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Full length Research paper

Multi-criteria decision of business management in product design industries

***Ziyang Xhoi, Cheng W. E. and Huang E. O**

Department of Creative Product Design, College of Arts, Nanhua University, Chaiyi, Taiwan 622.

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This study explores why some researches conclude that multi-criteria decision of business management approach is changeable with unclear condition and time in traditional product industries. It also helps the enterprise to face important reforms by using Fuzzy set with multi-attribute policy to make decisions in business management. These reforms construct an integrity product design operation pattern and the changeable solutions for unclear condition to deduce the best decision-making for the product design. The significances include how to friendly use the Fuzzy set with the multi-attribute policy making processes and steps, how to promote the product plan and how to accurately appraise product decision-making analysis.

Key words: Fuzzy theory, product design, multi criteria decision, traditional industries, business management, customer needs.

INTRODUCTION

In an intensely competitive environment, the product-design innovation business is maintained for the new product to be inducted into the market and to face some reforms in traditional labor force for the high-tech industry. This situation reaches a lot of indefinite infor-mation. Simultaneously, the product appraisals may be located in the Fuzziness. In the real world, the decision-making problems are very often uncertain or vague.

Today, in order to help enterprises deal with multi-purposes in the market, the maintenance economy for industries continues growing. This maintenance economy covers the new business, creation of investments, the product-design promotion, and the business for product production improvement. These factors internationally promote the products in more competitive forces and surroundings. At present, the product-design business is fast developing to assist in appraising the product quality and to meet many product changes alongside the environment and the production procedure complexity. However, these will make the product policy-makers not to have an all-around consideration. These made the all-round considerations not to naturally produce production question factors but to make effective product decisions. Therefore, the traditional type of policy makers will frequently want to promote their products but, at the same time, will invite many experts to participate in the production plan. Traditionally, these procedures require the decision-maker (DM) to express their preferences through precise ratio estimations.

Previous researchers have developed various approaches to address this problem, that is, how to find the best decision making process for questions in the entire product industries. This decision-making process often goes into patterns with many Fuzzy regions. Without friendly appraisal business and strategies, the outcome for product benefits is low. This situation refers to the moment when it is impossible to assist the product policy maker to solve the problem. Therefore, the product-design industries might apply Fuzzy set with multi-attribute policy-making analysis. Fuzzy measures and integrals can be used for analysis and evaluation of humans and to specify decision-makers' preference structures. Aside these, Fuzzy theories are also good equipments to explore how to solve problems in the

*Corresponding author. E-mail: ziyang.xhoi32@yahoo.com

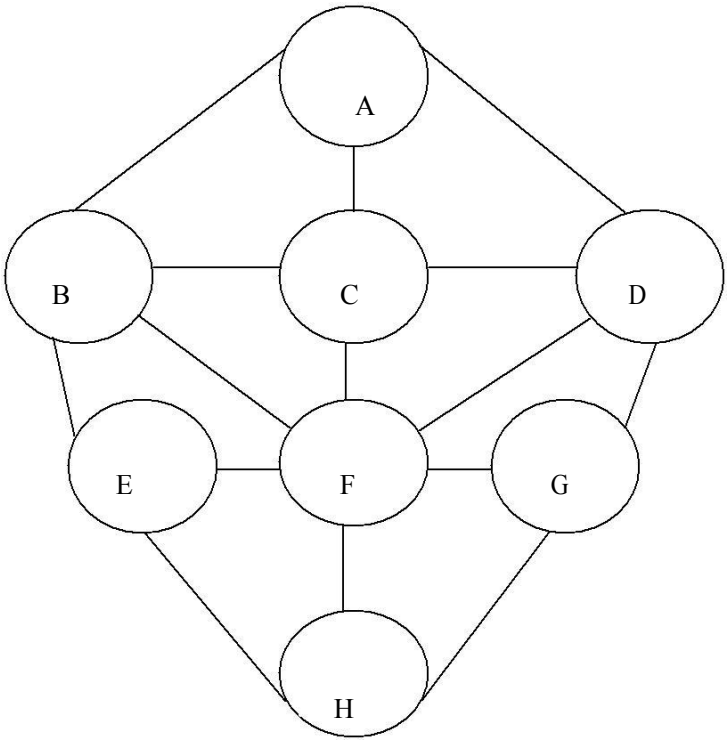

Figure 1. Traditional product design industries.

industrial enterprise to obtain the best pattern on how to form the core ability for an enterprise, how to keep the product at the longer enduring competitive advantage, and how to gradually take and use these purposes from the product designer. Many enterprises frequently face the product decision-making question. For example, costs and production time are usually considered so there are several condition criteria such as: the traditional screening way in the regular meeting, the multiple goals or views carried on by the numerous people for a more suitable plan, the assisted project evaluation to carry on, and the ability to make decisions.

