



A New Framework to study Decision in Organization: The Decisional Fit Model¹

□ Résumé

Le but de cette communication est de proposer un nouveau modèle décisionnel fondé sur le critère du Fit. S'inspirant d'autres modèles utilisant ce critère, ce modèle convient aux décisions prises en utilisant un système d'aide à la décision. Enfin, nous proposons une discussion sur les effets que peuvent avoir la non-adéquation en termes de survenance de stratégies de « *coping* ».

Mots clefs :

Prise de décision, modèle d'adéquation, systèmes d'aide à la décision, stratégies d'ajustement.

□ Abstract

The purpose of this communication is to display an original decision model - the Decisional Fit Model. Based on other models of fit, this model focuses on decision making when using a decision support system. In addition, we propose a discussion on the impact of misfit when coping strategies occur.

Key-words:

Decision Making, Fit Model, Decisional Fit, Decision support System, Coping strategies.

Jean-Fabrice Lebraty
Cécile Godé-Sanchez

¹ Ideas expressed in this paper are those of the authors and do not reflect the position of the French Ministry of Defense nor of the French Air Force.

1. Introduction

A recent study shows that articles on Decision Support Systems represent more than 15%² of all Information systems articles published in major academic journals (Arnott & Pervan, 2008). 74 articles proposed a conceptual framework or overview of DSS. We aim to position this communication in that field study. More precisely we are situated in the well known field of the consequences of the implementation of a new DSS on decision performance (Kohli & Devaraj, 2004; Todd & Benbasat, 1992; Williams, Dennis, Stam & Aronson, 2007). We seek to understand changes triggered by uses of a new DSS within a specific context, in proposing an original model. The ultimate goal is to enhance decision making with that new tool.

This article not only encompasses a theoretical interest but also a managerial interest.

The theoretical interest relates to the decisional fit model we develop; and this considers the examination of the relations between a task, a decision maker and a system. Such a model is drawn from the fit model category. The managerial interest relates to practical implications of our model since it provides new perspectives to understand the effects of networking technology usages for people who are engaged in turbulent situations.

This paper is divided into five parts. Section 2 develops a concept-centric literature review (Webster & Watson, 2002). Section 3 introduces our model of decisional fit. Section 4 closes this study with a discussion on the effect of misfit on decision maker behavior.

2. Fit Model: A Literature Review

Defining the origin of models built on “fit” in management science is not easy due to a vast number of ways of understanding what “fit” is. Therefore, we present the concept of fit in management science on the one hand; and on the other hand we describe fit models.

In management science, the concept of fit has been used in many different ways. As Venkatraman & Camillus (1984) mentioned: “*the concept of fit rooted in the population ecology model and in the contingency theory has the central thrust to the development of middle range theories in many management disciplines*”. We can accordingly retain the research work of Burns and Stalker (1961) as the starting point of this concept.

Strategic management is the first field application for the concept of fit, as for example the linkage between technology and structure (Woodward, 1965). Initially, “fit” refers to linking components to one another in order to explain the lack of performance of the whole organizational set by highlighting existing misfit between these components. So what does fit really mean?

2.1 Nature of Fit

In 1979, Van de Ven, reviewing the Aldrich’s book “Organizations and environments” opened the debate with several questions and the first one was: “*what is fit?*” (Van de Ven, 1979). He presented four different meanings: fit as

completeness – interaction effect – adaptation to the environment – spurious result of the precedent meaning. 5 years later, six different perspectives of the concept of fit were proposed (Venkatraman & Camillus, 1984) and structured into a six-celled matrix. Two kinds of criteria were used. For the rows, it is the domain of fit (external, internal and integrated) and for the column it is the way of conceptualizing the fit (focusing on the content of fit: elements to be aligned with strategy; pattern of interactions: process of arriving at fit) (p. 516). This classification of fit has evolved in the mind of Venkatraman and five years later (Venkatraman, 1989), he exposed another classification for the six perspectives of fit, naming each one precisely (Moderation, Mediation, Deviation, Gestalts, Covariation and Matching) (p. 425). Dimensions structuring the matrix are generic and can be applied to many researches, what can explain the success of this definition of fit. These dimensions are: the status of criterion (free or specific) – the degree of specificity of the functional form of fit based relationship (Low to High) – Number of variables in the fit equation (Few to Many). The main idea is that fit is the alignment, or configuration, of strategy and the organizational contingencies firm copes with (Venkatraman, 1990).

