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Building a Product Design of Innovative Strategy for Creating Enterprise Development

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Abstract

Purpose - Nowadays, the innovative design concept is being implemented in product design. In order to satisfy market trends and the demand for quality, designers should employ customer satisfaction questionnaires and analyze them with various experimental processes.

Research design, data, and methodology - These methodologies would help designers have a better understanding of their customers and judge the market size and clustering validity, by diverse product strategies, for dealing with the rapid change prevailing in the market today.

Results - By considering the innovative design with regard to telephones as an experimental case, the study investigates and demonstrates how the product can benefit from market-oriented and customized management concepts, when creative design ability is utilized for developing the product.

Conclusions - Along with the benefit of having an innovative product value, the product can stimulate progress inthe development of the enterprise management, which has emerged as the main issue in the area of social and economic development in every developed country.

Keywords : Fuzzy Theory, Innovation Design, Multi Criteria Decision Making (MCDM), Simple Multiple Attribute Rating Technology (SMART), Product Optimal Efficiency.

JEL Classifications : F31, F47, L83, L88.

1. Introduction

When facing this competitive era on product and globalization, it is important to create a design that will break the stereotype of traditional design process. This situation leads the team into innovation. The enterprises now face many management dilemmas and must take the team into internationalization, which means the application of creative product design to produce the varieties, functions, appearance, user, market compartment, price diversity, etc. in order to satisfy the demand of consumers. Basically, the process from taking the mode into practice to reveal the good fortune and convenience can precisely predict the technique development, demand, and service time (Tseng & Tzeng, 2002).

In order to help enterprises today dealing with multi purposes in the market, the modification of organization in product strategy is needed. The product design not only requires expansion on dimensions, but also the extent in different development levels. Pursuit of high productivity is a crucial step for an enterprise. Whether the enterprise can be sustainable depends on the transformation of innovative product design which plays an important role in this period. However, due to the limit on time and resources, the enterpriser cannot completely consider the problems of decision making.

The research model on traditional product design process is based on an optimization mechanism of choice. In substance, the calculation is based on a sequence of product design establishment. However, the strategy makers cannot understand the essence of the problem while facing a structural strategy problem, whether or not the optimization could calculate the result of product design. Whereas multi criteria decision making (MCDM) analyses tend to focus on the arrangement and distribution of purposes, especially under the situation that few coherent strategies were made (Carlos, 2004).

Previous researchers have developed various approaches to address this problem. For example, in the recent years, self learning and material exploring have become two of effective studying tools. These focus on the qualification course of strategy making, and the unpredictable environmental change instead of changing of time. Therefore, material exploring changes the way of knowledge acquisition, which has become an important way in work (Nakayma et al., 2005).

Next, according to Analytical Hierarchy Process, this study set up a product decision making system, Fuzzy set theory, and the Multi criteria decision making analysis in order to produce the best quality and best service for consumers, to establish the marketing predominance in the market, and to create the best benefit in product, show in Figure 1.