For enterprises' reforms, this study is important because it contributes to the friendly use of the Fuzzy set with the multi-attribute policy making processes and steps, the promotion of the product plan and the achieve-ment of an accurate appraisal and product decision-making analysis. Regarding the past legacy product, the design and the plan often came with multi-goals in the plan. But the considerations were not synthesized because each product design had a different pitch point alongside with the different situation value. Thus, the enterprises had to consider the interaction between the product communities. In fact, the problems can be defined into the service levels of the new facility. As the number of customers whose distances from the new facility are desirable, therefore, the objective of our problem can be interpreted as the maximization of the mean service level of the new facility (Javid and Davoudpour, 2009). Therefore, the product design in the multi-goals Fuzzy environment and the value of each goal is demonstrated with some difficulties for an explicit and correct value because they all had Fuzziness. This article proposed the Fuzzy multi-goals decision-making, the plan product design decision-making pattern and the effective goal of addressing difficulty that occurred.

RESEARCH APPROACH

Traditional product design industries

For traditional cabinet factories, product design procedures usually gather works at the machine shop and each node in the product design plan routes, from the beginning to the end, is the decision point. The designer also faces the different policy-making environments to find the most suitable project approach and then gradually proposes the product-design plans.

The overall product design route needs to carry on an appraisal route plan through considering multi-objectives, the essences and characteristics to yield the product-design decision model and use the value (Figure 1).

A: Procedure market numbers and past work experience.
B: Machine equipment costs.

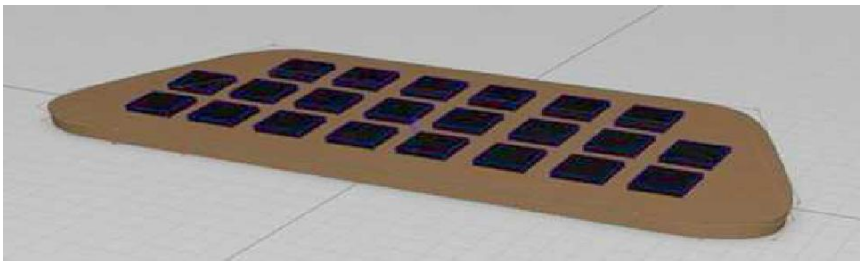

Figure 2. Keyboard product.

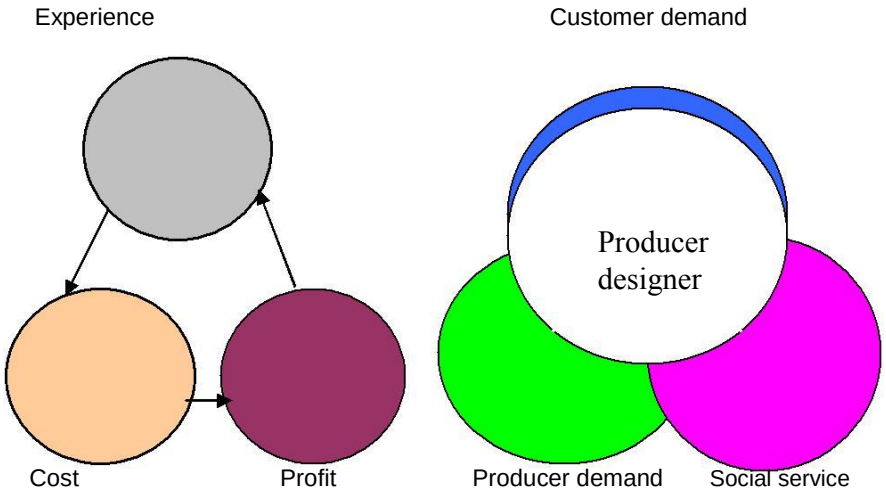

Figure 3. Result of both comparisons.

C= Persons costs.
D= Material costs.
E= Production manufacturing costs.
F= Product quality.
G= Product market sales.
H= Sales product income.

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

Multi criteria decision of business management

Product-design industries, in an attempt to make decisions immediately in order to solve the product questions or problems, often meet many design-bottleneck questions. Therefore, when the pondered policy makers need the decision, they must rely on the collected material data. However, the material data may cost much and are unclear. In other words, this condition is called Fuzzy.

LITERATURE REVIEW

In the past, the traditional industry was so impacted and so was the economy, science, or business. The environ-mental trend changes rapidly. Regarding the product design reformation and product production manufac-turing, very obvious fluctuations were observed, but gradually developed into many product design questions.