In a similar direction, and seeking to analyze fit in line with the contingency theory, Drazin and Van De Ven proposed three different conceptual approaches of fit: selection, interaction and systems approach (Drazin & Van De Ven, 1985; Meilich, 2006). Operating a choice between these approaches necessary affects fit definition. In our study, we are close to the selection approach. So fit “*is assumed premise underlying a congruence between context and structure*” (p. 515). But as our concern is at a micro-level, we are influenced by interaction approach (p.517).

Fit-based studies stream seems still relevant in strategic management (Hughes & Morgan, 2008) and many other domains management studies are based on that view (Dennis, Wixom & Vandenberg, 2001; Ensign, 2001; Hamzaoui & Merunka, 2006; Verdu-Jover, Llorens-Montes & Garcia-Morales, 2004).

2.2 Models of FIT

Two models emerge from literature: the Task-Technology Fit (TTF) and the Cognitive Fit (CF) model.

These two models were developed at the end of the 80’s and aimed to explain individual performance. The main difference between them is that CF focuses on individual mind whereas TTF connects organizational set.

The TTF model was first theorized by Goodhue & Thompson (1995). This model is still up-to-date and useful. As confirmed by Zack (2007) “*the notion that technology should fit the task has become an accepted approach to evaluating the performance impacts of information technology*” (p. 1671).

Many theories are closely linked to the TTF approach.

In 2000 Todd & Benbasat (2000) described a model linking a decisional task, a decision maker, a specific technology (a DSS) and decision performance. This model inspired by the TTF is one of the first to clearly focus on the performance of decision making.

To give another illustration of the use of TTF and decision making, Jarupathirun & Zahedi (2007) explore the influence of perceptual factors in the success of web-based Spatial DSS (SDSS). By using perceived TTF and perceived goal commitment as major constructs, they theorized that spatial

² 1093 for a total of 7184 articles took into account.

capabilities and self-efficacy could impact perceived TTF, which in turn influences the success of SDSS in terms of users' satisfaction (with decision and technology) as well as their perceived benefits of SDSS in terms of perceived decision quality and efficiency.

Recently, Zigurs & Khazanchi (2008) have reviewed theories referring to the TTF model (Media richness theory, channel expansion theory, adaptative structuration theory, task-technology fit, fit-appropriation model) (p.9) and proposed a new perspective based on the theoretical frame of pattern³. From their point of view: *"Patterns provide an intuitively attractive way of understanding the world around us by dealing with its complexity in terms of practices that address problems and by suggesting solutions in specific contexts, rather than by taxonomies that define separate elements of the context"* (p. 10). Based on the work of Alexander (1979), they defined patterns as *"a three-part rule that expresses a relationship among a specific context, a problem, and a solution"*. In terms of TTF, patterns mean searching general rules such as IF...THEN in a decision process. Patterns appear to be adapted for contexts where IT is massively used.

The Cognitive Fit (CF) model occurs in the mind of a manager who faces *"the theory presented here differs from the popular notion of task/technology fit in that it suggests that simply matching technology to task is insufficient to achieve the desired effects"* (Vessey & Galletta, 1991) p.65. As Vessey (1991) has said, the CF model *"views problem solving as an outcome of the relationship between problem representation and problem solving task"* (p. 220). Built on Herbert Simon's view of problem solving, CF model focuses on the link between information and cognition as an essential component of decision performance. In addition Vessey has studied the impact of information presentation (Graph Versus Tables) on performance. More recently Huang & al., (2006) have used CF to compare visualization techniques in the context of expertise management.

