1.1. Agent and point of view

We have already indicated that we use the notion of agents rather than individual in order to socially situate the decision making process (*cf.* 3.1.). Any agent can provide multiple points of view to the BPM. However, at a given moment, the BPM personal points of view are only the risk representation, his objectives and a promising strategy. His work on alternative strategies is seen as a work on strategies of some agents.

The notion of point of view can either refer to a risk treatment strategy, an objective, or an evaluation of the risk. Agents' points of view can express advices or constraints on the structure of criteria to consider or on the promising strategy. However, all of them are described as strategies in the model of decision making. Each strategy is described by a set of values on a specific set of criteria. The initial set of important criteria to consider comes from the identification of unfulfilled objectives of the BPM (*cf.* 5.2.1.).

In order to be implemented, the promising strategy must satisfy the different structures of the various constraining points of view (those that come from an agent that the BPM must take care of, *i.e.* an agent who express constraints). Therefore, the promising strategy can drastically evolve during the decision process by aggregating other strategies or contextualizing process modifications that it describes. The BPM may also have to convince of or to impose reviewed objectives on conflicting points of view during the dominance structuring phase.

5.1.2. Point of view assessment

The assessment of a point of view can be made thanks to either a mental simulation by the BPM of the point of view of an agent, a direct or indirect consultation of the agent's point of view, or the application of an assessment method that does not require stressing the assessed agent.

In order to be able to test the dominance of the promising strategy of the BPM, the result of a point of view assessment is reformulate according to the set of the criteria used to describe the promising strategy. If some criteria cannot be reformulated, the following dominance test fails and the criteria can be temporarily integrated during the dominance structuring phase (*cf.* 5.3.3.). The BPM can also go back to the beginning of the process in order to integrate the new criteria completely.

5.1.3. "Pre-editing" and "Finding a promising alternative" phases inversion

In our model, the pre-editing phase of the model of Montgomery corresponds to the phase consisting in the definition of the points of view of one agent. As agents

are identified thanks to the BPM's promising strategy, the promising strategy identification phase must happen before the pre-editing phase.

5.1.4. *Suppression of the exhaustiveness test of accounted information*

We consider that the exhaustiveness test of accounted information (Figure 1: "All relevant information evaluated?") arise from the processing of all relevant agents, and is a constitutive test of definition of BPM's strategies and dominance structuring phases. Thus, this test no more appears as a step in the model.

5.2. *Risk representation*

5.2.1. *Unfulfilled objectives*

A risk perceived by the BPM can be represented as a set of aspects defined on a subset of the criteria of BPM's objectives. This subset of criteria correspond to the criteria on which BPM's objectives seems unfulfilled. Unfulfilled BPM's objectives correspond to the aspects of the ongoing strategy before the identification of the risk. So it is also the representation of the BPM's targeted strategy. These unfulfilled objectives allow the BPM to identify a set of important criteria at the beginning of the decision making process. Therefore, as we consider that these objectives results from the integration of various agents' constraints, it also allow the BPM to initially identify the specific agents he has to take care of.

Agents' objectives are also represented as strategies in the model. As any other point of view, objectives can be modified during structuring phases.

5.2.2. *The passive acceptance strategy*

The BPM doesn't have systematically a fixed set of alternative strategies among which he has to make his choice. He may not be able to provide more than one alternative strategy or even no other strategy that the passive acceptance of the risk: neglecting the risk and continuing to act as previously. Let us note that the description of this strategy correspond to the description of the current strategy from the identification of the risk, that is also the description of the new identified risk (Uguen *et al.*, 2007).

Thus, we do not distinguish the "decision" output of the decision making process from the "give up or postpone decision" output of the model of Montgomery.

5.3. A constructive and constructivist approach

5.3.1. Constructive approach and new information integration

As the model of Montgomery is defined for a choice task, it requires knowing all the decision criteria and all the possible risk treatment strategies from the beginning of the decision process. The model doesn't explicitly prevent from adding new information but it doesn't explain how criteria, thresholds and aspects are obtained and how new information should be integrated. Although collapsing allows defining a new criterion, it consists in a reformulation of available information rather than the integration of new ones.

