Fuzzy and Multi Criteria Decisions for Business Management in Product Design Industries

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Abstract

Purpose - This study illustrates research product industrial engineering, which needs to be promoted to encourage knowledge intensive businesses. Research traditions related to industrial business products and a fuzzy multi criteria decision approach in technology management for product design industries have undergone continuous changes over time. However, there is no clarity on the present situation, and there is a need to reform business enterprises.

Research design, data, and methodology - Using fuzzy theory and appraising multi-goal plans, the manner of promoting the competitive advantage of industrial businesses is analyzed using a case study. In the case study, various aspects are examined, such as product design and manufacture, fuzzy set decisions with multi attribute policy making, flaws in the present system, and a review of the related literature.

Results - New fuzzy and multi criteria designs can improve the existing keyboard by solving product problems, resulting in a clear and durable typeface for a creative LED keyboard.

Conclusion - Using a fuzzy set with multi attribute policy-making influences the achievements appraisal system and can help achieve the anticipated strategy goal of product design.

Keywords: Industrial Business, Fuzzy Theory, Tradition Product Design, A Fuzzy and Multi Criteria Decision, Product Design.

JEL Classifications: C02, C61, C63.

1. Introduction

In the past, the traditional industrial business was under impact and so economy and science and technology, the environmental trend is rapid, regarding in product design reforming and product production manufacture, thereupon had the very greatly obvious fluctuation change, but gradually had the very many products design question, for example, the traditional industry had massive outside moves and withers the phenomenon, therefore, how head for target the product design faced with, to move towards studies the development and the technical innovation primarily, could maintain the product at the international on competitive advantage. In this way, it aims to contribute to the further development of these fields of study and to serve as a vehicle for the effective interchange of knowledge, ideas, and experience between research and training oriented institutions and application oriented industry.

In this product industrial business intense competition environment, the maintenance product superiority, obtains the design product innovation technology, with develops the new product to induct the market, as well as facing to the industry, from traditional labor force crowded industry reforming for the high tech industry, will be able to have many products information not definite problem, simultaneously, the product appraised will have Fuzziness, In real world systems, the decision-making problems are very often uncertain or vague. Due to lack of information, the future state of the system might not be known completely. This type of uncertainty has long been handled appropriately by probability theory and statistics (Chiou & Tzeng, 2002).

In order to help enterprises today dealing with multi purposes in the market, industrial engineering maintenance economy continues to grow, the product new technology the creation and the investment, the promotion product design and the improvement product production technology, internationally causes the product in to be competitive. At present, the product design development technology fast development, appraised the product quality, will meet many products changes the environment and the procedure complexity, will cause the product policy maker to be unable all around to consider, will have the product question factor, and will make the effective product decision making, therefore, the traditional type policy maker will be able frequently to want to promote the itself product, but will invite many this product expert to participate in the plan the choice, In traditionally, these methods require the DM to express his or her preferences through precise ratio estimates. Yet in practice such estimates may be difficult to elicit, especially if the DM has indeterminate preferences or if the alternatives are not known well enough to warrant exact statements (Singh & Mohanty, 1991).

Previous researchers have developed various approaches to

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address this problem, in entire product industrial engineering best decision making process question, often when into pattern, but can have many Fuzzy regions, if not friendly with the appraisal technology and strategy, its result is the benefit is low, is unable at the right moment to assist the product policy maker to solve the problem. Therefore, product design application Fuzzy set with multi- attribute policy-making analysis, Fuzzy measures and Fuzzy integrals can analyze the human evaluation process and specify decision makers' preference structures. The Choquet Fuzzy intergral is a Fuzzy intergral based on any Fuzzy measure that provides an alternative computational scheme for aggregating information (Tzeng et al., 2004).

How solves the enterprise industrial business to obtain the best pattern, forms the enterprise the core ability, obtains the product long enduring competitive advantage, and gradually takes and the use for the product designer. The common enterprise frequently faces to the product decision making question, for example in the product cost, the productive time, the product achievement and so on each kind of aspect question, in has the condition criterion under the consideration, the regular meeting uses the traditional screening way, to carries on the multiple goal view by the numerous people, hoped in the multitudinous goal, selects a more suitable plan, carries on the assistance project evaluation and the decision making, Their methods overcame the difficulty of data collection for subjective importance identification. Although their methods work well, their questionnaire data requires Fuzzydensities and partial information about performance values (Tzeng et al., 2006).

