

# INTUITIVE DECISION THEORY ANALYSIS AND THE EVALUATION MODEL

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**Abstract:** Intuitive decision-making studies the decision-maker's decision-making behavior from the perspective of image thinking, which it poses a challenge to the classic decision-making hypothesis pursuing "optimal decision" because the outcomes of intuitive decision-making are difficult to measure and its process isn't easy to describe and control. Therefore it has not drawn the experts' attention. This paper tries to establish an evaluation model of the intuitive decision-making as to giving a direction and inspiration of the quantization of intuitive decision-making, based on the systematic analysis of the existing domestic and international theory of intuitive decision-making.

**Key words:** Intuitive decision-making, Thinking in images, The evaluation model

## 1. INTRODUCTION

The decision-making behavior theory divides human decision behaviors into the rational decision-making and the intuitive decision-making. The research on the theory of intuition with management, and decision-making has experienced a growing process from embryonic to maturity; Western scholars have carried out a lot of research work on it. In 1938, Chester Barnard published a book named "Functions of the Executive", in which he included a speech called "Mind in Everyday Affairs" in the Princeton in 1936. "Non-logical process" described in this paper lies on the basis of intuitive decision-making. In 1955, American scholar Simon proposed that there were a lot of "stimulate—response" decision-making styles in the process of the organization and management. This style is the initial intuitive decision-making model in a certain sense. Simon also thought that the rational decision-making and the intuitive decision-making are mutually complementary. If effective integration of the two decision-making models could be done, more "satisfied decision-making" could be made.

In china, researches on intuition have a long history, which concentrated on the scopes of philosophy, aesthetics and psychology. But as to the intuition decision-making, the research is comparatively lagging behind and the literature is rare. In these literature explicitly referred to the "intuitive decision-making"

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are some methods in fuzzy math. Chinese famous scientist Qian Xuesen had related enunciation, in his thesis issued in "China Social Sciences" in 1980 proposed that intuition in the process of creation is a thinking style that is different from rational thinking.

Currently for the concept of intuitive decision-making there is still no uniform definition It is usually described as another decision-making mode beyond rational decision-making which grasps the overall decision-making question through scenarios estimation and finds the satisfaction program through progressive deepening, based on decision-maker's experiences, affected by the combined effects factors such as decision-makers' cognitive model, knowledge, feelings and decision-making environment, etc. This paper tries to establish an evaluation model of the intuitive decision-making So as to give a direction and inspiration of the quantization of intuitive decision.

## **2. INTUITIVE DECISION-MAKING MODEL**

Intuitive decision-making is neither subjective judgment nor purely empiricism, but closely linked with the decision-makers' knowledge, experience, emotion, etc. From the point of view of managers, the root of the intuitive decision-making already exists in the decision- Makers' emotional awareness, knowledge structure, and cognitive model rather than in the collection of information. There are some factors which are important: experience , knowledge and emotion al memory.

### **2.1 Experience**

Experience is composed of education, training, and exposure to events similar to the current situation. Facts show that many senior managers are used to making decision with their experience. During the intuition decision-making process, the experience is usually associated with the same scenario estimation. Because the decision-maker's experience is like a huge database. When decision-maker faces the decision-making in reality which is similar to the condition in the database, he will estimate the current scenario based on the experience thus gained the decision-making results. Based on the determination of this scenario information, decision-maker seizes the key elements in the decision-making environment and the key factors during the decision-making process. And also based on it, decision-maker quickly matches it with the knowledge and experience to form a rapid decision-making.

### **2.2 Knowledge**

Modern psychology defines knowledge as the information and organization process that the individual has gained through interaction with the environment. Guided by this definition, the paper divided knowledge of the decision-makers into explicit knowledge and tacit knowledge. Explicit knowledge is the decision-making skills which enables decision-makers process information clearly and logically. Tacit knowledge is personal knowledge based on the cognitive activities, processes, tasks and methods, etc. It extracts from the decision-maker's beliefs, values and a vision of the future that can't be exoresed by language. During making decision period, tacit knowledge arouses the implied and self-evident knowledge through interacting with experiences and values. It closes to intuition.

