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► To cite this version:

Gilles Coppin. Emotion, personality and decision-making: relying on the observables. HCP-2008: 3rd International Conference on Human Centered Processes. Vol. 1: main conference, Jun 2008, Delft, Netherlands. pp.141 - 154. hal-02862288

HAL Id: hal-02862288

<https://hal.science/hal-02862288>

Submitted on 14 Mar 2022

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Emotion, personality and decision-making

Relying on the observables

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ABSTRACT. This paper proposes a way to address the quantitative description of decision strategies for expert decision-makers in order to take into account the effects of personality, emotion or mood on decision-making. Most of common taxonomies used in popular models to describe user profiles and behaviors seem to be difficult to apply in empirical cases. Instead we propose to rely on computational models inspired by cognitive psychology. These models and the related methodology allow to extract meaningful data structures from the behaviors of decision-makers. This data can be used to propose robust definitions of decision-styles. We then discuss the impact of this refined modeling on decision-support system functionalities.

RÉSUMÉ. Cet article présente une approche permettant de décrire les effets de facteurs personnels tels que émotion ou personnalité sur les processus de décision. La plus grande partie des taxonomies utilisées dans les approches traditionnelles du domaine semblent en effet difficiles à appliquer en pratique du fait qu'elles ne prennent pas en compte les comportements observables des décideurs. Nous proposons précisément d'appuyer la modélisation et la compréhension des décideurs sur la mise en évidence de structures régulières de comportements, qui permettent de définir de façon plus robuste la notion de style de décision.

KEYWORDS: Decision models, emotion, personality, cognitive modelling

MOTS-CLÉS : Décision, émotion, personnalité, modèles cognitifs

1. Introduction

This paper is devoted to the modeling and analysis of *individual differences* in decision-making. These differences usually include some features related to the personality of the decision maker and others features related to his/her emotional states. It seems that these two kinds of features have usually been studied separately, so that it remains difficult to understand or predict what could be the real effect of combining a given personality profile with a transient emotional state. This paper strives to develop a unified representation for the categories of decisional behaviors using a cognitive model of decision making. Moreover, we show how such a unified representation could lead to a new definition of *decision styles*. Decision styles are of the outmost importance for the design of decision-aid systems.

The paper is structured as follows: first, we present a brief survey of personality and emotion theories as related to decision-making, from the psychological, cognitive and computational perspectives. Second, we present a set of models of decision-making that seem to have been often ignored by previous studies and that we find useful to describe individual decision-making behaviors and strategies. We especially try to identify which parts of these models can support the expression of individual differences. Lastly, we present the elements of a methodology that is adapted to our approach and some preliminary results. We briefly discuss potential applications of these modeling approaches to decision-aid systems.

2. Individual differences and decision : a brief state-of-the-art

2.1. *Taxonomic and process oriented approaches*

It is quite difficult to present a complete state-of-the-art on personality, emotions, moods and cognition when considering the huge amount of research on these topics that has been done for decades (such attempts were however done in (Revelle, 1995) or in (Schwarz, 2000)). The recent works of Damasio on somatic markers theory (Damasio, 1994) motivated new and broader dynamics in the domain by making obvious that neuro-psychology and neuro-imaging would add new crucial perspectives on the subject (see also (Montague, 2006)). Therefore we shall try to limit our introductory survey to studies that are directly connected to decision-making; even with this precaution, we do not claim to be exhaustive in our presentation.

Most of the theories and models that were proposed up to now can be separated into two kinds of approaches:

- A first type of approach consists of mapping classes of user profiles to classes of decision behaviors. The user profiles are either in terms of personality or emotion but do not combine both. The second set of classes corresponds to possible decision-making styles. The construction of the mapping of individual profiles to decision styles is commonly based upon statistical inferences.

- A second type of approach focuses on the description of the principles that underly emotion and moods, and on the modeling of their impact - possibly in terms of competition or collaboration - on usual cognitive functions such as reasoning, memory or decision-making.