However, one cannot suppose that the BPM will be able to recover all the desired points of view in a first phase without reacting to it progressively. Strategies can evolve with the acquisition of new information about the risk, due to external events or new risk assessments. Some strategies can become obsolete, appear, or be reconsidered. Criteria, thresholds and aspects of points of view, including the promising strategy, can evolve all along the decision process, as the BPM and other agents acquire new knowledge and abilities specific to the management of the risk.

The decision making process must be seen as a multi-period decision making process. Indeed, the BPM has other tasks than the resolution of a problem or risk and has thus a limited amount of time dedicated to this specific resolution. Moreover, agents may not be available for a meeting with the BPM, and some agents may need some time to emit a point of view (some time in order for them to proceed the same way as the BPM to make a decision, or in order to operate a specific risk assessment method).

Thus, the use of an evolving promising strategy in a dominance search model of decision making can be linked with the notion of sensemaking process (*cf.* 3.3.).

5.3.2. Constructivist approach

The constructivist approach (Landry, 1995) argue that representations are neither completely objective nor completely subjective but result from the interaction between the subject and the situation; *i.e.* result from the processing of elements of the subject experience and of the environment, assembling them in a form with a specific sense and labelled "problem".

The process of dominance search follows this constructivist approach: the chosen alternative is not intrinsically dominant; it has to be made dominant over other alternative thanks to dominance structuring strategies that include subjective knowledge integration.

Another example is Rousseau's work on territory management (Rousseau, 2003). Contrary to us, he distinguishes an individual decision making process cycle from a collective decision making process. Indeed, as we focus on an individual, the

proposed decision making process is an individual one, composed of two parts, one focusing on his points of view and the other one focusing on the integration of agents' points of view. Thus, we do not consider any collective decision making process. Collective sense emerges from the need for any individual to obtain a unique coherent point of view from other agents. This need is stressed by the necessity for any individual to make sense of the situation in order to act, *i.e.* the necessity to have a unique personal point of view on the situation.

5.3.3. *Temporary modifications*

The model of Montgomery shortly described in section 4 exhibits two main information processing stages: one relative to all alternative and one focusing on the promising alternative. These two main stages can also be distinguished in our adaptation of this model as information processing stages relative to the BPM for the first one and to a specific agent for the second one.

Therefore, we highlight the distinction between temporary modifications of criteria and BPM's promising strategy during the dominance structuring phase (second stage), and the definition of criteria and BPM's strategies during the first stage. Indeed, these temporary modifications can be useful only for the processing of the points of view of the current considered agent.

5.4. *Description of the model*

The resulting adaptation of the dominance search model is presented in the figure 2. The model starts from the identification of a new risk. This identification presupposes at least two strategies:

- The initial representation of the risk, represented as the new ongoing strategy from the risk identification, and labelled BRS (BPM's risked strategy) (*cf.* 5.2.2.);
- The initial BPM's objectives, represented as the ongoing strategy before the risk identification and seen as a BPM's targeted strategy (BTS) (*cf.* 5.2.1.).

Initially these strategies are represented on a unique set of criteria.

Then, the BPM choose one of these two strategies as his promising strategy (BPS). From the this promising strategy, he identifies an agent to take care of and assesses the agent's strategies (AS). This assessment can be a BPM's mental simulation, an analytical method, or a consultation of the agent's point of view. Then, the BPM testes the dominance of his promising strategy over all agent's strategies. If the promising strategy is dominant, the BPM can then try to identify another agent. Otherwise, the BPM tries a dominance structuring phase. He can try to modify the problematic agent's strategy and criteria, or try to temporary modify the promising strategy or the criteria he use. If the dominance structuring phase fails,

the BPM go back to the first phase of the problem in order to modify his problem representation and his promising strategy. The BPM's promising strategy can therefore no longer be one of the BPM's targeted strategy or BPM's risked strategy: the promising strategy can partially or completely integrate the problematic agent's strategy.