Traditional industries

The traditional industry, for example, has the pheno-menon of massive outside moves and withers. Therefore, how to head for the target, the product design it faces, and how to undertake studies about the development and technical innovation of traditional industry could primarily be used to maintain the designed product at internationally competitive advantages:

(1) 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 (Wu et al.,

2007).
(2) Due to lack of information, the future state of the system might not be completely known. This type of uncertainty has long been handled appropriately by probability theory and statistics (Chiou and Tzeng, 2002).
(3) In practice, such estimates may be difficult to elicit, especially if the DM has indeterminate preferences or if the alternatives are not well known to warrant exact statements (Salo, 1994).

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 industries, the relevant text analytical method is also outlined (Van Landeghem, 1988).

Fuzzy theory

(1) 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., 2006).
(2) Their methods overcame some of the difficulties encountered while collecting data for subjective important identification. Although, their methods worked well, their questionnaire data required Fuzzy density and partial information about performance values (Teng and Tzeng, 1996).

Customer needs

(1) 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 and Van Rensburg, 2010).
(2) In a company that designs for manufacturer by establishing links from quality results and customer requirements, the research determines the critical quality tools that are necessary to determine the capability to manufacture an item without the use of excessive planning resources (Erasmus and Waveren, 2009).

THEORETICAL FRAMEWORKS

In general, the Fuzzy theory must affiliate with the multi-goals decision-making method, the design-plan technology, and the appraisal plan. After these, the Fuzzy-theory solution occurs after having product decision-making questions. Based on the concept of product appraisal development, the Fuzzy uses weight to analyze each product, and gradually plans to produce the law to carry on the product programming from individual movement behavior to utilization machine equipments and product management goals. No matter the situation and time, enterprises can face the multi-stratification plans and product of decision-making question. The omni-directional thought, therefore, is the solution question that will be dealt with by using Fuzzy theory, multi-goals plan appraisal and its Fuzzy deduction overhead construction. All of these are presented in Figure 4.

Step 1

Building a product design system: Building a product designer

1. Each item of the product variable is Fuzzy. First, its explicit-set transformation is the Fuzzy set. Its process is to penetrate the subordination function to be transformed. The following variables are divided into product categories like: the product modelling, the product quality, the kinds of product machines and the product business value goals that are transformed by each kind of Fuzzy operation. In order to decide the product value, the society approves of it and the market responds to it.
2. According to the product hypothesis, the Fuzzy rule subscribes to fixing of production quotas. The Fuzzy logic appraisal social stratum has four kinds of different Fuzzy rules, including the product business value, the society approval, the market response, as well as three variables which conform to the complete product rule.
3. Product solution Fuzzy computation uses this language to change the value or transforms it to an actual value. This transformation computation process is called the product Fuzzy solution.
4. The Fuzzy deduction system belongs to those people who make most of the decision-making to obtain the ownership value.
5. Product quantification operation solution is Fuzzy; the product variable must go through the quantification of the business operation value which establishes how the business quantification operation value can affect the product deduction result accurately.
6. Product of decision making penetration establishes set of effective products, the quantification operation business values does for the achievements appraisal product decision-making, the palm controls the enterprise to manage the achievements, and maintain the entire product productive forces.

Fuzzy theory

The customer uses the product to respond to the feeling of Fuzzy idea for uses in the product response feeling question in the customer, application Fuzzy theory logic deduction. If it contains two or more products than that of the blurred target, then it belongs to the Fuzzy plan question that may use this type to indicate:

1. Establishment of the product sets of sub factors:

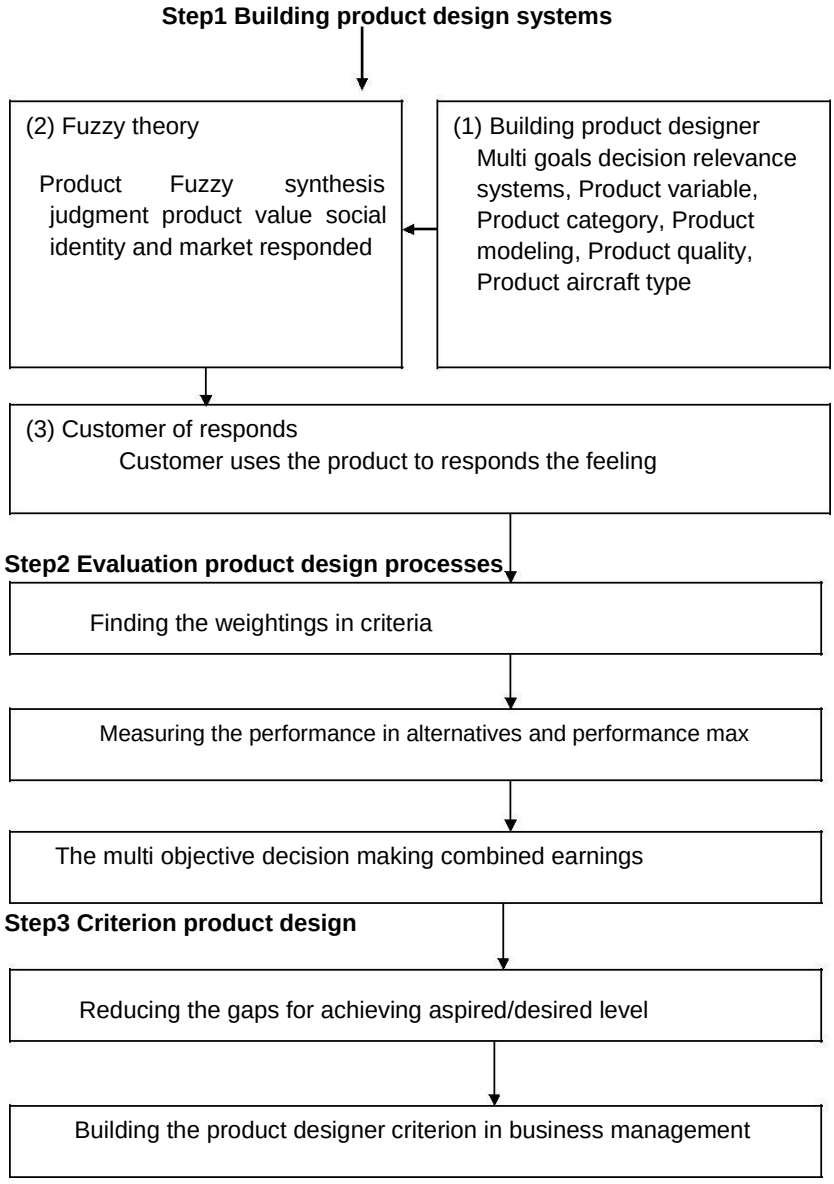

Figure 4. Criterion product design of frameworks.

Product sets of sub factors U= {Modelling, Quality, Cost, Price, Service}.

2. Establishment of the product weight set: When the judgment of the product is different from the various factors' objective point, the judgment result is dissimilar:

A= (Modelling, Quality, Cost, Price, Service).

3. Establishment of the product appraisal collection: The goal of the product's judgment is the clear understanding of the product by the customer to the product welcome degree. Each of the total judgment results should be given a welcome rank. Therefore, the product appraisal collection is:

Product welcome degree = {Welcome very much, Welcome, Not too welcome}.

4. Single factor Fuzzy evaluation: The customer to each independent factor makes the appraisal to this product unaided; the Fuzzy vector is R1, R2, R3, R4 and R5, respectively. This product design is matrix R for single factor judgment.

5. Result of the Fuzzy synthesis judgment: Fuzzy synthesis judgment is Fuzzy set $B=A_0R$.

6. Judgment standard processing

Because the sum of the judgment result in various factors that surpasses 1 must make normalized processing, may

Table 1. Analysis of plan weights.

Plan leaves	Product business value	Weights
First plan	100	100/230 = 0.435
Second plan	80	80/230 = 0.348
Third plan	50	50/230 = 0.217
Assembling	230	1

Table 2. Comparison of the mutual plans.

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

judge the result, changes the member to eliminate the denominator of the sum total 1, this normalized judgment product result obtains:

Customer response

The customer uses the product response feeling degree to obtain the different product welcome degree percentages.

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

The level analytic method and the simple multi-attribute quantity analytic method were used in this study. Thus, customers have more products to choose from and more channels through which they can satisfy their needs.