We examin briefly these two types of approach in the following paragraphs.

2.2. Taxonomies

2.2.1. Personalities taxonomies

As mentioned by (Revelle, 1995), defining taxonomies has been a recurrent tradition in personality theories since Plato. The most famous contemporary taxonomy was defined by Jung and instrumentalized by Meyers-Briggs (Carlyn, 1977). According to the Meyers-Briggs indicators, one personality may be described by four bipolar dimensions:

- sensing vs. intuition (SN),
- thinking vs. feeling (TF),
- extraversion vs. introversion (EI) and
- judgment vs. perception (JP)

Together these four dimensions describe the general attitude of the individual towards his/her environment, self, and logics. Almost as famous, the *Big Five* (McCrae *et al.*, 1996) and the *Even Bigger Three* (Eysenck, 1991) models (respectively, B5 and EB3) propose to classify individuals according to five or three dimensions amongst Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness. Let us only indicate here that these dimensions seem to broaden the focus on social features (Openness, Agreeableness), but that the main cognitive dimensions of personality description (Extraversion, Neuroticism) remain almost unchanged. For an in-depth discussion, one can refer to (Revelle, 1995).

Still according to (Revelle, 1995), an important point is that the number and the definition of attributes as well as the dimensions involved in the definition of classes have not been fixed yet, and still can be considered to be under discussion. In fact, many studies still focus on re-expressing these initial taxonomies and on finding an ever more adequate way of combining their related dimensions (Gray, 1994).

2.2.2. Emotion / mood taxonomies

Emotions and moods have also been expressed through many taxonomies (see (Schwarz, 2000) and (Frijda, 1994) for in-depth surveys). One of the most famous systems was proposed by Clore (Clore, 1994), who distinguished between emotions focused on self and focused on others, and between positive and negative (i.e. valence-oriented) emotions. Distinctions between emotions and moods may be related to the time duration of the phenomena, but also have to take into account the

notion of intentionality (Frijda, 1994).

More recently, it was proposed (Lerner *et al.*, 2000) to go beyond the concept of positive or negative valence for emotions and define them in terms of cognitive appraisals (ATF, Appraisal Technique Framework (Lerner *et al.*, 2006)) instead. Stating that emotions that are gathered in the same category¹ could lead to very different behaviors, Lerner proposed that emotions should be expressed in terms of classes that reflect the cognitive evaluation of situation (perceived level of control of situation, perceived level of uncertainty).

2.2.3. Decision styles

There are few choices for the different classes of decisional behaviors and styles. Two models seem to be emerging: the General Decision Making Style (GDMS) and the Decision Style Theory.

The GDMS framework (Scott *et al.*, 1995) proposes to define a decision style as one of five categories: *rationale*, *intuitive*, *dependent*, *avoidant* or *spontaneous*. Some of these categories are based upon the way the decision maker processes information. For instance *rationale* decision-makers are characterized by a "comprehensive search for information, inventory of alternatives and logical evaluation of alternatives", while *intuitive* ones "by attention to details and [...] relying on premonition and feeling" (Scott *et al.*, 1995). GDMS categories also take into account the relationship to others during decision-making (*dependent* decision makers search for advice) or the global attitude of the decision-maker towards the decision process itself (*avoidant* decision makers try to avoid making decisions, *spontaneous* ones want the decision process to converge rapidly).

In a different way, Rowe and Boulgarides propose a Decision Style Theory (DST) (Rowe *et al.*, 1992) that distinguishes four categories that are based on the ways we perceive the stimuli and the ways we choose to respond. According to DST, decision-makers may be *analytical*, *directive*, *conceptual* or *behavioral*. *Directive* decision-makers have a strong need for structure and are oriented towards tasks to be done more than towards people. *Analytical* decision-makers are also oriented towards tasks and technical aspects but can tolerate ambiguity. They evaluate the situation with abstract thinking. *Behavioral* style corresponds to focusing on people and social aspects. *Conceptual* decision-makers can tolerate ambiguity and are also focused on people.