This study enterprise industrial business is important in reforming, how friendly with the Fuzzy set with the multi attribute policy making process and the step, promotes to the product plan, accurate appraisal and product decision making analysis. Regarding the past legacy product, in the design and the plan work, often was in the multi goals the plan, has not performed to synthesize the consideration, to each product design different pitch point, had faced with the different situation value, had to consider between the product community the interaction, In fact, in our problem we can define the service level of the new facility as the number of customers whose distances from the new facility are desirable, and so the objective of our problem can be interpreted as the maximisation of the mean service level of the new facility (Javid & Davoudpour, 2009). Therefore, the product design in the multi goals Fuzzy environment, each goal achievements value, demonstrated with difficulty an explicit correct value, all had Fuzziness, this article proposed the Fuzzy multi goals decision making, the plan product design decision making pattern, in the goal effective addressing product design occurred sleepy difficulty.

Next, the rest of this paper is organized as follows: research tradition product of industrial business process of competence set in section 2, A Fuzzy multi criteria decision of technology management approach for product design industries business set in section 3, Expansion industrial business example in section 4. Discussion industrial business of implement in section 5 and conclusions industrial business are in the last section.

2. Traditional product design of industries business management

The choice tradition cabinet factory product design procedure, and establishes the related and so on collected works to gather by the traditional till machine shop, the product design plan route, from the beginning to end point, any node is the decision point. The designer also faces the different policy making environment, to ask in the policy making route the most suitable project approach, proposed that plans the law gradually.

The overall product design route carries on the appraisal route plan, considering the multi objectives the essences and characteristic, causing the product design decision model, conforming to the actual problem condition, and the use value, as Figure 1.

A = Procedure market numbers and past work experience.
B = Machine equipment costs.
C = Persons costs.
D = Material costs.
E = Production manuface costs.
F = Product quality.
G = Product market sales.
H = Sales product income.
Production profit = (Sales product income − Machine equipment costs − Persons costs − Material costs).
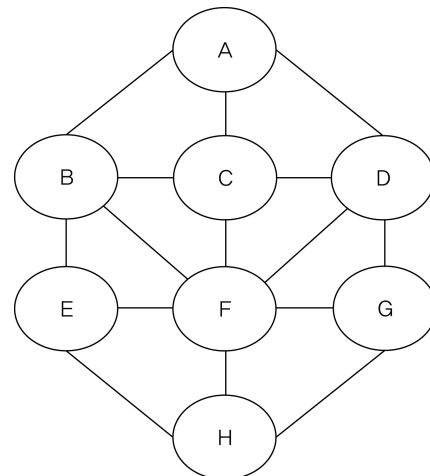

<Figure 1> Traditional product design of industries business management

3. A Fuzzy and multi criteria decision of business management

Due to the growth in the quantity of accessible textual information, and the growing importance of this type of information to business people and industrial engineers alike, the relevant text analytical method is also outlined (Uys et al., 2010). Thus,

product design industrial engineering in the work, often meets many designs bottlenecks question, must make the decision making immediately, solves the product to give rise to a question or problem, therefore, when the policy maker under pondered when wants the decision making, must rest on collects data of the material, however the material possibly is many Yuan not being clear about or saves is being Fuzzy.

Therefore, must the affiliation Fuzzy theory with the multi goals decision making method, the use design plan technology and the choice appraisal plan, the solution occurs product decision making question. When in the appraisal development product concept, the analysis product Fuzzy weight and Fuzzy gradually plans the law, carries on the product programming, from individual movement behavior, utilization machine equipment, product management goal and so on no matter in any situation, any time, can face the multi- stratification planes and product of decision making question the omni directional thought, therefore, is the solution question, use Fuzzy theory and multi- goals plan appraisal, its Fuzzy deduction overhead construction, as in Figure 2.