Step 2

Evaluation of product design processes: Finding the weightings of the criteria

1. Plan analytic method: The simple multi-attribute method is used to comment on the quantity business. With the preferred plan, the policy maker must consider the different kinds and attributes of a product before making the product's choice. For the policy maker's mind in the product business, when the weight of the value is appraised, it is first given by the product importance arrangement, then the policy maker aims at this importance to give the product value function and the relative weight. The multi objective decision-making analyzes the simple multi-attribute method that comments on the quantity business and chooses the hypothesis plan for the product, according to the order given by the different values, for example, the first plan's supposition for the product business value is 100, the second plan's supposition is 80 and the third plan's supposition is 50. This order is used to establish the product weight number as illustrated in Table 1. The Plan analytic method uses the product choice preferred plan order of rank according to the first plan, second plan, third plan, etc. It was observed that the first and second appraisal criterion is 5, the first and third appraisal criterion is 7, and the second and third appraisal criterion is 3. The hypothesis product weight number is illustrated in Table 2.
2. The user model building helps policy makers to make the best product decision. The hypothesis reached after the project evaluation and goal weight aims at devising a product plan through a graph, or carrying out a sensitivity analysis from the numerous plans. However, choosing satisfaction solution properly is also the best product decision scheme.
3. Process the multi objective variables and choose the product that recorded the best decision making. Fuzzy logic deduction by computer auxiliary computation implies that if the system's membership functions, the rule designs are good and may simulate the effectiveness of the biggest product.
4. Provide each kind of product analysis report form and the methods used to sort them out. Assistance is given to policy makers to appraise and sort out complex plans; they use the multi objective decision making analysis, through the multi-attribute value utility theory and the value focal point, to ponder on different probabilities. The description provide diverse analysis report forms and the methods used to sort them out, and also confirms the best plan for the product's choice.
5. Structure and vision of the product decision scheme. After the system structure design is complete, the product must undergo the process of Fuzzy logic deduction and interact with the multi spot appraisal for the project's result to be evaluated. The actual condition of the Fuzzy deduction system used to carry out the case test

determines the product's decision-making.

The inscription of the auspicious company about the product types is that they are primarily many and there are hundreds of suppliers wanting to supply raw ma-terials. In formulating the product design procedure, they mainly consider the product design modeling, the product cost, the productive time, etc., on three goals. Due to the fact that the project approach is very numerous and di-verse, the policy maker is faced with the choice of making good policies.

Performance measurement in alternatives and performance matrix

A total system approach is necessary to evaluate an organization's performance in general and multi-business companies in particular in order to arrive at a meaningful framework (Botha and Van Rensburg, 2010). Thus, the multi criterion decision making perfect matrix is in a high competitive power time nowadays. The product's policy maker improves the internal potency by the multi criterion decision making analytic method used by each enterprise in organizing various internal units; basically, there are still lapses in some units, as such, they need to be improved in order for them to produce high energy. However, the following implementation steps are required to improve the potency of various units:

1. The factory product attribute of the Fuzzy set definition of ownership function and the Fuzzy theory establishment of ownership function is determined by consumer demand, user attribute discrimination for quality level, cost level, value level and so on. The user receives differences for the low income, moderate income, high income, etc. on Fuzzy theory ownership function.
2. Establishment of the product hives off the dendrogram to complete the goal set by the user of the product, and displays the age of the user, though the highest number was displayed for young people. Therefore, in designing the new product, the young people should be mostly considered since they have more opportunities than the old ones.
3. Forecast the goal and plan of the enterprise, apply the user's quantity on the forecasted goal, and plan the pro-duct design and content properly, to achieve the desired goal. The enterprise uses the Fuzzy set in the product design process, equipped with three plans and a target of five items, in determining the overall product weight.

Multi objective decision making combined earnings

The factory takes advantage of the materials collected and utilizes the characteristics of the multi objective decision making to discover the most suitable product. The materials collected are used to establish the tree structure drawing, the material input hypothesis, the probability of the factory's reinstallation, steps of program analysis and appraisal, hypothesis goal, weight appraisal hypo-thesis, plan weight appraisal and its hypothesis as shown thus:

(1) Product design project: Modeling, quality, cost, price and services.
(2) Number of persons that participated: 200 persons
(3) Expense classifications: Labor cost, material expense, equipment depreciation charge, tube sales expense and duty expense.
(4) Goal weight method: Use the multi-attribute method to comment on the quantity of the technology.
(5) Importance ranking of goal weight hypothesis: Labor cost, material expense, equipment amortization, tube expense and duty expense.

Step 3

Criterion for product design: Reduction of the gaps observed in achieving the aspired/desired level

1. Condition classification: In the actual work process, the product design plan and Fuzzy theory function are used in discovering various attributes in relation to obtaining the product with the best design procedure plan, as illustrated in Table 3.
2. Enterprise hypothesis: The input name hypothesis.
3. Develop the enterprise goal: Newly advanced technical management methods are used in developing the industry's goal.

Building criterion product design in business management

The quota and qualitative hypotheses, like most hypo-theses, are used in determining the highest profit, the lowest cost, the best quality, the best customer degree of satisfaction, etc., but have a crucial influence on the achievement of the product's goal.