### **2.3 Emotional Memory**

Emotional memory refers to the experience of decision-makers leaving the signs in the decision-maker's spirit space. When a similar situation arises, these signs will deepen and clear up. Neural scientific research has proven that emotional memory determines the quality of decision-making. Emotional memory originates from experience and memory and grows from mistakes. When an experienced

decision-maker encounters a question, he can focus emotion to a point. When similar situations are aroused many years later, he may not recall the specific incident and the process, but he can arise the past emotion.

Based on the above, we can sum up the intuitive decision-making model.

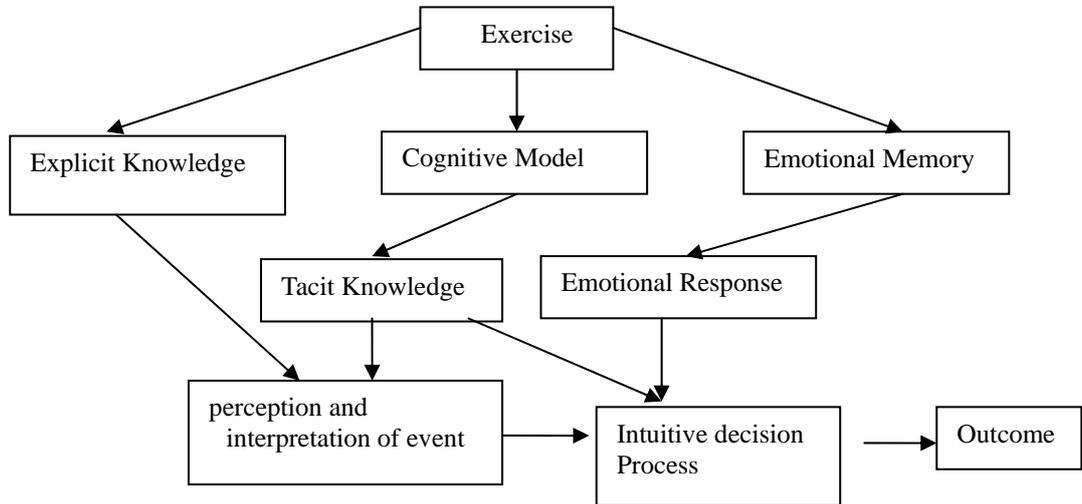


Fig 1 Intuitive decision-making model

### 3. INTUITIVE DECISION-MAKING EVALUATION MODEL

next we will try to build evaluation model to make quantitative analysis of intuitive decision-making.

Assumed that the biggest cost of accessing to knowledge, experience and other information of intuitive decision-making is  $I_m$ , the total cost of decision-making is a random variable  $K_r$ , and expectation cost is  $K = E(K_r)$ . When intuitive decision-making is completed, rewards will be gained in which value  $V$  is determined by the expectation of knowledge, experience and emotional factors, etc. We also assume that the expectation cost should obey the controllable diffusion process:

$$dK = -I dt + \beta(\Psi K)^{\frac{1}{2}} dz$$

In the above formula,  $I$  is the controllable expansion cost, and  $dz$  is increment of standards Wiener process. The mean value of the random parameters  $dK$  is zero and its variance is a linear relationship with decision-making standards  $\Psi$  and expectation cost  $K$ . With the knowledge and experience gradually improve, the uncertainties will be gradually reduced. If there is no cost ( $I = 0$ ), then the expectation cost of completing intuitive decision-making is the same ( $dK = 0$ ), thus we can get the simple relation between cost and variance:

$$Var(K_r) = \frac{\beta^2}{2 - \beta^2} K^2$$

Assumed that the  $V$  subjects to the geometric Brownian motion:

$$dV = \alpha V dt + \xi V d\omega$$

$\alpha$  means the instantaneous change rate of reward;  $\xi$  means the instantaneous fluctuation rate of the cost value, that is, the instantaneous standard deviation;  $d\omega$  means increment of Wiener process which is unrelated to the uncertainty of expectations cost.