Step 1 Building product design systems
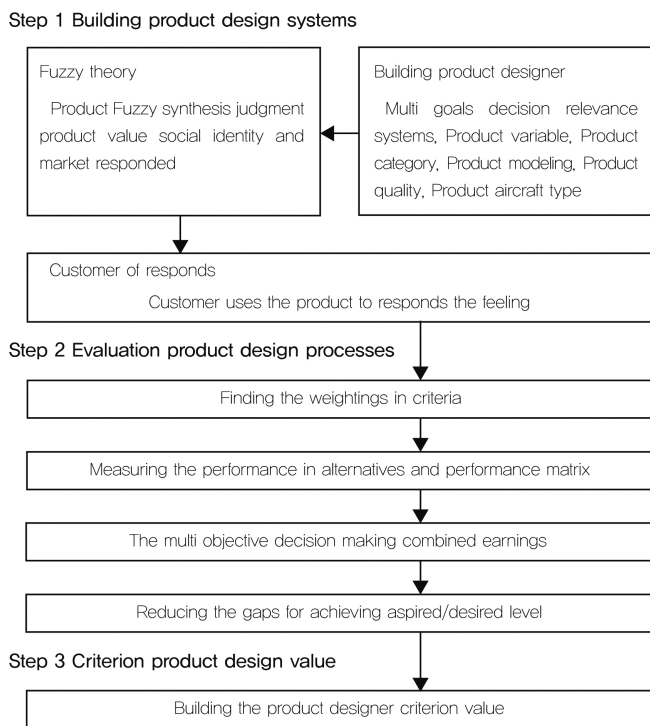
<Figure 2> A Fuzzy and multi criteria decision of business management

3.1. Building product design system

3.1.1. Building the product designer of multi goals decision relevance system

3.1.1.1. Each item of product variable is Fuzzy, First its explicit set transformation is the Fuzzy set, its process is penetrates the subordination function to perform to transform. Divides

into the product category, the product modelling, the product quality, the product machine kind by the product value goal and so on the variable, transforms each kind of Fuzzy operation, decided the product value, the society approve, the market response and so on three kind of variables.

3.1.1.2. Subscribes the fixing production quotas Fuzzy rule according to the product hypothesis the Fuzzy logic appraisal social stratum, when future actual operation Fuzzy deduction, has four kind of different Fuzzy rules, including the product value, the society approves, the market responded, as well as three variables conformity, becomes a complete product rule.

3.1.1.3. Product solution Fuzzy computation product uses this language to change the value to compare or the graduation, transforms it an actual value, this transformation computation process, is called the product solution to be Fuzzy.

3.1.1.4. Product most people decision-making ownership value product Fuzzy deduction system by belongs to the most people decision-making to obtain the ownership value.

3.1.1.5. Product quantification operation solution is Fuzzy, the product variable must through the quantification operation value which establishes, how should establish how many as for the quantification operation value, can affect the product deduction result and the accuracy.

3.1.1.6. Product decision making penetration establishes set of effective products the quantification operation values, does for the achievements appraisal product decision-making, the palm controls the enterprise to manage the achievements, and maintenance entire product productive forces.

3.1.2. Fuzzy theory

The customer uses the product to respond the feeling Fuzzy idea for uses in the product response feeling question in the customer, application Fuzzy theory logic deduction, if contains two or time two above blurred target, then belongs to the Fuzzy plan question, may use the type to indicate:

3.1.2.1. Fuzzy: Fuzzy G is three Yuan forewords groups

$G = (G, σ, μ)$
$G = (V, E, f)$ is approaches, also the G base, σ and μ respectively is two mappings
$σ:V → (0,1)$.
$μ:E → (0,1)$.
To wilfully e∈E, satisfied $μ(e) ≦ σ(μe) ∧ σ(Ve)$
μe and Ve expresses nearby the e two vertices
$G = (G, σ, μ)$ is a Fuzziness, the Fuzzy spot with equalizes taxes in (0, 1) in weight

3.1.2.2. Fuzzy spanning tree

Supposing T is G spanning tree, then
$G = (G, σ, μ)$, Named $G = (G, σ, μ)$ Fuzzy spanning tree

3.1.2.3. G Maximal tree

Regard, G All supports T, If has
$Σμ (e) ≦ Σμ (e)$

Then called T for G Maximal tree

3.1.2.4. Circuit's intensity

T each side weight minimum value
$\mu(e1) \; \varLambda \; \mu(e2) \; \varLambda \; \mu(e3) \; \varLambda \; - \; - \; - \; \varLambda \; \mu(en)$
Is called the circuit (Mu, V) intensity

3.1.3. Is called the circuit (Mu, V) intensity

3.1.3.1. Establishment product sets of sub factors

Product sets of sub factors U = {modelling, quality, cost, price, service}

3.1.3.2. Establishment product weight set

Judgment when judgment, is different to the product various factors' objective point, thus the judgment result is dissimilar.
A= (modelling, quality, cost, price, service)

3.1.3.3. Establishment product appraisal collection

Goal of the product judgment is the understanding clear customer to the product welcome degree. The total judgment's result should be each welcome rank. Therefore the product appraisal collection is:
Product welcome degree = {welcome very much, welcome, not too welcome}.