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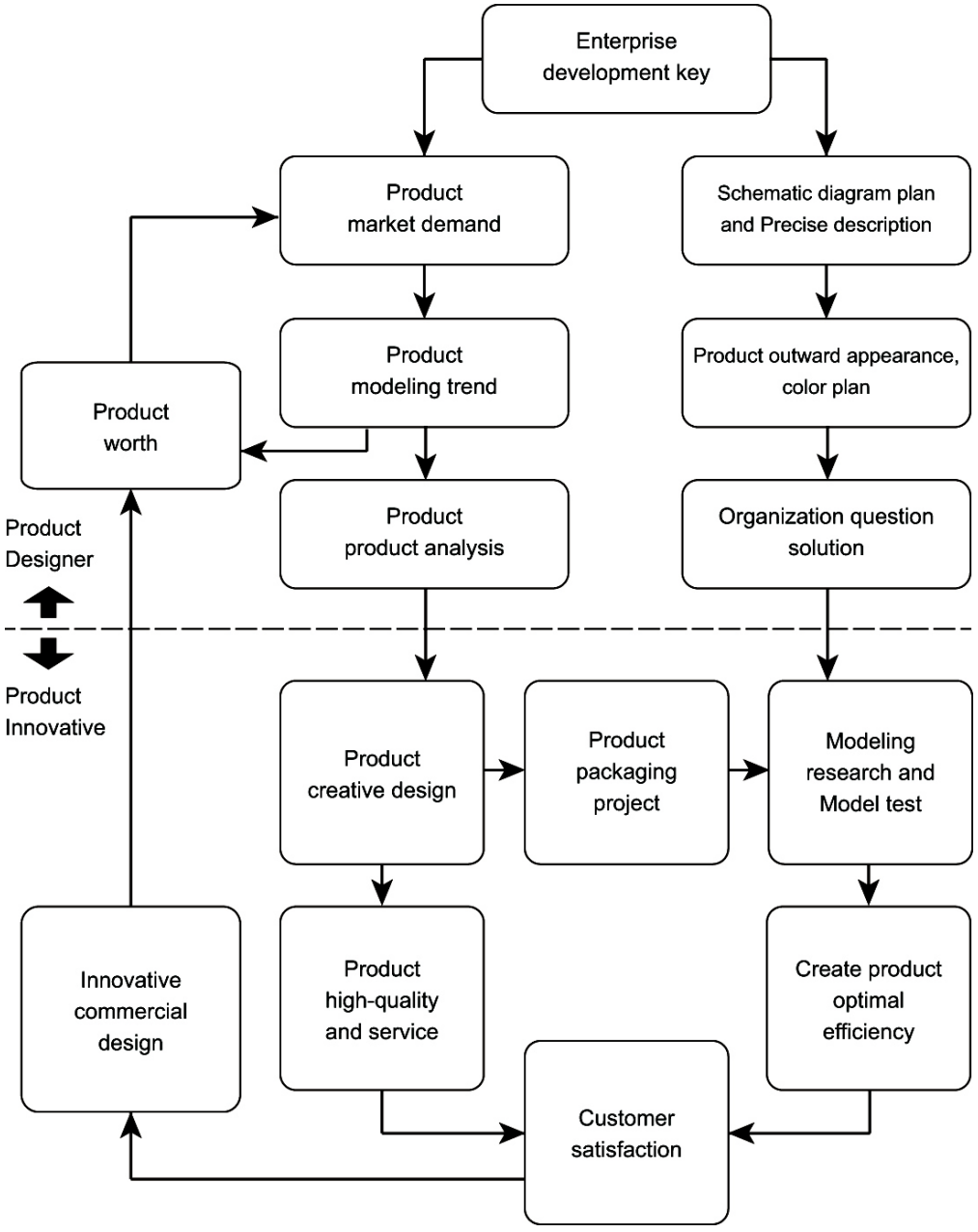
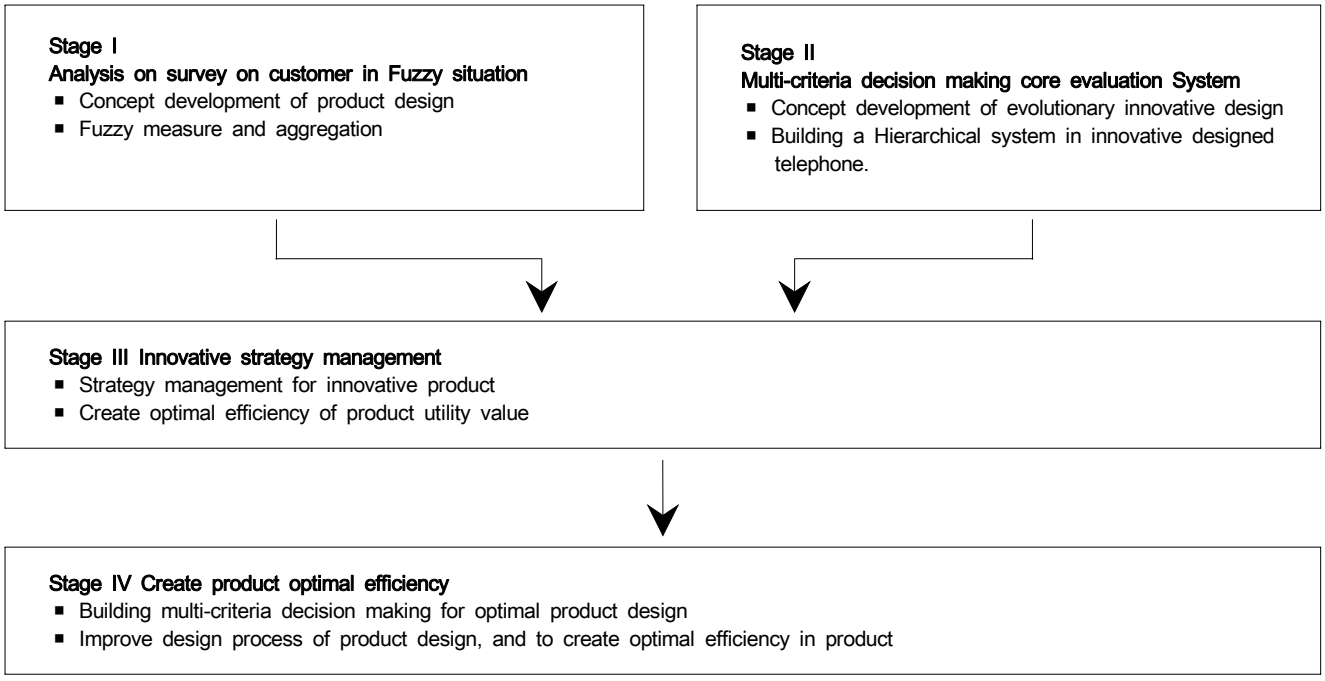


