The solution of excess ingredients in hotels deduced by extensible mind mapping

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Abstract. Aiming at the contradictory problem that the hotels' daily excess ingredient causes a lot of losses, which is contradictory to the profit purpose of ingredient, this paper establishes kernel model and Extensible model through Extensible theory methods combined with mind mapping. Through evaluating the characteristics of alike relative matter-element, making up comprehensive dependent functions and using Extensible transformation, we can get various solutions. And then, taking the matter-element characteristics as evaluation criteria, we can carry out the superiority evaluation to the solutions and finally get the superior solution.

1   Introduction

The ingredient of the hotel must ensure the freshness and quality of the ingredient every day. The daily excess ingredient is either sold to dealers at a discount, or thrown away. In any way, which causes a lot of losses, which is contradictory to the profit purpose of ingredient. The ingredient is not enough to meet the needs of daily operations, influencing hotel's normal running and makes a lot of losses. In order to keep daily operations, the hotel will purchase overmuch ingredient, but it will cause the waste of ingredient.

Extenics [3] is a new discipline based on the study of contradiction. Extenics method is used to analyze the contradiction, and find the superior solution. People continually study and discuss the using of Extenics from the various aspects of life. For examples, paper [4] studies the application of Extenics in self-service tourism. Paper [5] studies the application of Extenics in renting. Paper [6] studies the application of Extenics in job hunting. Besides, our team has developed a innovative software based on Extenics and has done some researches on innovative software architecture. We modeled Extenics Innovation Software by intelligent Service Components [7], developed Mobile Software for Extenics Innovation[8], did a research on web services-based Extenics Aided Innovation System[9] and came up with a method for self-adaptive software formal modeling by Extenics[10]. Extenics mainly uses Extensible transformation and comprehensive dependent function to generate the superiority evaluation and finally get the superior solution. These thinking and methods can correctly guide people to carry out innovative thinking activities in an effective direction. Extenics can effectively guide people to carry out innovative thinking activities, and this advantage makes up for the shortcomings of mind mapping. However,

Extenics is so abstruse and abstract to understand for normal people, so we should combine mind mapping and Extenics theory to solve contradictory problems.

Mind mapping [1], as a tool of creative thinking, has been widely used; Mind mapping can help people to analyze the problems in a hierarchical way. It can refine the problems and find the key factors to solve the problems. The establishment of mind mapping is beneficial for people to solve the problems in Systematic analysis and deep thinking, which is helpful to people's creative thinking. However, because its scope of thinking is too wide without any guidance and constraints, it causes the thinking process excessive divergence. Therefore, Mind mapping can't effectively control the innovation process in the direction of effective deduction. Freeplane [2] software is a visual tool of mind mapping. It can clearly show the whole thinking process of people. Whenever, as long as people have a new idea of thinking about their problems, they can record it on the software by themselves. Therefore, the software can make our thinking more convenient, clear and effective.

In order to solve the contradiction of hotels' excess ingredient, this paper will combine the theory of Extenics in Freeplane platform to model, transform and evaluate. In the end, according to the superiority evaluation, we will select the superior solution. The correct and effective combination of the Extenics and mind mapping will make our innovative thinking activities more convenient and efficient.

2   The steps of solving problem by extensible mind mapping

We solve problems by using the knowledge of Extenics to deduce a thinking tree on the Freeplane software platform.

2.1 Problem modeling

After a normal daily operation, the hotel had about 20 kg ingredients remains. per kg of the ingredient cost 6￥.The hotel can get 60% of the cost for refund if they return the remains ingredient to the supplier, which is not healthy for the development of the hotel. To make a profit, the weight of excess ingredient should control   lower than 25kg and the profits made by the selling of the food should be controlled   form the same as the cost to   twice of   the cost . In this situation, the promotion effect to the hotel is fine. Obviously, there is a question that the subjective desire is incompatible with the objective conditions. To solve this question, first step is to extend the contradictory problem to two kernel question, as it is shown in the picture.
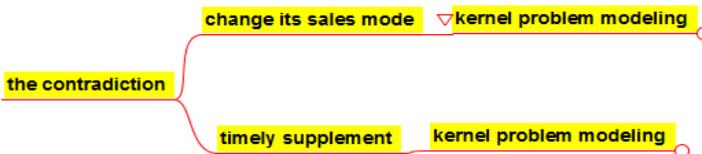

Figure1. Two Kernel Problems

We consider how to extend the shelf life of ingredient or other treatment to increase profit. For another kernel problem that the supplier timely supply supplement when the ingredient is not enough. Few suppliers can do that, so we don't refer to it in the following.