2.2.4. Mapping personality and emotion onto decision-styles: few robust results

A next step usually consists of statistically analyzing and inferring the correlations between personality or emotions profiles and decision styles. It is unfortunately extremely difficult if not impossible to draw robust conclusions from most experi-

1. Fear and anger in a negative valence category for instance

mental and statistical results provided by past experiments (see (Thunholm, 2004) for instance). We see at least two reasons for this common hinderance.

First, definitions and classes provided by the decision-styles theories seem to be very vague. Most of the analyses only refer to an ambiguous qualitative dichotomy between *heuristic* and *analytical* decision-styles². Although many experiments attempt to prove a correlation between negative emotions and moods and analytical decision-makers (while positive traits are tied to heuristic decisions (Schwarz, 2000)), they do not take the context or a concrete and measurable behaviour of decision-makers into account.

Another important concern is also related to the definition of a decision style: *decision styles* seem often to be indistinguishable from *cognitive styles*, which are themselves very close to psychological profiles used for personality definition. Thus, it seems to us, for instance, that the GDMS categories rationale and intuitive are very close to the thinking and intuition features of the initial taxonomy proposed by Jung³. According to (Leonard *et al.*, 2005), the four DST styles are re-expressions of the respective associations of dimensions proposed by the Myers-Briggs indicator. When aspects of input categories overlap output categories, it is therefore understandable that an inferential statistical approach to data analysis leads to confusing and contradictory results. We reach some kind of tautological association where the features characterizing a decision style could already be part of the personality profile of the decision maker, and not result from it.

A last but major concern is that these approaches do not allow to think about cumulating or combining effects of personality and emotions on the decision maker's behaviours. Taxonomy-based studies happen to focus on personality, emotion or mood separately while it would be necessary to take into account the whole set of influencing factors to answer a question such as: "would the decision style of an extravert, but angry and stressed, decision-maker remain heuristic or shift to analytical?".

2.3. *Cognitive processes, emotions and decision*

Another way of dealing with emotions and moods effects on decision consists in relying on cognitive processes *models*. This kind of approaches was especially used when taking into account the emotion in individual differences. Often referring to Damasio's work (Damasio, 1994), but as well to LeDoux (LeDoux, 1996) or Sloman (Sloman, 2002), a lot of studies have proposed to describe emotion as a

2. Lerner uses almost the same bipartition defined by *deep thought* against *shallow thought* (Lerner *et al.*, 2006).

3. Scott and Bruce admit themselves that these dimensions should be generally mixed in order to describe the real decision process.

specific process that could be complementary of the usual rational one. Forgas's Affect Infusion Model (Forgas, 2000) proposes for instance to distinguish different strategies for information processing (*direct access*, *motivated*, *heuristic*, *substantive*) and to identify when and where affect could impact them. According to this model, only the most *cognitive* processing strategies amongst the four may be influenced by emotion: *direct access* and *motivated* strategies barely involve conscious and complex retrieval in memory or processing of information, and therefore should not be influenced by affective markers related to the situations, while *heuristic* and *substantive* strategies could be. But the main concern with these approaches remains the same: the quantification of effects still relies on imprecise terms such as heuristic or analytical⁴ and does not provide an easy way to analyze real decision cases and behaviors.

At last, different approaches directly address computational models, and propose to embed some parameters that could represent emotions and moods within the decision process into simulations or even in autonomous agents, like in EMA (Emotion and Adaptation) (Gratch *et al.*, 2006) for instance. In (Gmytrasiewicz *et al.*, 2000), one can also find a model of decision processes for agents based upon utility theory and its parameterization from emotions and moods. An interesting approach is also proposed by (Hudlicka *et al.*, 2004) with the MAMID methodology where individual differences, including personality, emotions and moods, directly impacts quantitative parameters of cognitive processes such as memory, attention, or reasoning.