From the investigation of the material in input form, the best hypothesis was selected. The choice of project evaluation and the goal weight are the preliminary hypotheses used in obtaining the highest effectiveness of the product's preferred plan. Thus, corporate performance is inherently multidimensional in nature and is viewed from various perspectives to satisfy multiple objectives. It is multi-dimensional in the sense that it has many variables that enhance firm performance, though, its multi-perspective attribute from various stakeholders' stand-points and multi objectives are to be optimized (Aburas, 2010).

SURVEY DESIGN

Problem descriptions

According to the enterprise of keyboard product, the evaluative

Table 3. Product condition classifications

Classification	Consideration of the product's project
Product expense classification	Sales and product income, machine equipment costs, people's costs, material costs, and 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, developed area

Table 4. Traditional product design of procedure plan.

Project	First plan	Second plan	Third plan
Sales quantity of every month	1400	1800	2150
Each product cost	4.1	4.8	6.5
Each consumption man-hour	22	35	52
Every month income amount	115	125	90
Number of minutes used for each machine	4	4	2
Production profit	84.9	81.2	29.5
Unit number	6.06%	4.51%	1.39%

criterion of 30 customer samples is used for product design as illustrated in Figure 2.

Due to the industrial market environment, fast change in the product's market life cycle gradually reduces to the new product design development, thus, it grasps customer demand, establishes Fuzzy multi goals plan pattern and obtains the best product plans. With the competition facing globalization and the imminent meager profit time, only the most suitable product design can promote the innovation value of the enterprise product, create a design that conforms to the customer demand of the product, promote product competitive ability, and determines the best production efficiency for the enterprise.

Traditional product design factory of procedure plan

In a traditional enterprise, the procedure plan for a product design factory is illustrated in Table 4.

Production profit = (Sales product income - Machine equipment costs – Persons costs – Material costs)

(Production profit / every month sales quantity) ×10 0% = Product of a unit profit degree percentage

(1) First plan project
Production profit = 115 – 4.1– 22 – 4 =
84.9 (84.9/1400) ×100% = 6.06%

(2) Second plan project
Production profit = 125 – 4.8– 35 – 4 =
81.2 (81.2/1800) ×100% = 4.51%

(3) Third plan project
Production profit = 90 – 6.5– 52 – 2 = 29.5
(29.5 / 2150) ×100% = 1.39%
First plan project > Second plan project > Third plan project.

Multi criteria decision of business management approach for product design

Design of industries engineering

The tests steps of design 5 are used to establish several design product appraisal criteria and are applied in different item product designs, where the 3 plans are included in every plan, and the 30 customer samples is used to test the following:

1. Product design weight: Fuzzy logic is used to determine the product weight and examine the appraisal of the auxiliary decision making, and is more effective in carrying out of a Fuzzy deduction test and in determining the best product decision making as illustrated in Table 5.
2. Judgment target = (Product sale, Product service, Product aircraft type, Product quality, Product modeling)
3. Project plans = (First plan, Second plan, Third plan)
4. Judgment matrix = R = A product chance factor
5. Weightings = A = (0.25, 0.25, 0.1, 0.2, 0.2)

Product design of performance matrix

In a traditional enterprise, product design of performance matrix is illustrated in Table 5.

Product design of single factor judgment matrix

(1) Judgment matrix R: R = according to products, 30 customers of

Table 5. Product judgment target and weights.

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

Table 6. An enterprise of multi criteria decision of performance matrix.

Project	First plan	Second plan	Third plan
Every month sales 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

Table 7. Plan analytic weights.

Plan leaves	Each plan welcome degree	Weights
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

evaluative criterion, and product chance factor.

$$R=\begin{Bmatrix} 0.335 & 0.71 & 0.965 \\ 0.72 & 0.54 & 0.12 \\ 0.95 & 0.625 & 0.195 \\ 0.685 & 0.805 & 0.37 \\ 0.605 & 0.605 & 0.20 \end{Bmatrix}$$

$B=A \circ R$

$B=A \circ R = (0.25,0.25,0.1,0.2,0.2) \circ$

$$R=\begin{Bmatrix} 0.335 & 0.71 & 0.965 \\ 0.72 & 0.54 & 0.12 \\ 0.95 & 0.625 & 0.195 \\ 0.685 & 0.805 & 0.37 \\ 0.605 & 0.605 & 0.20 \end{Bmatrix}$$

= (0.61, 0.657, and 0.405)

After the normalization, we have 0.61, 0.657 and 0.405.
(2) Product welcome degree = {Welcome very much, Welcome, and Not too welcome}
Product welcome degree = {0.61, 0.657, and 0.405}:

Second plan project > First plan project > Third plan project.