Furthermore, we extendedly analyze the kernel problem and establish the kernel problem modeling.   According to the theory of Extenics, we will set up the goal element, the conditional element and the dependent function.   As shown in the following picture:
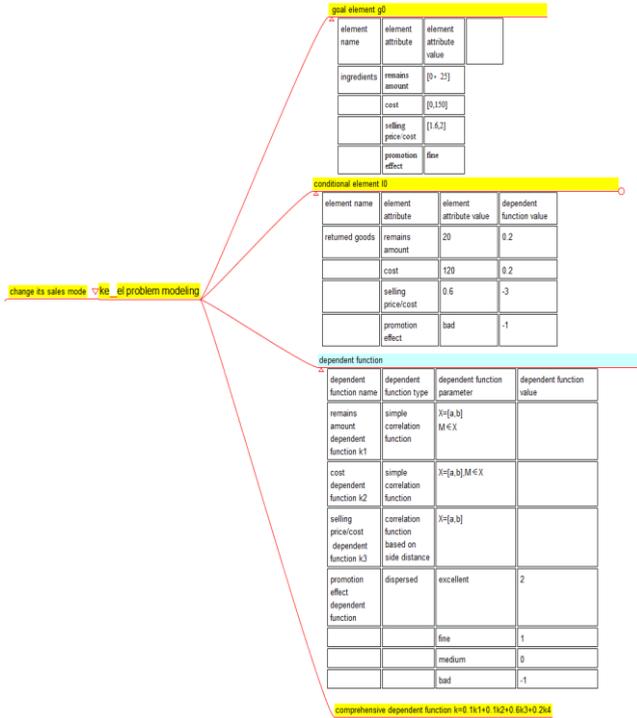
Figure2. Target Element, the Conditional Element and the Associated **Function**

It can be seen from the picture that the extensible modeling of kernel problem is P0=g0l0. Both of goal element and conditional element has some attributes. Set c1= remains amount,c2=cost,c3= selling price/cost,c4= promotion effect, X1=[0，25], X2=[0,150], X3=[2 [f1] *fator,2], X4=fine. The factor is c3's factor. We use it to form the satisfaction section so that we can screen out the strategy which has lower effect on the profit when we are forming final strategy. For now, we amuse factor is 0.6 which means X3=[1.2,2].

2.2 Establishment of dependent function

2.2.1 Establishment of dependent function about remains amount and cost

Generally, both of the remains amount and cost are as low as possible($0 \leqslant$ remains amount $\leqslant 25$, $0 \leqslant cost \leqslant 150$) when others factors meet demand. Thus, we need to create simple dependent function between remains amount and cost whose positive region is finite interval. According to paper[10] 2.7.6 session ,when the positive region is that X is <a，b> and $M \in X$, the simple dependent function is:

$$K(x) = \begin{cases} \frac{x-a}{M-a} & x \leq M \\ \frac{b-x}{b-M} & x > M \end{cases} \tag{1}$$

set x=20,a=0,b=25,M=0,the result of   the dependent function about remains amount is k=0.2; set x=120,a=0,b=150,M=0,the result of   the dependent function about cost is k=0.2

2.2.2 Establishment of dependent function about selling price/cost

According to the paper [11], set X3=[1.2,2] and the best value is x3=2, and it obtains   the right distance .

$$\rho(x, 2, X3) = \begin{cases} 1.2 - x & x < 2 \\ -0.8 & x = 2 \\ x - 2 & x > 2 \end{cases} \qquad (2)$$

According to the paper [11], the other formulas are as follows:

$$\rho\,(\,x\,,X\,) = \left| x - \frac{a+b}{2} \right| - \frac{b-a}{2}\ . \qquad (3)$$

set X3=[a, b] and X=[1, 2].

$$D(x, X3, X) = \begin{cases} \rho(x,X) - \rho(x,X3) & \rho(x,X) \ne \rho(x,X3) \text{ and } x \notin X3 \\ \rho(x,X) - \rho(x,X3) + a - b & \rho(x,X) \ne \rho(x,X3) \text{ and } x \in X3 \\ a - b & \rho(x,X) = \rho(x,X3) \end{cases} \quad (4)$$

$$k(x) = \begin{cases} \dfrac{\rho(x,x_3,X3)}{D(x,X3,X)} & \text{other} \\ \dfrac{\rho(x,x_3,X3)}{D(x,X3,X)} - 1 & \rho(x,X) = \rho(x,X3) \text{ and } x \notin X3 \end{cases} \qquad (5)$$

Combining (2), (3), (4) and (5), the result is k=-3

2.2.3 Establishment of dependent Function about promotion effect

In this paper, we give grade descriptions of the promotion effect which are excellent, fine, medium and bad. The values are 2, 1, 0and -1.The established discrete function is as follows.

$$k(x) = \begin{cases} 2 & x = \text{excellent} \\ 1 & x = \text{fine} \\ 0 & x = \text{medium} \\ -1 & x = \text{ bad} \end{cases} \qquad (6)$$

When the excess ingredient is returned to the supplier, the value of promotion effect is -1.