2.4. Finding new inspiration in psychology of decision

Let us summarize the problems we relate to existing methods. First, the definition of decision styles are too imprecise to support statistical inference and do not allow any cumulative effect analysis. The definition of decision styles is also mostly qualitative and too close from psychological profiles to allow the matching with empirical observations. Second, when using an approach based upon processes, most models use a similar vague description of classes of decision behaviours. When quantitative, models of decision rely on utility models that are known to be difficult to validate experimentally and are far from cognitive psychology theories.

We however aim at a decision models that integrate all individual differences and all specific features of a decision maker. Further, only this condition can enable us to design personalized and customized decision support systems that takes into account at the same time personality and emotions of the decision maker. Some models issued from the psychology of decision allow to better fulfil these requirements. We present them in the following paragraphs.

4. Forgas mentions the "most cognitive" processes to be more influenced by emotion, for instance, but how could we define a *most* and a *least* cognitive process?

3. Cognitive models for individual decision-making

3.1. *Work hypotheses*

Cognitive approaches of decision making mostly rely on the assumption that decision-making may be defined precisely with information processing techniques. Decision-making involves two main kinds of tasks: choice and judgment. In a choice task, the alternatives are compared, the ones to the others, in a judgmental task a label has to be attached on each alternative. Another important feature is related to the level of expertise of the decision maker, as it may have some influence on the cognitive processes invoked during the decision processes. We make the hypothesis in this paper that our decision-makers are experts. A main characteristic of expertise in decision is the low amount of the information processed to perform a decision (while a novice uses an overcrowded amount of information, an expert one uses what is just enough but relevant (Shanteau, 1988)). Obviously such a phenomenon is balanced by the high quality and the appropriateness of the used information. We will focus in the following on expert decision makers, especially because the notion of decision-style should be more easily related to some stable, experienced and measurable decisional behaviors. We also assume a multi-attribute framework to describe alternatives

3.2. *Cognitive models and dominance structures*

Three main kinds of cognitive models for decision-making have been proposed. A first one asserts that decision-making may be described as the chaining and use of elementary strategies that are applied on alternatives and/or attributes (Montgomery *et al.*, 1976). A second one describes decision-making as problem solving (Huber, 1986). A third one proposes to model decision-making as a search for dominance structures (SDS) (Montgomery, 1983). We shall rely in the following on a computational version of SDS, the Moving basis Heuristics (MBH), which was proposed by J.P.Barthélemy and E.Mullet in 1986 (Barthélemy *et al.*, 1986). We chose to rely on the MBH as it allows exhibiting some references combinations of attributes and values (called aspects) quite easily and from simple observations of the decision-maker.

3.3. *Individual differences and dominance structures*

Let us suppose that a judgmental decision task attached to an expert consists in selecting or rejecting alternatives that can be described along 10 attributes $a_1 \dots a_{10}$. For sake of simplicity, let us imagine as well that each attribute has 5 possible ordered values 1 to 5. Writing a_i^j the attribution of value j to attribute i , an alternative - dedicated to be either selected or rejected - can then be described by a vector of aspects such as $A = [a_1^3, a_2^4, \dots, a_{10}^2]$ for instance, meaning simply that A has a value 3 for its attribute a_1 , 4 for its attribute a_2 , etc.

Following the dominance search and MBH approaches, we assume that the expert's decisions will always rely on a limited set of information. More precisely, this means that when analyzing one alternative to be evaluated, the expert will only consider some specific and limited subsets of aspects that could win the decision. Thus, one could imagine that a combination such as $[a_3^3, a_5^2]$ (attribute a_3 with value 3 and attribute a_5 with value 2) is used as a reference and allows by itself to decide for a positive judgment for all alternatives that will be *at least* at these levels for attributes a_3 and a_5 , whatever could be the values of the other attributes. $SD1 = a_3^3, a_5^2$ is then one reference for the expert decision-maker, namely one of his/her dominance structures. $[a_2^4, a_4^3]$ or $[a_3^1, a_7^2, a_9^4]$ could be possible other dominance structures, but $[a_3^2, a_5^1]$ could not, as being dominated by $SD1$ ($a_3^2 \leq a_3^3$ and $a_5^1 \leq a_5^2$). In simple words, expert decision will then consist in browsing the set of dominance structures and in checking that at least one of them is satisfied by the alternative.