3.1.3.4. Single factor Fuzzy evaluation

The customer to each independent factor, makes the appraisal alone to this product, the Fuzzy vector respectively is R1, R2, R3, R4, R5, this product design single factor judgment matrix R.

3.1.3.5. Result of the Fuzzy synthesis judgment Fuzzy synthesis judgment is Fuzzy set

B = A∘ R

3.1.3.6. Judgment standard processing

Because sum of the judgment result various factors surpasses 1, must make normalized processing, may judge the result, changes the member to eliminate the denominator, the sum total 1, this normalized judgment product result obtains.

3.1.4. The customer of responds

The customer for uses the product response feeling degree, obtain the different product welcome degree percentage.

A% : the human welcomes this product.
B% : the human to welcome this product very much.
C% : the human not too to welcome this product.

The construction level analytic method and the simple multiattribute comment the quantity analytic method 1. To use the level analytic method and the simple multiattribute comment the quantity analytic method. Thus, customers have increasingly

more products to choose from and more channels through which they can satisfy their needs. In such an environment it is vital to ensure an exceptional customer experience, and to maintain this experience through delivering products and services according to customer needs (Botha & van Rensburg, 2010).

3.2. Evaluation product design processes

3.2.1. Finding the weightings in criteria customer of respond

3.2.1.1. Plan analytic method

Use simple multiattribute comments the quantity technology, is the policy maker when the choice product preferred plan, must consider product many kinds of different attributes, for the policy maker mind in the product value, when appraises the weight, first gives by the product importance arrangement, then aims at this importance to give by chance the value, obtains the policy maker product value function and the relative weight.

The multi objective decision making analysis the simple multi-attribute comments the quantity technology, chooses the hypothesis plan by the product, arranges according to the order gives the different value by chance, for example the first plan supposes is 100, the second plan supposes is 80, the third plan supposes is 50, uses this kind to establish the product weight number, as Table 1.

<Table 1> Plan analytic weight

Plan leaves	Product value	Weight computing mode
First plan	100	100/230 = 0.435
Second plan	80	80/230 = 0.348
Third plan	50	50/230 = 0.217
Assembling	230	1

Plan analytic method, uses in the product choice preferred plan order of rank, according to first plan, second plan, third plan and so on, first and the second appraisal criterion is 5, first and the third appraisal criterion is 7, second and the third appraisal criterion is 3, use hypothesis product weight number, as Table 2.

<Table 2> Plan mutually comparison

Plan mutually comparison	Appraisal criterion
First plan and second plan	5
First plan and third plan	7
Second plan and third plan	3

3.2.1.2. Helps the user model building makes the best product decision making

Hypothesis of after project evaluation and of the goal weight, then aims at the product plan to make the graph or the sensitivity analysis, from the numerous plans, chooses satisfaction solution a properly, is also the best product decision scheme.

3.2.1.3. Processes the multi objective variables choose the biggest product effectiveness the decision making

Fuzzy logic deduction, by computer auxiliary computation, if system's membership function, the rule designs are good, then may simulate the biggest product effectiveness.

3.2.1.4. Provides each kind of product analysis report form and plan sorting

Assists to appraise and to sort the complex plan, the product uses multi objective decision making analysis, passes through the multiattribute value utility theory, the multi objective decision making analysis, the value focal point ponder and so on different probability. The description provides the diverse analysis report form and sorting, the confirmation best product plan choice.

3.2.1.5. Structurizedand vision product decision scheme

Fuzzy logic deduction, when after the system structure design completes, the product must undergo the interaction with the multi spot appraisal, causingits project evaluation result, can conform to the actual condition, by the Fuzzy deduction system, carries on the case test, inspected obtaining the better product decision-making.

3.2.2. Multi objective product design evolutionary

In a company that designs for manufacture. By establishing links from quality results and customer requirements, the research determines what critical quality tools are necessary to determine the capability to manufacture an item without the use of excessive planning resources (Erasmus & van Waveren, 2009). The inscription auspicious company product main production tradition cabinet, the product type is primarily many, and has hundred suppliers to supply needs raw material. When inscription auspicious company programming product design procedure, mainly considers the product design modelling, the product cost, and the productive time and so on three goals, as a result of product system regulation work planning, consideration of overall corporate goal achievements value, therefore, the project approach is very numerous and diverse, the policy maker faces the choice, that one kind of good policy making question.