2.3 Establishment of comprehensive dependent function

By establishing the comprehensive dependent function, we can judge the solution more accurately and find the root of the contradiction better. According to the above statement, the comprehensive dependent function is as follows:

$$K_P = ek_a + fk_b + gk_c + hk_d\ . \qquad (7)$$

k a, k b, k c and k d are the function values of each function. And e and f are the weight of remains amount and cost, because they are easily affected by objective conditions, such as weather, customers' favorite and so on , so their weight is 0.1. The g is the weight of selling price/cost, because The starting point of our solution is to increase profit,so the weight is 0.6.The h is the weight of promotion effect, it has a certain importance for the hotel, so the weight is 0.2.Therefore , Draw the following formula:

$$K_P = 0.1 \times 0.2 + 0.1 \times 0.2 + 0.6 \times （-3）+ 0.2 \times （-0.1）< 0$$

It is shown that the above problem is incompatible, so it is necessary to carry out extensible transformation. The following paper will give the Extensible transformation of the contradictory problem.

2.4 Extensible transformation

From the above statement, the reason of the comprehensive dependent function less than 0 is that the function values of selling price/cost and promotion effect are less than 0. In order to change the value of the two functions into positive values, the extensible transformation of the conditional element is carried out. The following is the condition extensible transformation strategy given in this paper:

Conditional element can be replaced with network good. With the rapid development of networking, online sale become more and more popular. The excess ingredients also can be sold in this way.

Conditional element can be replaced with bundling products, bundling means bundling other products together and selling them together. For most consumers' psychology, this strategy can bring more guests to the hotel.

Conditional element can be replaced with Promotional products, the ingredient as free promotional products for promotion can greatly enhance the promotion of the hotel.

Conditional element can be replaced with food which has longer storage time. Ingredients can be made into meatballs, cakes and so on, as long as the treatment is great, not only did not the hotel make the loss, but also the profits are not low.

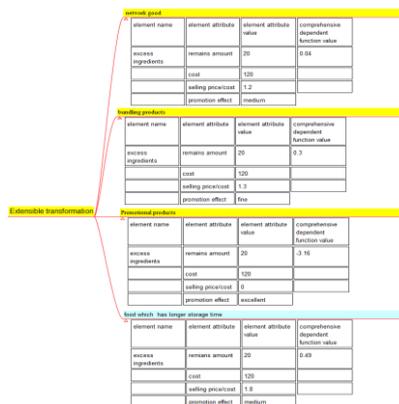The extensible transformation session are shown as follows through the Freeplane software.

Figure3. Extensible Transformation
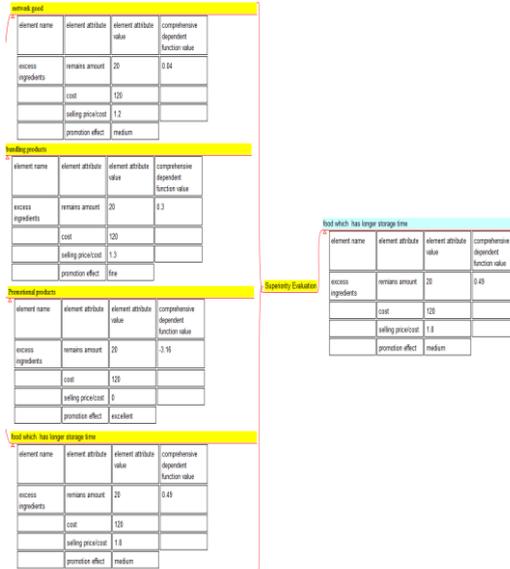
2.5 Superiority evaluation

Figure4. Superiority Evaluation

After extensible transformation, the four strategies can be evaluated according to the comprehensive dependent function. The comprehensive dependent function value of the forth solution is 0.49 and are greater than the comprehensive dependent function value of the other three solutions, so we choose the forth solution as the superior solution. Therefore, we can increase the profit of excess ingredients through the way.

Through the complete extensible thinking routes, we can see more clearly how the superior solution is deduced, and the routes are shown in the following figure.

Figure5. The Complete Extensible Thinking Routes

3   Conclusion

This paper focuses on the contradictory problem of excess ingredient that the excess

ingredient causes a lot of losses, which is contradictory to the profit purpose of ingredient. For this problem, we use Extenics theory combined with the mind mapping to solve it By the steps that are problem Modeling, Extensible transformation and superiority evaluation, finally we screen out the forth solution as the superior one. In conclusion, Extenics can correctly guide me to think in an effective direction. And the mind mapping can clearly show my thinking route, which make my thinking more efficient and more convenient. In the future, we can research how to combine Extenics and mind mapping to make a new Extensible mind mapping software which can solve most of the daily contradictory problems.

4   Especially thanks

5   References

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