It was demonstrated that it was possible to extract the set of dominance structures related to an expert decision making through the the analysis of his/her decisions under interactive questioning (Barthélemy *et al.*, 1995). Of course, the complete exploration of the combinatorial space is generally not possible: the size of the problem may be too large, or even when limited, too large for an expert decision maker to accept to spend so much time to browse explicitly the whole space. Efficient solutions may be however proposed with light supplementary hypotheses (Lenca, 1997).

In other words, it is possible to extract from expert decision makers' behaviours some sets of data structures that represent their respective decision anchors and references, and that describe their respective and personalized decision process. We consider these sets are the key for expressing individual differences on decision making, as we explain in the following paragraphs.

3.3.1. Defining decision-style from (observed) decision-maker's dominance structures

Let us now suppose, as an example, that

$$SD1 = a_3^2, a_5^5$$

,

$$SD2 = a_4^1$$

,

$$SD3 = a_4^5, a_{10}^2$$

could be attached to the description of the behaviors of one expert decision maker DM1. Hence, (s)he would decide an alternative to be accepted if this alternative presents either a combination of attributes a_2 and a_5 respectively greater than 3 and 2, or an attribute a_1 greater than 4, or a combination of attributes a_4 and a_6 respectively greater than 6 and 10. Suppose now that another expert DM2 on the same decision task could be described, after the same kind of analysis, by the structures

$$SD1 = a_1^4, a_2^4, a_3^3, a_7^2 \quad , \quad SD2 = a_2^3, a_5^2$$

,

$$SD3 = a_1^4, a_4^3, a_9^3$$

,

$$SD4 = a_2^3, a_7^4, a_8^3, a_9^2, a_{10}^2 \quad , \quad SD5 = a_5^4, a_3^3, a_7^5$$

,

$$SD6 = a_1^3, a_4^2, a_9^2$$

Obviously, we would have now some support to say that the second decision maker bases his/her decisions on more in-depth analysis of alternatives attributes, and has more references to take to justify his/her decisions: *in-depth analysis* can actually be attached to the average number of attributes per dominance structure and to the amount of dominance structures attached to the decision task.

We can further define two levels of empirically-based decision-styles for the respective expert decision makers:

- at a *categorical* level, DM2 can be said to be more analytical than DM1, on the basis of the measured number of dominance structures used in the decision task and on the average number of aspects composing the dominance structures. DM1 could be said, at the opposite, to be heuristic.

- at the *individual* level, each DM can be uniquely defined by the contents of his/her dominance structures. Decision-styles could be then compared on a set-comparison (two expert decision makers can happen to share few or a major part of their rules).

We have represented on figure 1 the dominance structures that were extracted from the observation of expert decision makers in professional orientation (Barthélemy *et al.*, 1986). Each of the sixteen experts had to analyse a same set of about one hundred student applications, and to decide whether the student was to be accepted or not. Students applications described their grades (1 to 8) in different disciplines (A to I). According to the previous notation, dominance structures are encoded by the name of the attributes - A to I - and the related value - 1 to 8, the + operator being equivalent to a logical *or*. Thus the expert 1 exhibited choices that could be explained by a grade in discipline A greater than 5, or a grade in C greater than 6, the combination of two grades of 4 for disciplines A and C or a same kind of combination for disciplines C and I.

From this analysis, the expert number 7 and the expert 11 exhibit different decision style: the first one apply a one-attribute unique rule as the second one uses 9 rules, most of them being double-attribute . Both of them remain heuristic in their strategies, but we can now distinguish between different ways of being heuristic. Experts 4 and 7 could this way share a same categorical style (one decision rule only, with one attribute involved only), and their respective individual style would be defined by their respective threshold (in this particular case, both expert use the same attribute in their unique decision rule).