Synthesis for alternatives

According to Table 2, a multi criteria decision of business management is used for the analysis of industries, where each is a unit profit:

(Product of a unit profit × every month sales quantity × welcome degree) = Total profit

1. First plan of the product's total profit
(6.06 % × 1400 ×0.61) = 5175.24
2. Second plan of the product's total profit
(4.51% × 1800 × 0.657) = 5333.53
3. Third plan of the product's total profit
(1.39% × 2150 × 0.405) = 1210.51
4. Product profit degree = {Profit very much, Profit, and Not too much profit}.

Product profit degree = {5333.53, 5175.24 and 1210.51} = {Second plan, First plan and Third plan}.
Second plan project > First plan project > Third plan project

Plan analytic weights

1. Plan analytic weight = (Each plan welcome degree / Assembling)
(1) 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. It is used to establish the product weight number, and is illustrated in Table 7.

Mutual plan comparison

Plan analytic method uses the product choice preferred plan order of rank, according to the first, second and third plan. The first and

Table 8. Mutual plan comparison.

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

Table 9. Reducing the gaps for achieving aspired/desired level.

Classification	Product consideration project for reducing the gaps
Product expense classification	Reducing disburses expense: Machine equipment costs, persons costs, material costs, production manufacturing 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

second plan appraisal criterion is 1.267, the first and third plan appraisal criterion is 1.015, and the second and third plan appraisal criterion is 1.062. This comparison uses the hypothesis product weight number and is illustrated in Table 8.

1. Mutual plan comparison = {Welcome very much, Welcome, and Not too welcome}
2. Mutual plan comparison = {1.267, 1.015, and 1.062}
First plan and second plan > First plan and third plan > Second plan and third plan

Reducing the gaps for achieving aspired/desired level

Due to the competitive product market, designers should consider factors like function, appearance, market compartment, price diversity, etc., to create diverse products that satisfy various consumers. Accordingly, it is a great challenge for designers in this competitive environment. It is significant 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 customers' requirements.

With the change of consumer's usage, the design trend for innovative design changes as well. Hence, the new technology management came up. This study is expected to improve the interaction benefit obtained 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 and is illustrated in Table 9.

Criterion product design in business management

Criterion product design value is the use of multi-criteria decision-making law to attain the most suitable product industrial engineering procedure. This opportunity which the customers link up to not only assists them to satisfy their needs but also to obtain and guaranty the actual product decision-making demand to correctly meet each other's needs.

Furthermore, criterion product design business value and the idea from the massive guests are used to positively match the users' needs so that the product designers have to provide an innovation product. Thus, this circumstance lets the customer to rapidly obtain the product information. In addition, the innovative product design should be made according to the different views of each customer and may present the unique style of the product service which will be measured as the main body for the customer.

RESULTS AND DISCUSSION

As discussed in this study, with the change of consumers' usage, the design trend of innovation caused changes as well. Hence, the new business management has shown up. This study could improve the industries' interaction benefit from the innovative screen. Therefore, how to explore the potential function demand of consumers providing innovative solutions and integrating them into the systems has become the challenge of designers.

Illustration of key elements and improvement of alternatives

The traditional product design of industries (Figure 1) was done according to the keyboard products of an enterprise, which demonstrates results from using 30 customers' data. Some industries, through a lot of stress, have specific values in the producers' demand from their

past work experience and intuition feeling, low cost, easy production, standardization and production profit.

Table 3 shows the widespread application of decision making method for business management and appraisal business; from the product design feasible plan, the set of choice procedures are penetrated to appraise various attribute relative importance, limit each feasible plan and center on the preferred plan.

Considering fuzziness in effectiveness perception

A multi criteria decision of business management (Figure 2) is made when the product is much. Each method that rests on the theory is not the same. In using different methods, applying the identical question can often have different results. For the multi attribute policy making method, the policy maker in charge of the production of many products under the quantification appraisal criterion carries on the appraisal to the feasible alternative scheme, and decides if it is fit or unfit to execute each alternative scheme in the order of priority.

As shown in Tables 7 and 8, the industry uses the appraisal decision making method, which usually weighs the standard not only by the smallest cost or biggest benefit sole target, but in many complex product design environment. The product question which the policy maker faces is simultaneously complex day by day, and often faces many conflicting goals.

As shown in Figure 4, in the case of the step illus-tration, product industrial design decision making helps the policy makers in their 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 to conform to the product industrial policy plan.

Consistency of the results of hybrid multi criteria decision of the business management model with the results of traditional product design

The results of Tables 8 and 9 show that the product design of industries reduces man power and production cost. This rapidly provides the customer the ability to purchase the product and manage the supply chain. It shows the relationship between the management and the customer, and uses the cross organization of the conformity synthesis to compare the product.