Then, in 2006, Shaft & Vessey (2006) presented an extended CF (ECF) model which detailed the concept of problem representation (p.32). This new model distinguishes the internal representation of the problem domain and the external problem representation. Based on the work of Zhang and Norman (1994), internal representation refers to the pre-existing knowledge concerning the problem category. The external representation is the formalized image of the problem seen by the decision maker. Are internal and external representations a simple mirror, complementary or just compatible? This question seems to be complex. For example, Maxion & Reeder (2005) underlined that external representation is complimentary to internal mental representations by providing additional memory capacity, cues to internal processes, and information structures that allow patterns to be easily perceived (p. 29).

All these approaches inspired us and are useful, but we will have to proceed with customization in order to stick to our specific context and to our approach of decision making.

2.3 Decision Making in Natural Settings

Decision making is a process containing at least two steps: problem finding and problem solving. Two main approaches to decision making can be found. The first one is focused on the entire process and tries to conceptualize this process. The

decision is the result of a rational choice between alternatives although this rationality can be bounded (Simon, 1997). This approach is useful to explain problem resolution and result in building guidelines that can help novice decision makers.

At the end of the 80's, a team of researchers led by G. Klein decided to follow an original path to study decision maker (Klein, 1998; Klein, Orasanu, Calderwood & Zsombok, 1993; Lipshitz, Klein & Carroll, 2006; Zsombok & Klein, 1997). They just observed the way decision makers behave in natural settings.

This naturalistic or observational methodology, which contrasts with experimental and quasi-experimental methodologies (Lipshitz, Montgomery & Brehmer, 2005), has led to a relevant result: in context, an expert decision maker facing a complex, urgent and risky situation does not choose between options to decide. His decision is the result of a recognition primed process. This new result appears to be very important to decision support, since it means that support is more effective at the very beginning of a decision process rather than at the end by proposing many options (Lebraty & Pastorelli-Nègre, 2004). That is why Naturalistic Decision Making is closely linked with situation awareness issues (Endsley & Garland, 2000).

2.4 Misfit and coping strategies

The case of unfit or misfit began to be studied according to the contingency theory (Gresov, 1989). The idea was to explore and predict the conditions under which designs of work units failed to fit with their context. Other studies deepen this concept of misfit by decomposing it into variables (Burton, Lauridsen & Obel, 2002) as situational misfit. In this paper, we focus on consequences of misfit on human decision making behavior.

In case of misfit, generation of a task solution shall be more problematic than before and result in causing stress to the DM. To this extent, the DM will have to cope with that stressing situation and we think it's relevant to have a look at the coping theory.

2.4.1 The Concept of Coping

The concept of coping first occurred in the mid sixties in the field of psychology (Folkman & Moskowitz, 2004), and had been made popular by the work of Lazarus & Folkmann (1984). When a number of people faced a stressing situation, a two step appraisal process occurred. The first assessment consists of giving sense to the situation and the second aims at dealing with the effects of this stress. More precisely, Lazarus gives the following definition *"Like stress, coping is an integral feature of the emotion process. It comes into play at the very start of the cognitive-motivational-relational process that generates an emotion when an appraisal has revealed a problem that must be dealt with"* (Lazarus, 2003)(p. 95). Folkman & Moskowitz (2004) (p.746) present a widely accepted definition of coping : *"as thoughts and behaviors that people use to manage the internal and external demands of situations that are appraised as stressful"*. Coping theory always evolves and a new branch has emerged: positive coping. Two main characteristics must be stated here: on the one hand, there is a temporal side of coping, according to which the decision maker manages the stress sometimes before being in situation; on the other hand, sense giving to an event is very important with regards to coping strategies.

