Full Length Research Paper

A digital product of research and development (R and D) management decision for the best selection in fuzzy industry development

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This paper has the product design to transform the complex question that the designer often wants to solve. Therefore, the Research and Development (R and D) planning policy-maker in many enterprises invests much manpower and mental effort every year to deal with these complex questions. The paper first discusses tradition industry products that are changeable with not only some clear conditions but also the enterprise's important reforms. Secondly, the paper uses Fuzzy and Grey sets with the multi-attribute policy-making research technique to construct an integrity product design operation pattern as well as the changeable solution under clear conditions with the other ones. Finally, the paper deduces the product best design decision-making.

Key words: Fuzzy and Grey set, multi-attribute policy-making, design decision-making flow, R and D management, product design.

INTRODUCTION

In recent years, the traditional industries had been impacted by the following reasons and so did economy, science, and technology. First, the environmental trend is rapidly changing, especially for product-design reforming and production manufacturing. Thereupon had the very greatly obvious marketing fluctuation changed, but gradually had the very many product-design questions. For example, the traditional industry has massive outside moves and withers the phenomenon. Therefore, how to head for the target that the product designers faced with or/and how to move towards studies which focus on the development and the technical innovation primarily become important to be concerned and could maintain the product on competitive advantage at the international marketing. The current pace of technological development has forced many companies to invest significant capital and resources in research and development (R

and D) activities. A systematic and efficient method of identifying technology trends and their evolutionary potentials can help companies guide their R and D planning and wisely allocate their R and D resources (Wang et al., 2010).

In this intense competition of the product-design environment, the maintenance of product superiority obtains the design innovation technology to develop the new product to induct the market. When traditional labor-force crowded industries are reforming to be the high tech industry, enterprises will be able to have much product information without definite problems, simultaneously, Fuzziness will be applied to the appraises of products as well. In real world systems, the decision-making problems are very often uncertain or vague in a number of ways. Then, the fundamental question for innovation research may explain how firms develop innovative solutions in the form of products, processes, and services (Guus et al., 2010).

Therefore, if the national and international economy continues growing, the technology of new products will also get along with being created and invested. The

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promotion of product designs and the technology of product improvements internationally cause the competitive product markets. At present, the product-design development technology is fast developing to appraise the product quality and to meet the environment of many product changes and the complexity of production procedures. Sometimes, the product policy-makers are not able to consider their products all-around so that they will concentrate on the product question factors to make the effective product decision-making. Therefore, the traditional policy-makers will frequently want to promote their products, but also invite many product experts to participate in the production plan. Moreover, Absorptive Capacity has emerged within the literature as a theoretical framework or lens for exploring the development and application of new knowledge and technology (Maura et al., 2010).

Thus, the entire product best decision-making will cause some of the process questions. When the product decision-makers obtain the pattern of designing products, they have many Fuzzy regions. Without the appraisal technology and the strategy, this outcome is of low benefit to assist the product policy-maker to solve the problem. Therefore, the product designers can apply Fuzzy and Grey sets with multi- attribute policy-making analyses because Fuzzy and Grey measures and integrals help product designers to analyze the human evaluation process and specify decision makers' preference structures.

This is very different from the view and knowledge of many outside of the innovation and the R and D management world (Guus et al., 2010). Thus, the following factors ought to be considered for the enterprises: aiding the enterprise to obtain the best pattern, forming the core ability, gaining the long-enduring competitive advantage, and gradually taking and using the ideas of the good product designer. The common enterprises frequently face some of the product decision-making questions, like in the production cost-saving, the production time-flow, the product excellence, and other kinds of aspects, which have the conditional criteria to fit some considerations. Their regular meetings use the traditional screening way to carry on the multiple goals and they have the multitudinous goals to select a more suitable plan for assisting project evaluation and the decision-making.

Innovation strategy helps a company in three ways: exciting its customers, outperforming competitors, and building a new product portfolio. The literature describes many frameworks for innovation strategy but offers little detail about how to implement them (Collins Luke, 2010). Therefore, the time consideration of enterprises is an important factor in reforming an enterprise. These reforms might include how to apply the Fuzzy and Grey set with the multi- attribute policy-making process and the step to promote the product plan, accurate appraisal, and product decision-making analysis. Regarding with the past pattern of legacy products, the designs and the

production plans often had the multi-goals but had not synthesized all of the considerations, that is, each product design differentiated each pitch point because of facing with the different situation and value such as considering the interaction between the product communities. However, the product design in the multi-goals of Fuzzy and Grey environment will achieve each goal or value and demonstrate with difficulty for an explicit value. Among these, there is Fuzziness. This article proposed the Fuzzy multi-goals decision-making, the plan product design decision-making pattern, and the importance of the goal effectiveness by product designs with difficulty.