3.2.3. Measuring product design of performance matrix

A total systems approach is necessary to arrive at a meaningful framework for evaluating an organisation's performance in general and multibusiness companies in particular (Botha. & van Rensburg, 2010). Thus, the multi criterion decision making perfect matrix nowadays, is in a high competitive power time, the product policy maker by the multi criterion decision making analyticmethod, improves the internal potency, moreover each enterprise organizes internal various units, basically, still had the space which many need to improve, how the question was must internal various units, in order to produce high energy, from the union all material analysis, calculates an integrity, uses result which many input factors and many items deliver, im-

proves various units' potency, its implementation step.

3.2.3.1. Ownership of function and Fuzzy set definition and ownership of function product Fuzzy theory establishment tradition till factory product attribute, according to consumer demand, user attribute discrimination for quality level, cost level, value level and so on; The user receives differences for the low income, the income, the high income and so on Fuzzy theory ownership function.

3.2.3.2. The establishment product hives off the dendrogram to complete the goal which the product user hives off, displays age of level the user, if supposing the young people have the faith to be highest. Therefore the design develops the new product should aim at the young people most to have the opportunity.

3.2.3.3. Forecast that spot the goal plan chooses as the behavior enterprise making the product decision, uses the user's quantity of forecast goal, and plans the product design and the content properly, achieving the effect of the goal. The enterprise product uses the triggers Fuzzy set, in the product design production, is equipped with three plans, the five items target, and in overall product weight.

3.2.4. The multi objective decision making combined earnings

Material collection tradition till factory, takes advantage of the material collection, utilizing characteristics of the multi objective, and discovers the most suitable the answer. The product material collection establishes the tree structure drawing, the material input hypothesis, the preinstall by chance, steps and so on program analysis and appraisal, hypothesis goal, weight appraisal hypothesis, plan weight appraisal, and its hypothesis:

3.2.4.1. Product design project: Modelling, quality, cost, price, serves.

3.2.4.2. Participation population: 200 persons.

3.2.4.3. Expense classifications: Labor cost, material expense, equipment depreciation charge, sells tube expense, duty expense.

3.2.4.4. Goal weight method: Use the multiattribute to comment the quantity technology

3.2.4.5. Goal weight hypothesis the rank importance: The labor cost, the material expense, the equipment amortize, the tube expense, and the duty expense.

3.2.5. Reducing the gaps for achieving aspired and desired level

3.2.5.1. Condition classification

In the actual work process, product design plan, the ownership of the utilization Fuzzy theory function, discovers various attributes the relation, obtaining the most superior product design procedure plan, as Table 3.

<Table 3> Product condition classifications

Classification	Product consideration project
Product expense classification	Sales product income, machine equipment costs, people's costs, material costs, sells tube expense
Product design project	Modeling, quality, price, service
Product transportation	Highway, railroad, aviation, marine transportation, high valence iron
Product geographical environment	Science park area, emerging industrial district, develop the area

3.2.5.2. Enterprise name hypothesis: The input name hypothesis.

3.2.5.3. Increases the enterprise goal: Newly advanced technical management in industry goal.

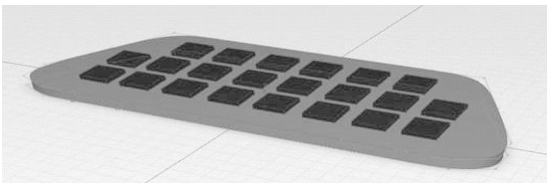## 3.3. Criterion product design value

The quota hypothesis and the qualitative hypothesis, like most is by chance the low product design final goal, in the pursuit of the highest profit, the lowest cost, the best quality, the best customer degree of satisfaction and so on, the thousandth of a clear criterion or the attribute, finally achieves the goal, and has crucial influence.

From the investigation material in the input form, the selection hypothesis product goal and utilization especially comments the nuclear effectiveness function, function of the use in advance by chance hypothesis, the choice project evaluation and the goal weight, the preliminary hypothesis completes, obtains the highest effectiveness result arrangement, and chooses the largest effectiveness value product preferred plan. Thus, corporate performance is inherently multidimensional in nature, is viewed from various perspectives, and has to satisfy multiple objectives. It is multi-dimensional in the sense of being a function of many variables that drive firm performance; multi-perspectival, from various stakeholders' standpoints; and multi objectives are to be optimised (Aburas, 2010).

4. Numerical example

4.1. Problems descriptions

According to an enterprise of keyboard product, using 30 customer samples of evaluative criterion, product design as Figure 3.