A lot of research work has linked decision making and coping theory. In general, the idea is to examine the impact of negative emotions on decision making (Sayegh, Anthony & Perrewé, 2004). Others like Sweeny (2008) focuses on crisis

³ This concept has a known success in computer science with researches on "design pattern".

decision making and uses coping theory to predict decision outcomes. We are in line with that workstream which means trying to connect decision making in a specific context, decision support system and problems which are the outcome of non-adaptation.

2.4.2 Coping Strategies

As we stated earlier, we postulate that misfit between components of our model generate stress pushing the decision

maker to react by having coping strategies. But what are these strategies?

As Schwarzer & Knoll (2002) showed, four perspectives of coping can be found in literature:

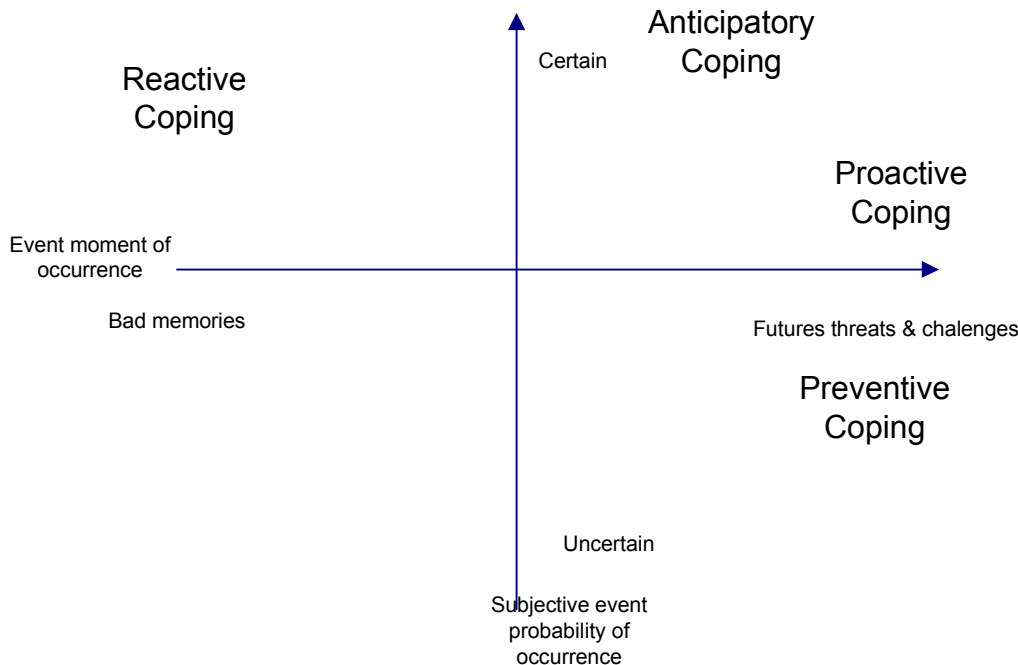


Figure 1 : Perspectives of coping (Schwarzer & Knoll, 2002)

All these perspectives lead to strategies of readjustment. In the specific case of a decision maker, these strategies have particular meanings:

- In the reactive coping, DM will try to manage the past event by compensating with other things in life or accepting the future as a fatality.
- The main difference between reactive coping and anticipatory coping is that the event has not yet occurred. So the behavior of the decision maker can be influenced before being in situation. So DM can try to gather all the information on his future challenge or he can reduce the threat by giving a more positive sense to the event. The Decision maker can try to reduce the risk by refining the situation.
- Preventive coping consists of the examination of all imaginable alternatives. For example DM can make many plans and assess all of them.
- In the proactive coping perspective, DM will focus on goals and not on risks. So he will try to find all opportunity sources to reach his goals.

In addition, the decision maker will reconfigure or degrade one or more elements to avoid stress. So evaluating the level of decisional fit can be extremely relevant to understand the behavior of the decision maker before, during and after an event. That can serve as a witness to detect misfit

3. The Decisional Fit Model

We would like to propose here our framework that allows us to study the link between a decision maker in natural settings and the performance of his decision. This model will be based on the following postulate: the performance of a decision depends on the fit of three elements:

- Decision Maker and his internal representation of a problem;
- The system which gives the DM an external representation of the problem;
- The problem itself via its characteristics.