<Figure 1> Flow diagram of the proposed system

The rest of this paper is organized as follows. The review of strategic proposed method is discussed in section 2. Case studies 1: Data analysis and results in section 3. Case studies 2: Product decision making system in section 4. Section 5 presents a discussion of implementation and conclusions.

2. Proposed method

This research obtains valid questionnaires to be the research target samples. The researchers mainly focus on evaluating the preference of values among users. So the goal is to create a feasible progress chart in the shortest time to deal with problems encountered. Divide the research methods into four stages in this article, show in Figure 2.



<Figure 2> Implement phases of the proposed method

2.1. Method

Adequate information and data are needed while strategy makers' face the problems during the procedure of product design. However, the data or information may contain multi-uncertainty or Fuzzy situations hence, they have to adapt Fuzzy theory and MCDM theory analysis, that is, one kind of programs and techniques of designing plan to solve the problems in product designing. These methods depend on good knowledge models and expansion ability, which focus on limited, but effective sustainable learning (Simeonov et al., 2003)

2.2. Fuzzy measure and aggregation

The purpose of Fuzzy theory is to assist strategy makers in realizing the product quality for consumers' demands including safety, usability, price, function, material, main faculty, and etc., and also in simplifying the product. In addition, the product designers can know the demand model of consumers with using various design techniques and methodologies to complete the synthetic drilled by analyzing the appearance and color in nowadays in various products. Therefore the designers can solve the existing problems for product users; moreover, these processes can promote the design of product creation.

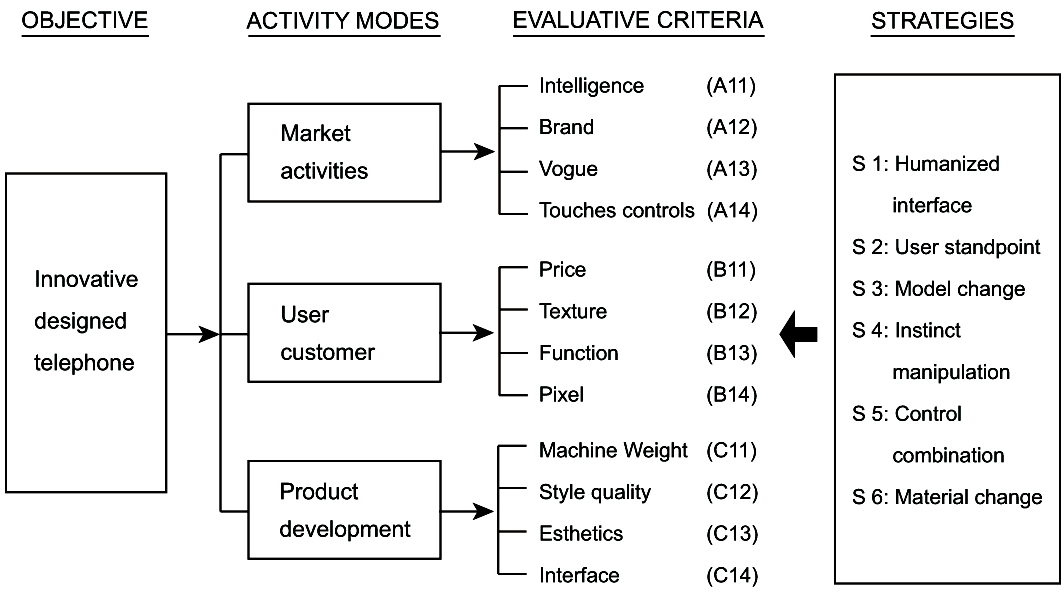
2.3. Concept development

During the process of development of evolutionary innovative in designing high quality products, the designers must understand the oral-required qualities of demandsand take those elements into consideration for the experimental samples. These elements include quality, usability, material, price, battery, and etc. The strategy makers enable to evaluate product designs by calculating these elements.