Expert	rules
1	A5+C6+A4C4+C4H4
2	A5F5+A4I5+B3F6+C2G6+D3E6
3	A6+A4B6+A4G6+B6C4+B3D6+B5I6+C4I5+D3E6+D3J6+E3H6
4	A5
5	I6+A5B3+A2C6+A3D5+B3D6+D3J6
6	C6+A4E5+A5F5+A5G4+B4F5+B5I6
7	A4
8	F5+A3C6+A3D4+B5D4+B3H6
9	A6+A5B5+B6C3+B2D6+C4D5+C5D4+C3G6+D3E5
10	A4B6+A5B3+A3D6+A4F6+A4G6+C6D5+D3J6+E6F5
11	A5+A3C6+A3D6+A4E4+A4F5+A4H3+B5I6+C3E6+C3G6+C4I5
12	A3C6+A3D6+A2F6+B4F5+B3H6+C3G6+C4I6+E4J6
13	A5+A3D6+A4G6+B6C4+B3E6+B3F6+B4G6+C5D4+D6F3
14	B6+E6+A5B3+A3C6+A4F6+B3D6+C4I5+D3J6
15	A5+G6+H6+A4I5+C3I6+F6G4
16	A5+I6+A3C6+A3E6+A4F5+A3I6+B2C6

Figure 1. Representation of dominance structures underlying decision strategies of 16 experts

3.4. Extending the decision-style to emotions and moods

It is not too difficult now to think about taking into account of emotions in a similar way: still developing our purposefully simplified example, one could analyze the effect of emotion on decision-making through a differential effect measured on the sets of dominance structures. Thus stating that our expert decision-maker DM1 shifts for instance from

$$SD1 = a_2^3 a_5^2, SD2 = a_1^4, SD3 = a_6^4 a_{10}^2$$

to

$$SDe1 = a_1^3, a_5^2, a_6^3, SDe2 = a_1^3, a_4^2, a_9^2$$

$$SDe3 = a_1^4, a_6^4, a_{10}^2, SDe4 = a_2^3, a_7^4, a_8^3, a_9^2, a_{10}^2$$

under the effect of sadness could allow an objective quantification of "going towards analytical". The same means can be used to analyze the effect of aggregated effects, such as shyness added to anger added to stress for instance, in cumulating the differential evolution of dominance structures to achieve at least a qualitative understanding of the process.

Effects of emotions and moods on decision-making thus can be defined and possibly measured from the variation of the apparent dominance structures that can be extracted from the expert decision behavior. If we call N1 the number of structures and N2 their average number of aspects, we may add to the definition of one decision-maker's individual style his/her typical variations of strategies when facing given emotional states. In the previous toy-example, variations of $N1 = +1$ and $N2 = +1.8$ can be attached to the decision-maker DM1. At a categorical level, one could expect some of the expert decision-makers to globally show limited variations of decision structures under effect of emotion or mood.

4. Defining decision-styles from empirical observations and observables

Describing the stable decision strategies of a decision-maker thanks to his dominance structures allows in a way to think of a new point of view on individual differences in decision-making. What matters really in order to understand and further to assist a decision maker is no more related in priority to his or her personality category or emotional state. What matters is the form and content of the decision maker's set of dominance structures, their content and their possible variation depending on mood and emotion. This approach especially allows us to evaluate properly the additive effects to be expected from the personality, the emotion and the mood of the decision-maker.

In other terms, the method should better consist in first identifying the main forms of sets of decision structures and, only after this first step, try to correlate them with combinations of emotions, moods or personality. We do not claim that this would mean to redefine the categories of moods or emotions *from* the decision styles, but at least, this should give a more practical and concrete way of managing individual differences in decision making.