Putting together these elements create a mental representation of the solution that will be directly applied to the problem. As a result, this solution will imply decision performance.

Our model has two main specificities:

- It is an attempt to bring together TTF and CF models. More precisely, DF model is a variation of the ECF model. We propose that if there is a misfit between task and technology for example, a cognitive misfit will be likely to occur.
- DF Model is also an actualization of ECG model focused on DSS and including new research findings on decision-making and on the behavior of Decision-makers (Naturalistic decision making and coping strategies).

We will detail now component elements of DF model.

3.1 Key Components of DF Model

Joining the Task-Technology Fit Model (Goodhue & Thompson, 1995) and its variations (Todd & Benbasat, 2000), as well as the Cognitive Fit Model (Shaft & Vessey, 2006; Vessey, 1991), our DF model includes the following components:

○ Decision Maker plays a critical role since he appears twice in our model: first, he is able to develop an internal representation of the problematic situation he is going to deal with. This internal representation depends, as regards of the TTF model, on individual characteristics as motivation, attitudes to risks, prior experience with the task and the decision model he learned during training times. Indeed, it has to be noted that such a model structures his vision of the problem. Second, the mental representation of the task solution is related to a recognition process, occurring in his mind. Two different kinds of decision makers can be found in literature: the expert and the novice. Many definitions can be found for the concept of expertise. Farrington-Darby & Wilson (2006) proposed as a large definition: “*Expertise can describe skills, knowledge or abilities, in tasks, activities, jobs, sport and games. It can refer to a process such as decision making or it can refer to an output such as a decision*”. We can say that expertise is the ability to know what we do not know. This is caused by learning and experience. On the contrary, a novice does not have an intelligible vision of the picture he is facing. As we see, there is a significant difference between expert or novice use of system, especially DSS (Hung, 2003).

○ Task: it’s a decisional task. Following the classical typology of decision making (Gorry & Scott Morton, 1989), we focus here on semi-structured decision making process for the two following reasons : first structured decisions do not need an interaction between DSS and decision maker, second, DSS is not so used to help non structured decision making. In that specific type of task, the task represents the work or the mission the decision maker has to accomplish including the situation he has to handle. This problematic situation requires decision maker to react – to make a decision. That is the reason why the DF model presents a double arrow linking task to mental representation.

○ DSS provides the external representation of the problem domain as well as the specific task it partly manages. As a result, we can see an arrow linking task and system. Human and machine are combined, making up a complex system. This explains the double arrow between these two elements.

○ Decisional behavior: it represents the result of the previous elements combination. Three main behaviors can be imagined. First, if there is a global fit then decision maker will perform a valid recognition primed decision (RPD) process. Second, if misfit occurs without DM realizes, he will make a non-coherent RPD process. In the third case, if DM feels the misfit, he will develop coping strategies.

○ Context is everywhere: it means that the cognition is situated in a specific context (Susswein & Racine, 2008).