<Figure 3> Keyboard product

Due to the industrial market environment fast change the product market life cycle gradually reduces to the new product

design development and should grasp customer demand, establishes the Fuzzy multi goals plan pattern and obtains the product plans, best product most suitable solution. Facing the globalization competition and meager profit time approaching, only the design product most suitable solution, can promote the a enterprise product innovation value, design conforms to the customer demand product and the promotion product competitive ability, brings the best production efficiency for the enterprise and a bigger earning, and is the current enterprise manages the urgent topic.

4.2. Traditional product design factory of procedure plan

In traditional an enterprise, product design factory of procedure plan, as Table 4.

<Table 4> Traditional product design of procedure plan

Project	First plan	Second plan	Third plan
Every month sells quantity	1400	1800	2150
Each cost expense	4.1	4.8	6.5
Each consumption man-hour	22	35	52
Every month income amount	115	125	90
Each machine each minute	4	4	2
Production profit	84.9	81.2	29.5
A unit number	6.06%	4.51%	1.39%

Production profit = (Sales product income − Machine equipment costs − Persons costs − Material costs).

(Production profit / every month sell quantity) x 100%
= product a unit profitdegree percentage.

4.2.1. First plan project

Production profit = 115 − 4.1− 22 − 4 = 84.9
(84.9/1400) x100% = 6.06%

4.2.2. Second plan project

Production profit = 125 − 4.8− 35 − 4 = 81.2
(81.2/1800) x100% = 4.51%

4.2.3. Third plan project

Production profit = 90 − 6.5− 52 − 2 = 29.5
(29.5 / 2150) x100% = 1.39%

4.3. A Fuzzy and multi criteria decision of technology management for product design industries business

Tests step of the design 5 judgment target products evaluative criterion, establishes several design product appraisal criterion and applies in different item product design, take the 3 plans, as every plans, and using 30 customer samples to test.

4.3.1. Product design weight

Product weight of the Fuzzy logic decision making compared

to, deduces product of decision making merit in the achievements, the used product values, takes the examination appraisal the auxiliary decision making, and is more effective, has the basis way, carries on the Fuzzy deduction test, and inspects the better product decision making, as Table 5.

<Table 5> Product judgment target and weigh

Judgment target	Product sale	Product service	Product aircraft type	Product quality	Product modelling
Weight	25%	25%	10%	20%	20%

(a) Judgment target = (Product sale, product service, product aircraft type, product quality, product modeling).
(b) Project plans = (First plan, second plan, third plan).
(c) Judgment matrix = R = A product chance factor.
(d) Weightings = A = (0.25, 0.25, 0.1, 0.2, 0.2).

4.3.2. Product design of performance matrix

In traditional enterprise, product design of performance matrix, as Table 6.

<Table 6> An enterprise of Fuzzy and multi criteria decision of performance matrix

Project	First plan	Second plan	Third plan
Every month sells quantity	1400	1800	2150
Each cost expense	4.1	4.8	6.5
Each consumption man-hour	22	35	52
Every month income amounts	115	125	90
Each machine each minute	4	4	2
Product welcome degree	0.61	0.657	0.405

4.3.3. Product design of single factor judgment matrix

(a) Judgment matrix R
R = According to products 30 customers of evaluative criterion, product chance factor.

$$R = \begin{Bmatrix} 0.335 & 0.71 & 0.965 \\ 0.72 & 0.54 & 0.12 \\ 0.95 & 0.625 & 0.195 \\ 0.658 & 0.805 & 0.37 \\ 0.605 & 0.605 & 0.20 \end{Bmatrix}$$

B=A。R
B=A。R=(0.25,0.25,0.1,0.2,0.2)。

$$R = \begin{Bmatrix} 0.335 & 0.71 & 0.965 \\ 0.72 & 0.54 & 0.12 \\ 0.95 & 0.625 & 0.195 \\ 0.658 & 0.805 & 0.37 \\ 0.605 & 0.605 & 0.20 \end{Bmatrix}$$

= (0.61, 0.657, and 0.405)
After the normalization, is (0.61, 0.657, and 0.405).

(b) Product welcome degree = {welcome very much, welcome, and not too welcome}.
Product welcome degree = {0.61, 0.657, and 0.405}.