2.4. Building innovative telephone

A hierarchy system for Innovative designed telephone research focuses on a modeling approach and a set of mathematical tools that were derived from research on intelligence systems, namely, modeling. For each decision problem, a competence set is necessary and consists of ideas, knowledge, information, and skills for successfully solving the problem (Hu et al., 2003).

Evaluation methods not only are taken as a solution to the traditional product design, but also to modify the efficiency of the design itself. Therefore, strategy makers can get the division by dividing the available questionnaire replies according to their features, show in Figure 3.



<Figure 3> Building a hierarchical system in innovative designed telephone

2.5. Trategy management

After collecting the questionnaires, the researchers are going to quantify the product designing on the beginning of the experiment. We use Hierarchical Clustering to design a series of virtual creative products and services. Comparing with similar desire and demand, we have to divide various customers into groups. We can realize the demand intensity and propose so the overall product makes it convenient and practical to use for custormers. Moreover, we can realize the demand of customers and achieve the required service.

2.6. Create product design

The application of innovative design can stimulate the product design. Therefore, how to efficiently apply the innovative interface, to explore new usages, and to facilitate the users to use the interface intuitively have become the mainstream of design.

2.7. Building multi-criteria decision making

Multi-criteria decision making (MCDM) involves determining the optimal alternative among multiple, conflicting, and interactive criteria. Many methods are based on multiple attribute utility theory. For example, goal programming is an analytical approach devised to address decision making problems where targets have been assigned to all the attributes and where the decision maker is interested in minimizing the non-achievement of the corresponding goals (Nakayma et al., 2005).

2.8. Improve design process

Techniques for machine learning have been extensively studied in recent years as effective tools in data mining. Although there have been several approaches to machine learning, we focus on the mathematical programming approaches in this paper. The environment of decision making changes over time. Therefore, we have to revise knowledge obtained from data mining according to the change of environment. To this end, additional learning becomes an important task in machine learning (Hu et al., 2003).

3. Case Studies 1: Data analysis and results

3.1. Problem description

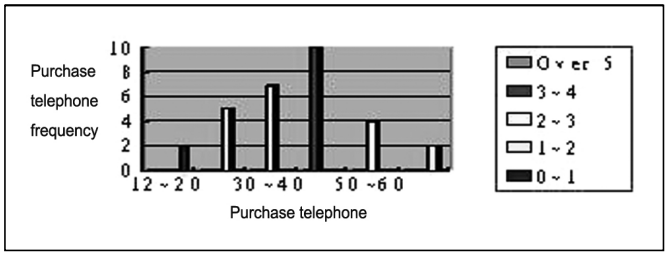
Analyze the demand of telephones according to Fuzzy situation. With the technological design, the product must be friendly designed in its HCI. It will be more popular in the screen of analysis. Innovative design telephone products can strongly accelerate the product design to new trend.

The esthetic value is highly praised in the innovative designed. With the combination of wisdom, fashion, and various materials, it can definitely get out of the stereotype of traditional ones to create a classic one made in high quality and humanized. Form inferring the innovative designed phone, we can list the rankings as Intelligence, Brand, Vogue, Touches controls, Price, Texture, Function, Pixel, Weight, Style, Esthetics, Interface, and etc.

According to Figure 2, the analysis task comprised of four stages:

(1) Analysis on survey on customer in Fuzzy situation
(2) Multi-Criteria Decision Making core evaluation System
(3) Innovative strategy management
(4) Create product optimal efficiency

It is observed that the least number of descriptions used is 60. The majority of the subjects were utilized between 60 descriptions. In usage of 60 descriptions, the choice of purchasing telephones was made most frequently for telephone ages/3 years, in Figure 4.



<Figure 4> Frequency distribution and Purchase telephone ages/3 years

3.2. Expression telephone of activity modes

Regarding to 60 descriptions, Figure 4 displays that the frequency distribution of descriptions are listed as purchases telephone brands, features in Market activities, Users' customs, Product developments, and expression support numbers. For example, innovative designed telephone screen and the features of innovative designed telephone play two of critical factors in the experimental outcome. This shows that the solution lies in the combination of feature design brand, A, B, C, and D.

The outstanding performance of innovative designed telephone brand in the competitive market is accomplished within the promising R&D and design according to the market.

3.3. Telephone brand and feature

The outstanding performance of innovative designed telephone brand in the competitive market is accomplished within the promising R&D and design according to the market and customer demands. Therefore, it is important to specifically realize the demand of customers according to their various demands, and to satisfy individual demands among all sorts of consumers. The 60 descriptions were mingled randomly and then provided to each expert, show in Table1.