RESEARCH APPROACH

The product designer often meets many designs bottleneck questions, must make the decisions immediately, and solves all questions or problems. However, the material possibility for production is not clear so that this situation belongs to fields of Fuzzy and Grey; Therefore, the product designers must affiliate Fuzzy and Grey theory with the multi-goals decision-making method to use design plan technology and the choice appraisal plan and to occur the solutions associated with product decision-making questions. In the concept of the product appraisal development, the product analyses of Fuzzy and Grey weighting in gradual law-planning may carry on the product programming, from individual movement behavior, utilization machine equipment, product management goal, and so on. No matter in any situation, any time, product designers can face the multi-stratification planes and products of decision-making questions that guide the Omni-directional thought. Therefore, the solutions for questions derive from using Fuzzy and Grey theory, multi-goals plan appraisal, and the overhead construction of its Fuzzy and Grey deduction.

Research product designs for management decision

Nowadays research regarding innovation product designs of management decisions has to face these topics such as the globalize subject, the creation product, and the customer value to link with the key method for the enterprise development. If the enterprise plans to develop the product into the internationalized market, the value creation is one of the successfully essential conditions. Besides, the legacy of product's design may take the technology as a starting point. More than this, to solve the customer's demand is another starting point. Generally, the product creation and the customer's value contain four steps: Needs (excavates customer demand), Solution (development solution), Differentiation (creation and competitor difference), and Benefits (pursues the customer biggest benefit). In other words, the product or
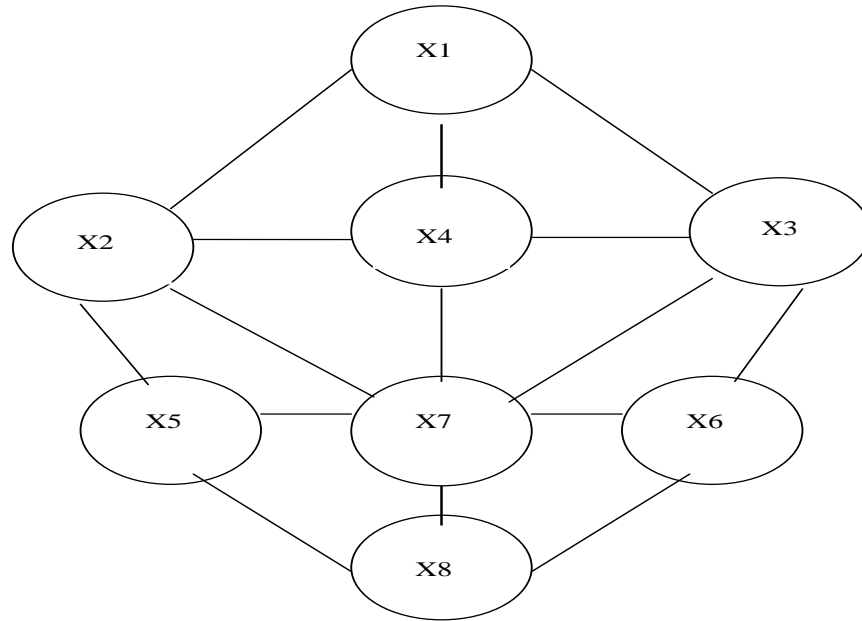
Figure 1. Tradition industries product development.

the service from a company perhaps solves the customer's problem due with the distinctive quality as the company pursues an unevenness growth to find the turning point for the product creation value.