4.3.4. Synthesis for alternatives

According to Figure 3, A Fuzzy multi criteria decision of business management analysis industries engineering, each a unit profit:
(Product a unit profit x every month sells quantity x welcome degree) = Total profit
(a) First plan of product total profit
(6.06 % x 1400 x 0.61) = 5175.24
(b) Second plan of product total profit
(4.51% x 1800 x 0.657) = 5333.53
(c) Third plan of product total profit
(1.39% x 2150 x 0.405) = 1210.51
(d) Product profit degree = {profit very much, profit, and not too profit}.
Product profit degree = {5333.53, 5175.24, and 1210.51}
= {Second plan, First plan, and Third plan}.

4.3.5. Plan analytic weight

(a) Plan analytic weight = (Each plan welcome degree / toyal plan)
(b) Product total welcome degree = (0.61 + 0.657 + 0.405) = 1.672
First plan is 0.365, second plan is 0.429, and third plan is 0.206, uses this kind to establish the product weight number, as Table 7.

<Table 7> Plan analytic weight

Plan leaves	Each plan welcome degree	Weight computing mode
First plan	0.61	0.61/1.672 = 0.365
Second plan	0.657	0.657/1.672 = 0.429
Third plan	0.405	0.405/1.672 = 0.206
Assembling	1.672	1

4.3.6. Plan mutually comparison

Plan analytic method, uses in the product choice preferred plan order of rank, according to first plan, second plan, and third plan, first and second plan appraisal criterion is 1.267, first and third plan appraisal criterion is 1.015, second and third plan appraisal criterion is 1.062, use hypothesis product weight number, as Table 8.

<Table 8> Plan mutually comparison

Plan mutually comparison	Appraisal criterion
First plan and second plan	1.267
First plan and third plan	1.015
Second plan and third plan	1.062

(a) Plan mutually comparison = {welcome very much, welcome, not too welcome}.
(b) Plan mutually comparison = {1.267, 1.015, 1.062}.

4.4. Reducing the gaps for achieving aspired and desired level

Due to the competitive product market, designers should consider the factors like function, appearance, market compartment, and price diversity, etc. to create diverse products that make various consumers satisfy. Accordingly, it is a great challenge for designers in this competitive environment. It is singnificant that how they analyze the market status and performance to draw up the product positioning and strategy for creating new product value. The designers also need to understand costumers'requirements.

With the change of consumer's usage, the design trend for innovative designed. Hence, the newly technology management has shown up. This present study expects to improve the interaction benefit from the product innovation. Therefore, how to explore the potential function demand of consumers, that is, providing innovative solutions and integrating different systems, has become the challenge for designers, as Table 9.

<Table 9> Reducing the gaps for achieving aspired and desired level

Classification	Product consideration project
Product expense classification	Reducing disburses expense: Machine equipment costs, Persons costs, material costs, Production manuface costs
Product design project	Enhancement Product design: Modeling, quality, price, service
Product transportation	Complete transportation plan design: Highway, railroad, aviation, marine transportation, high valence iron
Product geographical environment	Product market sales: Science park area, emerging industrial district, develop the area

4.5. Criterion product design value

Criterion product design value, using a multi criteria decision making law attains the most suitable product industrial engineering procedure. The opportunity which and the customer links up assists the individual customer and obtains the actual product decision making demand guaranteeing correctly meeting each customer's need.

Furthmore the massive guests, innovate the idea to conform to demand of the user, providing an innovation product, This lets the customer rapidly obtain the product the information, and in the product packing design in view of each customer, differently presents the unique style of the product service which measures the body for the customer.

5. Discussion

5.1. Traditional product design of industries business management

In Figure 1, According to an enterprise of keyboard product, using 30 customers of results. Industries engineering the value in the producer demand, according to the past work experience and intuition feeling, low cost, easy to produce, standardization, and production profit.

As discussed, with the change of consumer's usage, the design trend of innovative designed changes as well. Hence, the newly technologies management have shown up. In the present study, we wish to improve the industries business 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.

5.2. A Fuzzy and multi criteria decision of business management

In Table 3, using decision making method for business management and appraisal technology by widespread application, from the product design feasible plan, penetratesing the set of choice procedures to appraise that various attribute relative importance, limit each feasible plan and center preferred plan.

In Table 4, When the product is much type, each method resting on the theory is not the same, in using different methods, applying the identical question, often can have different result, for multi attribute policy making method, for the policy maker in many products electron particle materialization or under the quantification appraisal criterion, this carries on the appraisal to the feasible alternative scheme, and decides fit and unfit quality of or the execution of each alternative scheme in the order of priority.