<Table 1> Telephone brand and feature

Telephone Feature			
Brand	Market activities	Users customer	Product development
A	34	32	30
B	13	10	11
C	2	1	1
E	6	6	7

<Table 2> Innovative designed telephonefor evaluating criteria

Telephone feature evaluating criteria		
Elements	Frequency	Percentage
Market activities	6	10%
Users customer	23	44%
Product development	24	46%

The combination of designed feature in innovative designed telephone brand (A) gets the optimal efficiency in product design. It contains a completely profound function and system.

3.4. Determining of evaluating criteria

The researchers set up telephone branddecision system by decomposing the problem into a hierarchy of interrelated elements.

These 60 descriptions were evaluating criteria of designed telephone provided to each element, show in Table 2.

To combine of designed feature in innovative designed telephone for evaluating criteria Product development, 46% of the 60 descriptions reach the optimal Evaluating criteria frequency in product design.

<Table 3> Evaluating criteria of designed telephone

Evaluating criteria of users customer (0.1~1.0)				
Evaluating criteria elements	20~30 Ages	30~40 Ages	40~50 Ages	Mean
1. Market activities				
Intelligence	0.8	0.7	1.0	0.83
Brand	0.9	0.9	0.7	0.83
Vogue	1.0	0.8	0.6	0.8
Touches controls	0.7	0.7	0.7	0.7
2. Users customer				
Price	0.9	1.0	0.8	0.9
Texture	0.8	0.9	0.8	0.83
Animation Function	1.0	0.8	0.7	0.83
Pixel	0.5	1.0	0.6	0.7
3. Product development				
Machine Weight	0.4	0.4	0.5	0.43
Style quality	0.8	1.0	0.9	0.9
Interface	0.7	0.8	0.6	0.7
Total	9.1	9.8	8.5	0.76

3.5. Evaluating criteria of designed telephone

This stage generates input telephonedata consisting of pairwise comparative judge of decision elements. The plan tested individually on Mode 1 Market activities: Intelligence A(11), Brand A(12), Vogue A(13), Touches controls A(14), Mode 2 Users customer: Price B(11), Texture B(12), Function B(13), Pixel B(14), Mode 3 product development: Weight C(11), Style C(12), Esthetics C(13), Interface C(14), and etc, show in Table 3.

<Table 4> Consumers preference of products

Group user hobby	User values
First group mode	Machine weight
Second group mode	Style quality
Third group mode	Price
Four group mode	Function

Calculating data from 60 descriptions, 6 customer groups demonstrate five main means which are 0.06, 0.15, 0.21, and 0.58 as their preference values. In addition, Machine weight is 0.06, Style quality 0.15, Price 0.21, and Function 0.58, show in Table 5.

<Table 5> Number of descriptions supplied in each customer group

	Customer groups						
Third group mode	1	2	3	4	5	6	Mean
Machine weight	0.08	0.05	0.07	0.05	0.05	0.06	0.06
tyle quality	0.16	0.14	0.15	0.14	0.15	0.14	0.15
Price	0.21	0.18	0.24	0.21	0.19	0.23	0.21
Function	0.54	0.59	0.63	0.58	0.57	0.57	0.58

In Table 5, in order to get the final question point and then to solve the problem in Function, the researchers design the research method to achieve customer purchase product satisfaction.

3.7. Innovative strategy management

According to Table 5, using data from 60 descriptions, this analysis discloses on the elements of innovative designed telephones: Mode 1 Market activities: Intelligence(A11), Brand A(12), Vogue A(13), Touches controls(A14), Mode 2 User's custom: Price B(11), Texture B(12), Function B(13), Pixel B(14), Mode 3 Product innovative development: Weight C(11), Style C(12), Esthetics C(13), and Interface C(14).

Depending on the development of telephone industry, the necessity of low cost, high flexibility in the superiority of production, and the demand of humanized product should be controlled to influence the concept of design and the development of crucial modules enormously, show in Table 6.