Finally, the strategy to implement is the BPM's promising strategy obtained at the end of the decision making process. This end is reached when all constraining points of view identified by the BPM have been taken into account. This is reached when the promising strategy and the targeted strategy are equals. If the BPM's risked strategy is also equal to his promising strategy and his targeted strategy, then the implemented strategy is the passive acceptance strategy (*cf.* 5.2.2.).

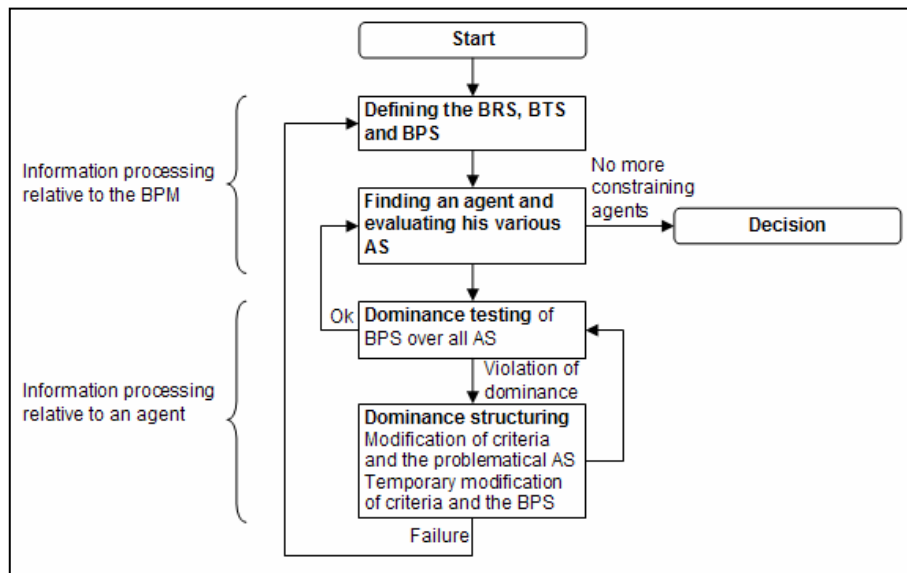


Figure 2. A socially situated dominance search model of decision making

6. Conclusion

The proposed individual decision making model was initially designed in order to describe how a BPM decide to implement a specific risk treatment strategy. However, the model results from considerations from domains such as psychology of organization, sociopsychology of organisation and a naturalistic decision making

model. These considerations lead to the definition of a process addressing not only the strategy choice but also the processing of the evolving representations of a risk and objectives.

Complementary works may focus on various points.

First of all our hypotheses and model have to be validated through tests on real risk management cases in a business process.

Then, we have hypothesized that the individual decision making process is socially situated. However, as the notions of agent and point of view used in this article aren't restricted to individuals, these notions address a stronger hypothesis. It may relate our work to the domain of situated cognition.

Another point is the definition of the ways the BPM identifies agents that he should or must take care of.

This model may also be used in major risk management. Indeed, major risks management needs to make a distinction between political decision maker, experts as scientists and the population. Our model can therefore be used as a descriptive model of the political decision maker and his need to take care of conflicting points of view. However, major risks often come from the combination of various minor risks. As the presented model addresses the way a decision maker treat one risk, such combinatorial aspect should be deepened.

Finally, this descriptive model is defined in order to identify how we should assist the BPM during his risk management task. We hypothesize that this task is a kind of sensemaking process, and that we must focus on a constructive and constructiviste approach of the BPM's situation representation and preferences. Therefore, it should be more interesting to try first to identify information concerning the agents that the BPM should take care of, rather than information about stabilized preferences and representations. Moreover, as we focus on risks, this is more the ways he processes new or usual information than preference structures that may be stable.

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