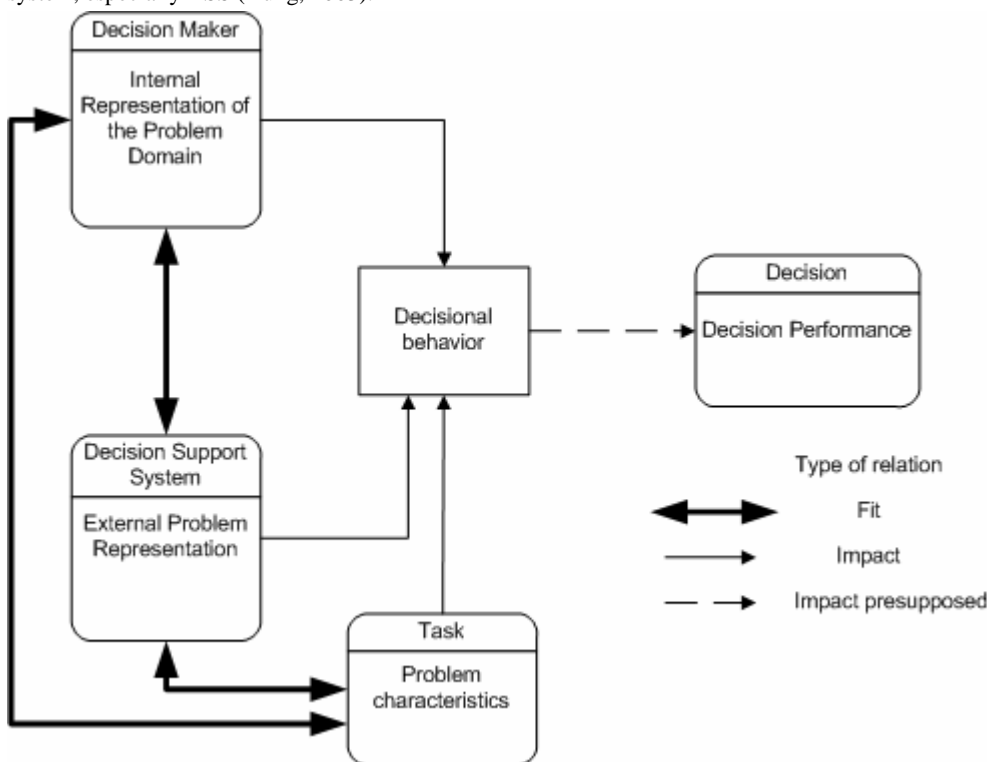


Figure 2 : General Decisional Fit Model

As we previously showed, there are three kinds of links. The first one represents fit relationships. The second one illustrates the results of the global fit (sum of the three fit relations). Once implemented, this task solution leads to a certain result affecting decision performance. As naturalistic decision making perspective argues, the importance of the task solution representation is crucial to decision making. However, we do

not focus on the study of relationships between a task solution and the performance of the decision, assuming that there is a positive relation: Fit – Adapted task solution – Decision Performance. In the next section, we detail these types of links.

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3.2 How Using Decisional Fit Model?

3.2.1 Nature of Fit: Fit as Gestalt

First of all, it is important to understand in-depth the nature of fit due to the fact that fit is a central criteria of the Model. Among the six perspectives of fit mentioned above, “Fit as Gestalts” perspective seems relevant for the two following reasons. First, it matches with the naturalistic decision making paradigm. We assess that decision making is the result of recognition of a situation, so the importance of this recognition process is predominant. Recognition process is a sort of image matching. As Adejumo, Duimering & Zhong (2008) mentioned “This approach considers the cognitive processes involved in the recognition or formulation of an appropriate representation of the problem structure enabling the solution to be obtained.. recognizing the appropriate problem structure coincides with obtaining the solution” (p. 83). That is the reason why we choose to rely on gestalt theory. Second, Gestalt theory is intrinsically a tested and solid approach. From Wertheimer (1938) to Fuller (1990), this approach has seen its evolution without changing its foundation: “Gestalt psychology views perception and other mental processes as holistic rather than atomistic in nature” (Schroeder, 2007).

The following tab describes what fit is in a gestalt vision:

Key Characteristic	Perspective of fit as Gestalts
Underlying conceptualization of fit	Internal congruence
Number of variables	Multiple
Analytical scheme(s) for testing it	Numerical taxonomical methods as cluster analysis or factor analysis
Measure of fit	Ordinal – Interval Measure
Illustrative references	

Tableau 1 : Fit as Gestalt

3.2.2 Assessing Relationships in the DF Model

As we mentioned above, there are three types of links in our model.