Assumed that the probability of gained the knowledge, experience and emotional memory. Untimely is  $\lambda$ , then  $\lambda dt$  is probability of this incident occurrence in  $dt$  time. This is an independent Poisson process.

Recorded intuitive decision-making's compensation function as  $F(V, K)$ , we can get Bellman partial differential equations met by  $F(V, K)$  if we use cameras rights analysis method..

$$\max_I \left[ \frac{1}{2} \sigma^2 V^2 \frac{\partial^2 F}{\partial V^2} + \frac{1}{2} \beta^2 I K \frac{\partial^2 F}{\partial K^2} + (\alpha - \delta) V \frac{\partial F}{\partial V} - I \frac{\partial F}{\partial K} - (r + \lambda) F - I \right] = 0 \quad (3.1)$$

$(\alpha - \delta)$  means the instantaneous change rate after decision-making;  $r$  means risk-free interest rates. If  $\sigma$  means the uncertainty of rewards for intuitive decision-making and  $\beta$  means the uncertainty cost, then intuitive decision-making cost satisfies the following:

$$I = \begin{cases} I_m & \frac{1}{2} \beta^2 K \frac{\partial^2 F}{\partial K^2} - \frac{\partial F}{\partial K} I \geq 0 \\ 0 & I < 0 \end{cases} \quad (3.2)$$

partially differential equation (3.1) is linear to  $I$ , so the maximization cost  $I$  of reward must be equal to the cost  $I_m$ , or zero. Set the boundary value of decision-making cost as  $V^*(K)$ , when  $V > V^*(K)$ , then  $I = I_m$  or  $I = 0$ , and  $V^*(K)$  is part of  $F(V, K)$  solution, it satisfies the following equation:

$$\frac{1}{2} \beta^2 K \frac{\partial^2 F(V^*, K)}{\partial K^2} - \frac{\partial F(V^*, K)}{\partial K} - I = 0 \quad (3.3)$$

Therefore, when  $V > V^*(K)$ ,  $F(V, K)$  should meet the following equation:

$$\frac{1}{2} \sigma^2 V^2 \frac{\partial^2 F}{\partial V^2} + \frac{1}{2} \beta^2 I_m K \frac{\partial^2 F}{\partial K^2} + (\alpha - \delta) V \frac{\partial F}{\partial V} - I_m \frac{\partial F}{\partial K} - (r + \lambda) F - I_m = 0 \quad (3.4)$$

Otherwise, it should meet:

$$\frac{1}{2} \sigma^2 V^2 \frac{\partial^2 F}{\partial V^2} + (\alpha - \delta) V \frac{\partial F}{\partial V} - (r + \lambda) F = 0 \quad (3.5)$$

At the same time, the partial differential equations meet the following boundary conditions:

$$F(V, 0) = V \quad (3.6)$$

$$\lim_{K \rightarrow \infty} F(V, K) = 0 \quad (3.7)$$

$$F(0, K) = 0 \quad (3.8)$$

$F(V, K)$  must be continuous at the point of  $V^*(K)$ . Formula (3.6) indicates that the reward of intuitive decision-making is expectations value. Formula (3.7) shows that when the expectation cost is great, the possibility of implementation of the decision is little. Formula (3.8) indicates that when decision targets have no value, decision-making has no value either.

#### 4. CONCLUSION

Intuitive decision-making and traditional rational decision-making is indispensable from the decision-making theory. It will be an inevitable trend that the logical thinking way which pursues "Exquisite" decision-making model integrates intuitive thinking way.

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