Comparison of the results of traditional industries with the results of multi criteria decision of business management in product design industries

In Table 6, the best project for traditional industries is seen in the first plan, and in Table 7, the second plan has the best project for the multi criteria decision of business management of product design industries.

When Figures 6 and 7 were compared, the results obtained were analogous, that is, the second plan has the best project for the Fuzzy multi criteria decision of business management of product design industries, while the first plan has the best project for traditional industries. An illustration of these results is shown as follows (Figure 3):

1. The composition factors of the traditional product design industries are: experience, cost and profit.
2. The composition factors of the multi criteria decision of business management of industries are: customer demand, producer demand, social service and producer designer.

A multi criteria decision of business management approach for product design industries

In traditional industries, product design is an essential process in decision making used to obtain better achievements. In fact, these industries are frequently faced with lots of criteria, such as multi-people and questions, especially when their decisions have to consider the complex environment factors as well as some special situations that affect the policy makers' judgement. Another item that was noticed is the environment variation which often changes. Therefore, business management policy making is seen like some kinds of Fuzziness. The use of industrial statistics are stochastic in carrying out the appraisal process, and is often unable to sufficiently share and express it, using the Fuzzy theory with the multi attribute policy making law, which solves the product design choice problem.

Taking the case study of optimizing product design in industries, multi goals are achieved in decision making because the product design does not have the determinism, complexity, risk, and so on. In addition, the changeable factor causes the entire decision-making process to be more difficult. The Fuzzy deduction and correlation business can be used in appraising the feasible method and multi-goals decision-making, solving problems of product multi goals and limited resources, and making the best product design resources assignment.

The industrial enterprise must, in conformity with the product design resource distribution, develop a set of product competition strategies from top to bottom, in order to improve the enterprise's product with or without the consumers' approval. Otherwise, the product design stage would not conform to the project and so, the laws and regulations would not be authenticated or considered by the product designers.

Analysis of the industrial project’s product design can be used to appraise the effectiveness and customer degree of satisfaction obtained from the value of the product, the implementation wish, the product’s

promotion level and market competition strength. Therefore, the use of Fuzzy set with the multi attribute policy making method enhanced the achievements appraisal system, and can be used to achieve the product design anticipated strategy goal. When the hypothesis achievement standard is used to achieve the market goal, the best product choice design is the policy making foundation, so, the industrial competitive advantage may be maintained for future development of the product.

REFERENCES

Aburas HM (2010). An integrated performance management framework for a multi-business company. South Afr. J. Ind. Eng., 1(21): 35-43.

Botha GJ, van Rensburg AC (2010). Proposed business process improvement model with integrated customer experience management. South Afr. J. Ind. Eng., 1(21): 45-57.

Chiou HK, Tzeng GH (2002). Fuzzy Multiple-Criteria Decision-Making Approach for Product Design Decision Flow. Springer -Veriag New York Inc.

Erasmus PV, Waveren CC (2009). Evaluation of quality concepts influencing a manufacturing environment in SOUTH AFRICA. South Afr. J. Ind. Eng. Nov., 2(20): 93-105.

Illier SF, Lieberman JG (1996). Introduction to Operations Research. Fuzzy Sets Syst., 1(39): 27-41.

Javid AA, Davoudpour H (2009). A new model for single facility location based on service level. South Afr. J. Ind. Eng., 2(20): 219-227.

Salo AA (1994). On Fuzzy ratio comparisons in hierarchical decision models. Fuzzy Sets Syst., 1(84): 21-32.

Tzeng GH, Chiang CH, Li CW (2006). Evaluating intertwined effects in e-leaning programs: A novel hybrid MCDM model based on factor analysis and dematel. Expert Syst. Appl., 4(32): 115-119.

Teng JY, Tzeng GH (1996). Fuzzy multicriteria ranking of urban transportation investment alternatives. Transp. Plan. Technol., 1(20): 15-31.

Uys JW, Schutte CSL, Esterhuizen D (2010). Trends in a South African industial engineering research journal: A textual information analysis perspective. South Afr. J. Ind. Eng., 1(21): 1-16.

Van Landeghem HE (1988). A bi-criteria heuristic for the vehicle routing problem with time window. Eur. J. Oper. Res., 2(36): 217-226.

Wu CH, Tzeng GH, Goo YJ, Fang WC (2007). A real-valued genetic algorithm to optimize the parameters of support vector machine for predicting bankruptcy. Expert syst. Appl., 32(2): 398-408.