<Table 6> Establish the user's telephone of performance matrix

Evaluation Strategy	Criteria Matrix											
	A11	A12	A13	A14	B11	B12	B13	B14	C11	C12	C13	C14
S 1: Humanized Interface	(0.8,0.6)	(0.8,0.7)	(0.7,0.7)	(0.8,0.8)	(0.9,0.9)	(0.6,0.6)	(0.9,0.9)	(0.6,0.6)	(0.5,0.5)	(0.9,0.9)	(0.8,0.8)	(0.7,0.7)
S 2: User standpoint	(0.8,0.8)	(0.7,0.9)	(0.8,0.8)	(0.8,0.8)	(1,0.9)	(0.5,0.6)	(0.8,0.8)	(0.7,0.7)	(0.6,0.7)	(0.9,0.9)	(0.7,0.7)	(0.8,0.8)
S 3: Model change	(0.6,0.6)	(0.6,0.9)	(0.8,0.8)	(0.7,0.7)	(0.9,0.9)	(0.7,0.8)	(0.9,1)	(0.6,0.6)	(0.7,0.7)	(1,1)	(0.8,0.8)	(0.6,0.6)
S 4: Instinct Manipulation	(0.8,0.7)	(0.8,0.7)	(0.6,0.7)	(0.7,0.7)	(0.8,0.8)	(0.8,0.7)	(0.8,0.9)	(0.8,0.7)	(0.7,0.7)	(0.9,0.8)	(0.7,0.7)	(0.7,0.7)
S 5: Control combination	(0.8,0.5)	(0.7,0.8)	(0.5,0.6)	(0.8,0.7)	(0.9,0.9)	(0.7,0.7)	(1,0.9)	(0.7,0.7)	(0.7,0.8)	(0.9,0.9)	(0.8,0.9)	(0.7,0.6)
S 6: Material change	(0.7,0.8)	(0.8,0.6)	(0.5,0.5)	(0.7,0.7)	(0.9,0.9)	(0.7,0.7)	(0.9,0.9)	(0.8,0.8)	(0.9,0.8)	(0.9,0.8)	(0.7,0.5)	(0.7,0.7)

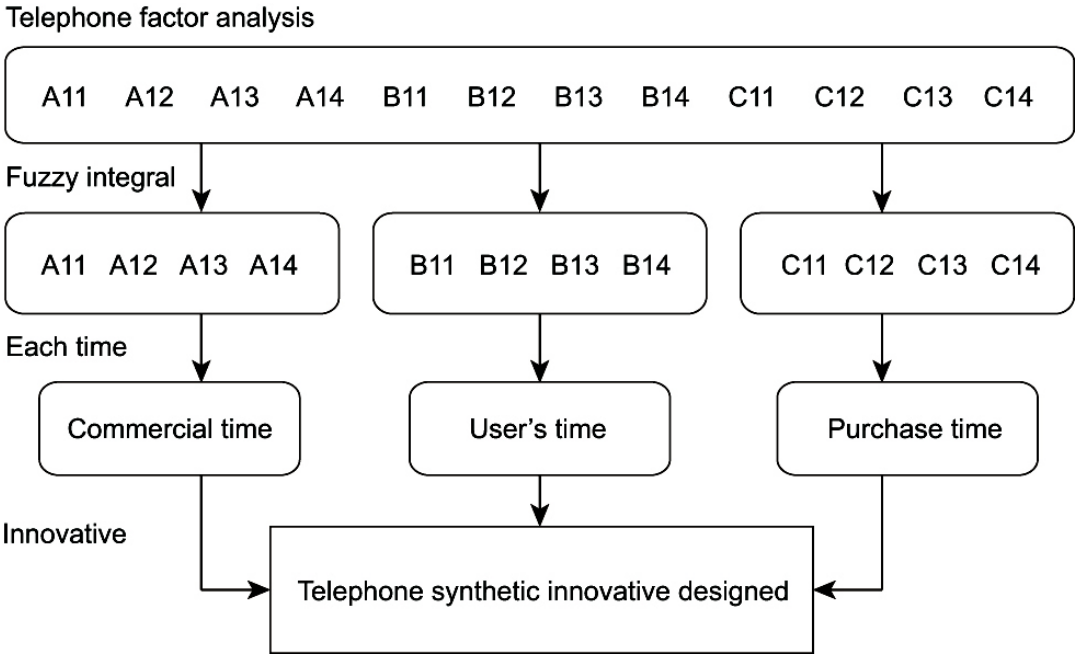
The results in Table 6 establish the user's telephone of performancematrix. Fuzzy sets are adapted in the strategy of business administration. Take telephones for an example, there are creative designs to choose in the establishment of production, all of which point to the division in Humanized interface, User standpoint, Model change, Instinct manipulation, Control combination, Material change, and etc.

Hence, according to the criteria quantification, it chooses the innovative plan as the optimal plan. It is optimal production. Considering the elements of price, benefit, and usage, it has more chances to choose the most appropriate plan. Therefore, in the actual design process, this study adapts the membership functions in Fuzzy Theory for searching the relevance between each feature and obtains the best result in quantification, show in Table 7.