As Table 8 and 9, product industrial business uses the appraisal decision making, usually weighs the standard, only by smallest cost or biggest benefit sole target, but in many complex product design environment. The product question which the policy maker faces is day by day complex, simultaneously, often facing many conflicts goals.
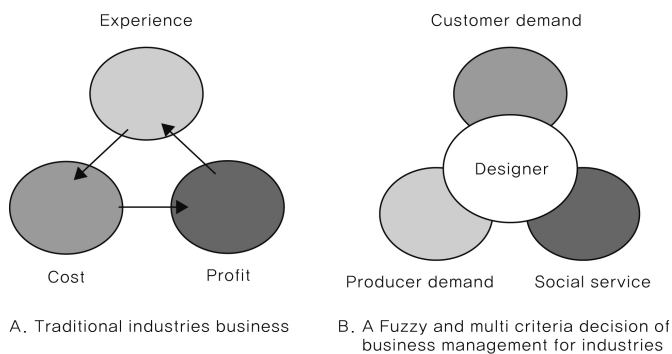
As Figure 2, In case the step illustration, product industrial business design decision making essence helps the policy maker in the limited feasible plan, according to each plan attribute characteristic. From the product feasible plan each plan makes a series of fit and unfit quality arrangement which are appraised and chosen, conforming to the product industrial business policy plan.

The results of Table 9 and 10, the product design industrial business pursues and creates the product massive guests to make the value, reducing the man power and the production cost, This rapidly provides the customer the ability to make the product, the conformity electron material exchange, the supply chain management, relates the management with the customer and so on to the link, uses the cross organization of the con-

formity synthesis effect, and by comparison the system product which rapidly provides the customer.

5.3. Both comparison tables

(a) In Table 5, traditional industries business management is first plan.
(b) In Table 8, a Fuzzy and multi criteria decision of business management of product design industries business the best project are second plan.
(c) both not same result of comparison tables, a Fuzzy and multi criteria decision of business management of product design industries business the best project is second plan superiorly in traditional industries business the best project is first plan, as Figure 4.

<Figure 4> Both comparison tables

A. Traditional product design industries business of composition factors: Experience, cost, profit.
B. A Fuzzy and multi criteria decision of business management of industries business of composition factors: customer demand, producer demand, social service.

5.4. A Fuzzy and multi criteria decision of product design for industries business management

In Table 3, keyboard product, people increasingly favor DIY (do it yourself) activities for two main reasons: first, hands on experience is enjoyable; second, user friendliness function. This new design can solve and improve the existing old keyboard product problems, into clear and durable typeface of creative LED keyboard product. The characteristics of creative LED keyboard product: Material: plastic, Reduced power consumption, Easy installation, Prevention of dust invasion problem.

6. Conclusion

In this research, traditional industrial business, product design makes the flow, decision making of time choosing better achievements. In fact, frequently can face many criteria, the multi people and questions, when the decision making enters

the complex environment, also some special factors, often affect policy maker's judgement, another item is a weight often receiving the environment variation to change. Therefore, managing policy making product question itself to fill Fuzziness. The use tradition industrial business statistics are stochastic, and carry on the appraisal in the process, often is unable to sufficiently share and express it, using the Fuzzy theory with the multi attribute policy making law; this solves the product design choice problem.

Taking the case study of optimizing product design, in solution product industrial business, multi goals decision making question, because the product designs middle, exists because it usually does not have the determinism, the complexity, the risk, and the conflict and so on. In addition the changeable factor causes the entire decision-making process to be more difficult. If uses the Fuzzy deduction and the correlation technology, appraising the feasible method and the multi-goals decision-making, solves in facing the product multi goals and the resources limited situation, and makes the best product design resources assignment.

However, the enterprise industrial business must in the conformity product design resource distribution, develop a set of product competition strategies from top to bottom, to the enterprise's product improvement whether achieved consumer's approval. Or not the product design stage has conformed to project and so on laws and regulations, authentication, included when the product designers considered.

Therefore, product design industrial business project analysis, appraised effectiveness and the customer degree of satisfaction obtain the maximum value, the benefit on behalf of the implementation wish, promotion product level and market competition strength, Therefore, the use of Fuzzy set with the multi attribute policy making method, causes the achievements appraisal system, and can achieve the product design anticipated strategy goal. When the hypothesis achievements standard produce the market goal, the best product choice design is the policy making foundation, so, it may maintain the industrial business competitive advantage and the product development.

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