Many of the customer's demands were excavated by various research methods to carry on constructing several design products. Some of these research methods just started on the Fuzzy and Grey stage and caused the new product business planning and the product specification. Through exploring and studying the customer demands, an enterprise has the system conversion of product characteristics, first, and then launches the final system towards each organization, components, and the manufacturing flows to grasp various stages of the managerial key-functions. There-fore, this process illustrates that a critical issue in this kind of high-tech development is to search for developing approaches that integrate and balance needs for formal organizational control with high levels of project flexibility (Daniel and Christian, 2010). Then, the establishment of the several design products conforms to the customer demands and promotes the optimization of several designs. Product design methods should improve the traditional classroom now and perhaps provide students the Omni-directional learning processes. Several design product studies have the reasonable plans and layouts. These methods include:

(1) Analyzing the quality of several design products correctly to meet the curriculum demand fast.
(2) According to several design products, establishing the business planning quality and the human as the project

objective.
(3) Designing the conception, transmitting truly into the manufacture units, and reducing several product designs from the quality questions.
(4) Under comparative analyses of competitive products, reducing the number of times due to engineering-design change and the product development time.
(5) Penetrating the operation pattern of several product designs and establishing the complete system to prevent failures from cost reductions.
(6) Guaranteeing that several product designs meet the customer demand and enhancing the degree of customers' satisfaction.

Product design in fuzzy industry development

The procedure selection of designing products and the related work-collected establishment in tradition cabinet factories are usually gathered by the traditional till machine shops. The product design plan routes from (X1) beginning to end (X8) point perhaps exist many nodes that are called the decision points. The product designer is also forced to face the different policy-making environ-ment and then is asked to find the most suitable project approach by the policy-making route. Thus, the Fuzzy is gradually proposed.

The overall product design route includes carrying on the appraisal route plan, considering the multi-objectives, the essences, and the fuzzy characteristic, causing the product design decision model, conforming to the actual problem condition, and using values as in Figure 1.
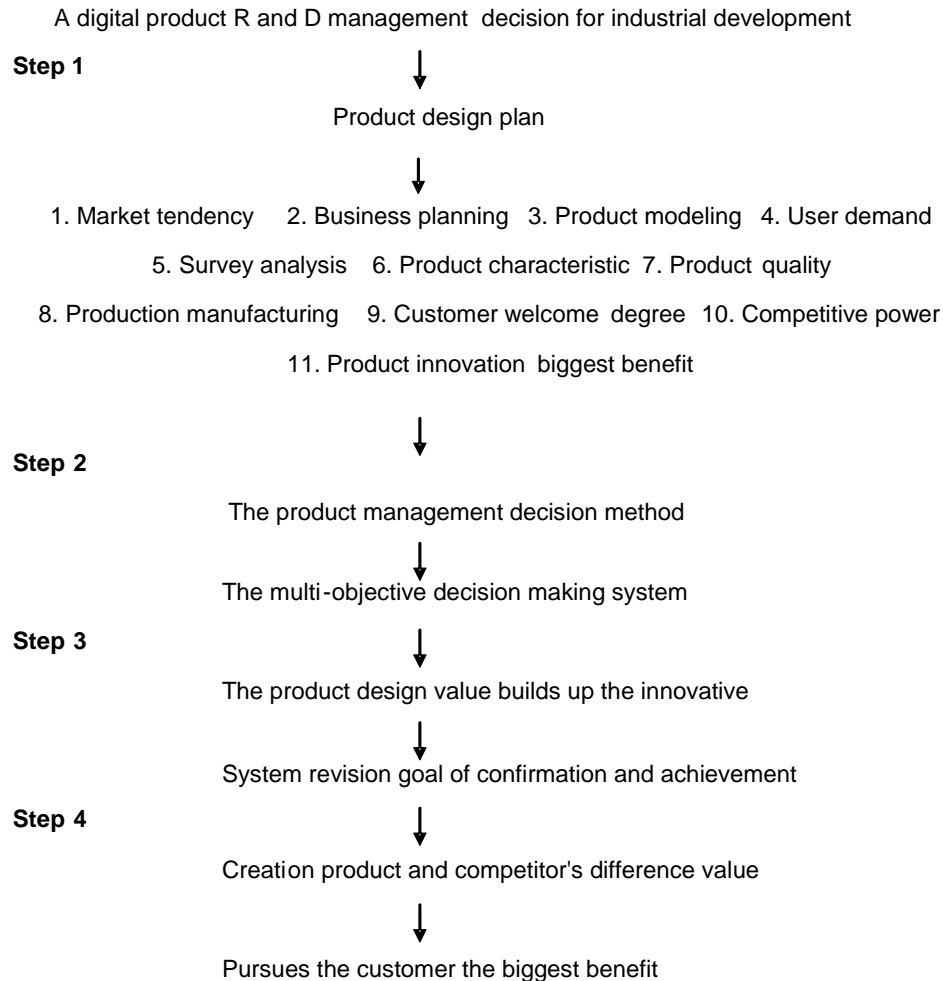
A digital product R and D management decision for industrial development

Step 1

Product design plan

1. Market tendency   2. Business planning   3. Product modeling   4. User demand

5. Survey analysis   6. Product characteristic 7. Product quality

8. Production manufacturing   9. Customer welcome degree 10. Competitive power

11. Product innovation biggest benefit

Step 2

The product management decision method

The multi-objective decision making system

Step 3

The product design value builds up the innovative

System revision goal of confirmation and achievement

Step 4

Creation product and competitor's difference value

Pursues the customer the biggest benefit

Figure 2. A digital product decision for Fuzzy industries development.