<Table 7> Calculating telephone synthetic utilities

Evaluation Strategy	Telephone values of criteria												
	A11	A12	A13	A14	B11	B12	B13	B14	C11	C12	C13	C14	Mean
S 1: Humanized Interface	0.8	0.8	0.7	0.8	0.9	0.6	0.9	0.6	0.5	0.9	0.8	0.7	0.7
S 2: User standpoint	0.8	0.9	0.8	0.8	1	0.6	0.8	0.7	0.6	0.9	0.7	0.8	0.8
S 3: Model change	0.6	0.9	0.8	0.7	0.9	0.8	0.9	0.6	0.7	1	0.8	0.6	0.77
S 4: Instinct Manipulation	0.8	0.8	0.7	0.7	0.8	0.8	0.9	0.8	0.7	0.9	0.7	0.7	0.78
S 5: Control combination	0.8	0.8	0.6	0.8	0.9	0.7	1	0.7	0.8	0.9	0.9	0.7	0.8
S 6: Material change	0.8	0.8	0.5	0.7	0.9	0.7	0.9	0.8	0.9	0.9	0.7	0.7	0.77
Total	4.6	5.0	4.1	4.5	5.4	4.2	5.4	4.2	4.2	5.5	4.6	4.2	4.62

(A11)4.6, Brand A (12)5.0, Mode 2 User's custom: Price B (11)5.4, Function B (13)5.4, and Mode 3 Product innovative development: Style C (12)5.5 and Esthetics C (13)4.6, if the criteria are substitutive and independent, show in Figure 6.



<Figure 6> Innovative telephone measurements

4. Case Studies 2: Product decision making system

4.1. Product objective

According to Figure 3, the product design modelis adapted for stimulating the proper solution to satisfy consumers with various points of views. However, multi decision making theory would be widely adapted in the long term, uncertain environment. With this strategy, the decision maker can realize the optimal mode of the solutions to problems. So the designer must realize and analyze the features of product before making design drawing, including striking a balance between the relationship of cost and user satisfaction, which is highly emphasized in this research.

4.2. Activity modes

According to the telephone industry market and the coming Innovative management trend, the competition in the innovative telephone market will be for sure in the future. This activity mode include product design position and market strategy, product management, creation of R&D value, design of organization structure of R&D, performance management and development mechanism. So the decision maker must set the industry goal and strategy to reflecr market competition.

4.3. Evaluative criteria

Through using 60 descriptions and data from the user questionnaire survey form, in order to analyze innovative designed telephone, the product market can be divided into Market activities: value chain(A1), wise financial management(A2), product quality(A3), and research & development(A4); for User's custom: product management(B1), customized service(B2), marketing(B3); and for Product innovative development: R&D structure technique(C1), service quality(C2), management model(C3), and market environment(C4).

Telephone enterprise management ranks into 5 points. Which incluse: not important for 1 point, normal for 2 points, important for 3 points, and very important for 4 points, And the result reveals that important and very important are optimal in innovative designed telephone, show in Table 8.

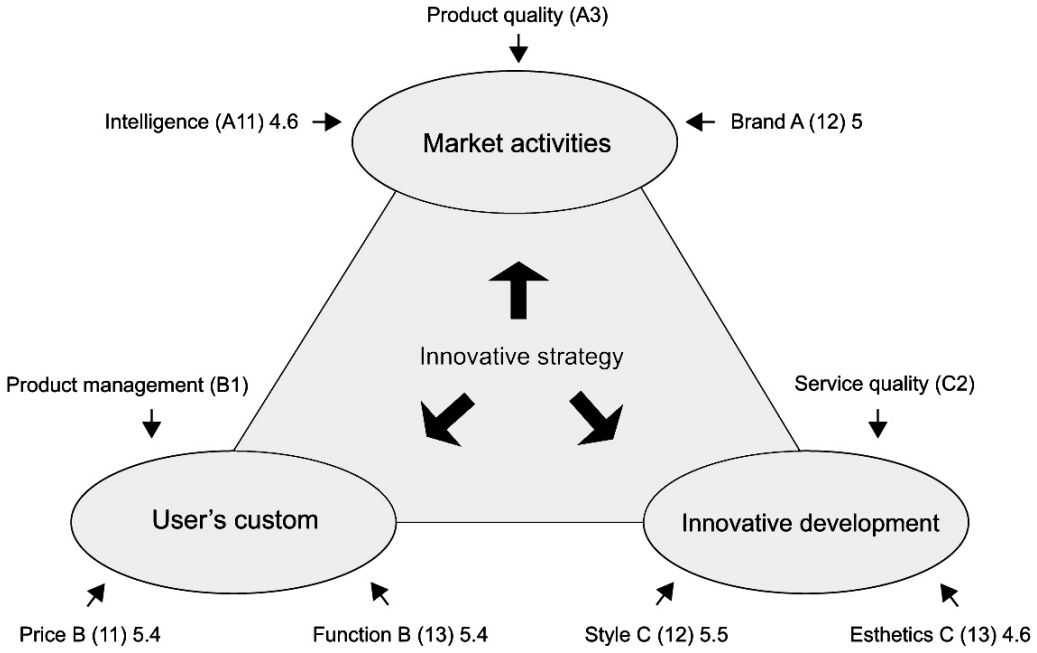
<Table 8> Innovative designed management