The first one represents the “fit relationship”. That means three relations can be studied:

1. Task and DSS (FIT1)
2. Decision Maker and DSS (FIT2)
3. Decision Maker and Task (FIT3)

An example can be useful here to understand how this model works. Nowadays, US Air force fighter pilots engaged in Close Air Support missions are supported by a modern DSS. The task will have to be adapted to this kind of mission (FIT1): e.g. are the specifics of the mission given to the pilot (with whom, against whom, the rules of engagements...) adapted to what the pilot can do and have been trained for? Concerning the FIT2, does image of the mission comply to the image displayed by the DSS? For the FIT3, is Decision Maker prepared to cope with this situation?

As we mentioned above, the criteria of fit takes in account is the “Gestalt”. That means that the measure of fit-misfit is based on image comparisons. To realize such comparisons, we use the Cognitive Task Analysis (CTA) method (Crandall,

Klein & Hoffman, 2006). Among the vast number of methods, we have made a selection according to the components mobilized.

We can assess the quality of fit by the following way

- FIT1 : a cognitive analysis of the human machine interface (Vicente & Rasmussen, 1992) ;
- FIT2 : a cognitive analysis of information processing (Rasmussen 1986)
- FIT3 : a cognitive reliability and analysis method (Hollnagel, 1998)

The level of fit-misfit determines the mental representation for the task. This mental representation can be evaluated in measuring the situational awareness of decision makers (Salmon, Stanton, Walker & Green, 2006). Many SAGAT method variations can be used here.

3.2.3 Using DF Model to Enhanced Decision Performance

As the following figure illustrates, there are two ways to use Decisional Fit Model in order to enhance decision performance:

1. Searching to reduce sources of misfit in order to limit the occurrence of coping strategies
2. Analyzing behavior to search for coping strategies and if such are discovered, then tracking the sources of misfit.

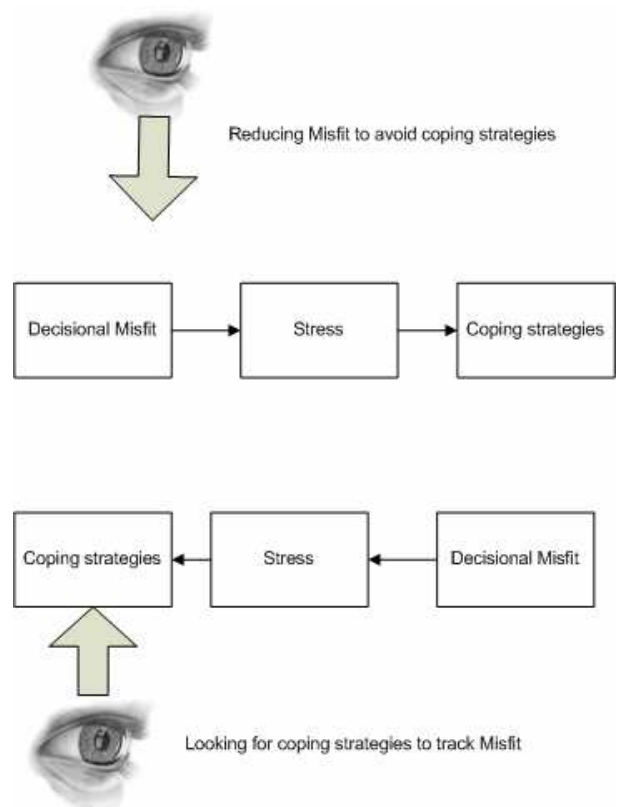


Figure 3: Two ways to use DF Model

4. Conclusion

In this communication, we aimed to present a new decision model based on the concept of fit. This Decisional Fit Model was a variation of the Extended Cognitive Fit Model and had two main specificities. First, it was an attempt to bring together CF and TTF model. Second, DF Model was an

actualization of ECG model focused on DSS and including new research findings on decision-making and on Decision-makers behavior (Naturalistic decision making and coping strategies).

Then we detailed the key components of the DF Model and explained the way to evaluate the level of fit or misfit.

We are currently testing this model on a specific field: pilots of the French Air Force still engaged in Afghanistan.

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