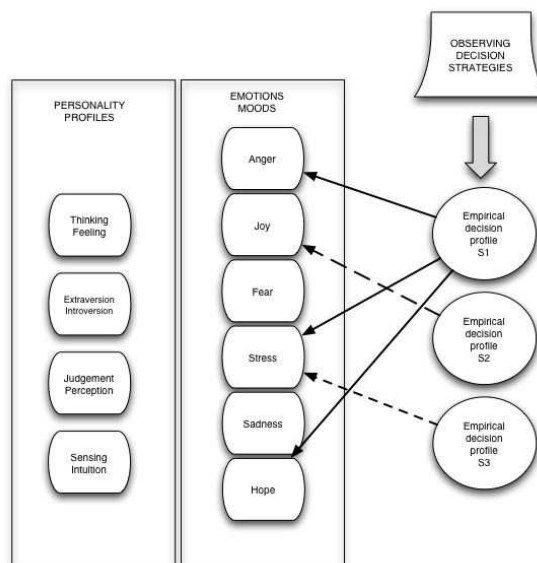


Figure 2. *Going from classes of observed decision behaviors backward to emotional states and personalities*

5. Individual and personalized decision support system

As we propose to rely on existing and observable human decisional expertise - or minimally recurrent and stable behaviors, we have to forget about classical decision support systems and change our mind about the role of an assisting system. The assisting system is not considered as providing the decision maker with solutions that refer to an absolute reference or optimum any longer, but on the contrary as proposing a kind of structured mirror image of decision maker's actions and strategies, aiming at the extraction and synthetic formalization of one unique decision-style.

What can be the operational interest of this approach, if the decision maker is an expert and if the data that are initially used for extracting the most pro-eminent strategies come from him / her? The answer is at least double:

- first, the expert decision maker may not be able to express his / her own expert strategies. Proposing to mirror these decisional strategies allow reaching a better level of meta-cognition for the expert DM that may be usually drowned into daily action.
- second, this explicit expression of decisional strategies may be used as reminders and controls for the expert himself / herself, or even as guides for novices

This approach was developed and validated on different cases of industrial process control that involved expert decision makers. Strategies of control were extracted from the daily observation of behaviors, then synthesized and displayed towards the experts themselves as a mirror of their know-how. This on-line non-intrusive assistant allowed to elicit expert strategies, and to capitalize and work further on refining the process control (Coppin *et al.*, 2007).

But it should be possible now to go further in the management of decision support. Affective computing as defined by (Picard, 1997), that is to say taking into account emotions and moods in the management of man machine interaction, has become a major challenge and could possibly be the key for a more efficient man-machine cooperation. This is even more crucial when dealing with decision-making. Overwhelming flows of information addressed to a decision maker that is known to decide from few robust and simple dominance structures could rapidly lead to bad performances and failure. Hiding information or shifting part of them to the machine when the decision-maker is more analytical and needs more exhaustive browsing his/her numerous dominance structures could not be efficient either. So defining personal and individual decision-styles from personality and emotion, and identifying them from current behaviors, could allow to adapt the communication, the information display and even the task sharing between the user and the machine.

6. Conclusion

In order to personalize the decision assistance, it is necessary to better focus on the effects of emotions and moods on the behaviors of decision-makers, and especially

the expert ones. We have presented in this paper an alternative way to classify these effects. Starting from observable data and interpreting them from a cognitive psychology point of view, we can extract formal and comparable descriptions of decision strategies, i.e. the dominance structures, and then map more safely the effective decisional behaviors with measured or inferred personality profiles of states of emotion. When doing this, we expect to make decision styles explicitly based upon observable behaviours instead of defining them *a priori*, and to validate these styles definition with the feedback of the decision makers themselves. These perspectives should be studied in coming laboratory experiments.

Acknowledgements

The author especially thanks MIT/HAL Pr. Missy Cummings, Mark Ashdown, Yves Boussemart and Vanessa Esch for their fruitful and relevant comments and suggestions on this paper.

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