Innovative designed management												
	Market activities (A1~A4)				User's custom (B1~B3)			Innovative development (C1~C4)				Total
Item	A1	A2	A3	A4	B1	B2	B3	C1	C2	C3	C4	
Not important	4	0	0	0	0	4	4	4	0	4	0	20
Normal	18	6	9	6	54	0	9	18	45	9	12	340
Important	48	76	80	88	72	80	76	76	60	76	96	2268
Very important	25	45	35	30	50	40	30	15	50	30	15	1460
Sum	284	420	480	396	524	404	370	242	410	370	372	4088
Average	71	105	120	99	131	101	92.5	60.5	102.5	92.5	93	1068

The combination of Innovative strategy management of designed telephonefor Market activities: Product quality (A3), User's custom: Product management (B1) and Product innovative development: Service quality (C2) gets the optimal innovative designed management in product design.

4.4. Innovative strategy

Create product optimal efficiency, according to Table7 and 8, the evaluation of products requires the intent combination of design techniques and user's, complete understanding of industry dynamic, application of management of innovative designed telephone management to users, integration of the interior and exterior resource, and establishment of organization construction. Therefore, it is necessary to create optimal product and customer value during enterprise transformation, show in Figure 7.



<Figure 7> Innovative strategy

5. Discussion

As discussed, with the change of consumer's usage, the design trend of innovative designed telephones changes as well. Hence, the newly touch screen technologies have shown up. In the present study, we wish to improve the human-computer interaction benefit from the innovative screen. Therefore, how to explore the potential function demand of consumers providing innovative solutions and integrate the systems has become the challenge of designers.

In Figure 3, Hierarchical system in innovative designed telephone, discusses the confirmation of demand items first by the method of evolution of innovative designed telephone, including making the demand items of users, collecting the demand widely, selecting the demand items, categorizing the demand item,

and etc. Depending on these procedures, this study successfully createsthe design value of production through technological innovation and creation of competitive advantages in strategy. And then the researchers observed the customer demands and propose the solution. Meanwhile, this study also applied diversity analysis to provide optimized efficiency by initiation of product efficiency and value.

The results of Figure 5, innovative telephonesynthetic innovative measurements, had shown telephonevalues of Fuzzy performance score with respect to criteria. This study explains that why the evolution of innovative designed telephone becomes the highest amongst the satisfaction of consumers. Known that the priority is the price and the second is the function.

In Table 4, the preference of product consumers has shown the subject used at least four expression modes through deep analysis to understand the crucial customer demand of innovative telephone. Then with the relative analysis of combination of exterior demand and interior quality production, the key and imply the variables were controlled to improve the quality to these crucial points, like web phone, which has been highly emphasized in its vocal quality and delicate simple style.

Therefore, in Figure 6 and Figure 7, the research of innovative design telephone is in Fuzzy field in the beginning. MCDM system is mainly applied in using strategy to make product design and in setting the product standard. First, we systematically transform customer demand into product feature, and then expand to every part, and to plan the production process, controlling the manage points in each stage. Hence the designer can be suitable to customer demand and can be promoted with the optimal product design.

6. Conclusion

Taking the case study of innovative designed telephone, this study has adaptedthe quantification solution like Fuzzy Theory, Hierarchical Analytical Process, MCDM theory, and product competition. Also, we emphasize customer demand to solve the problem, to design the optimal solution, to create the diversity to competitors, and to pursue the max sum.

Since this is a theoretical study, the results cannot be applied directly in the field of practical product design. However, in studies, the results of the present study are expected to provide a useful foundation with which to develop practical tools for innovative designin telephone form. In the design process of innovative designed telephone, some problems wait to be solved. And we must create innovative value, and get out of the dilemma, and to promote the strategy of new development of enterprise. With the promising thinking of wise financial management and customized management, we can promote ourselves by the creative ability through the process in the market, programming, and marketing, explore, and design, and make value chain become the most valuable factor in the design.

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