A digital product R and D management decision

Traditional role of R and D investment, which was simply viewed as a factor aimed at creating specific innovations. This concept sees R and D expenditure as an investment in an organization's absorptive capacity. Studies about several design products, like the type, the function, the outlook, the user, the market area separation, and the price under uneven level community opinion method, have the multi-objective questions because each question will have many uncertainties, the complexity, and the risk conflicts. Thus, the changeable variables will make the entire decision-making process very difficult. In addition, the changeable variable will be used by several product-designed development flows and is provided through the elastic appraisal research technique. Thus, the improvement of structuring product-designed questions may deduce product-designed problems. The system of technology-using logics helps the user to face and solve the questions under the limited resources for the best resource utilization. The flow of the research

development is shown as in Figure 2.

Step 1

Product design plan

The questionnaire, according to the product characteristic plan, was designed to analyze these issues from projects, customers' demand, product characteristics, product specification, product block diagram, and the correlation matrix about product characteristics. These analyzed targets include the following research questions. Does the experimental design exist? And, how to achieve the specific feature?

Market tendency and business planning

The dynamic market fast vicissitudes so the product life cycle reduces gradually. In general, the new product

design development begins with grasping customers' needs, establishing the kinesics and the multi-objective programming pattern, and building the design product best manufacture procedure. How to strengthen the product business planning designs, the product innovation, and the internationalization by the high quality and the creativity energy, these will lead the enterprise integral development. For example, the methodology presented appears to satisfactorily fulfill the goals of Company A. The development of the methodology and its application to the PACKTECH case took less than 3 months to be completed and returned 20 possible alternative applications for the PACKTECH technology (Mattia et al., 2010).

Product modeling and user demand

Several product models are inspected in accordance with whether or not conforming to the user to request the condition, the performance, the specification table, and the material examination of bad-style design analysis, questioning spots for the possible bitter experience, carrying on the analysis and the countermeasure appraisal. These inspections came from the users who confirmed product official modeling and style to carry on the product construction model. Thus, new innovation models recently proposed to capture the policy makers' attention. These study objectives are to analyze these models in a particular model of research and technology organizations: the R and D units in the Basque Country in Spain launched with the aim of improving R and D and technology transfer efficiency (Jose et al., 2010). Widely collects the users' demand and classification of the screening of demand items, by the technological innovation and the creation strategically competitive advantage, the success creation product design value, urges the whole staff to see clearly the customer demand, proposes the solution, and using the variance analysis, creates the benefit and the value for the customer and the organization, lets the design the value display, creates the biggest benefit.

Step 2

The product management decision method

The social stratum analysis decision method, reported according to the user that inspected the student individual study condition, under the similar condition, with other student's performance, will have any difference; The grouping reported that easy to see the student to meet the bottleneck, also around may study the student performance which does the comparison, and revises the plan of instruction; The report of proceedings, helps to inspect that homemade practice, for example the student according to the condition grouping, chooses the student

to study the preferred plan, groups the report, the user to report that appraisal criterion ways and so on report of proceedings, make the important degree order of rank. Thus, a key challenge in managing innovation is to explicitly identify ways to improve an organization's performance with regard to discontinuous innovation (John et al., 2010).

The multi-objective decision making system

The multi-objective decision-making system in various ways ponders over the explanation for product questions to deduce the consumer's satisfaction in good plans. This system belongs to the long time interval, the gradation, and under the uncertainty high working conditions. Applying the multi-objective decision-making method and satisfying grade of fit in each criterion, this system may evaluate the best technical program to provide the best pattern for the policy-maker.

The multi attribute comments and technical law apply the quantitative method in the product design development. This method includes to take the question which the design preferred plan, the creation and competitor's product differences with the customers' needs, the solution product occurs, and to pursue the user biggest product benefit in order to overcome the questions, to create product innovation value, to relieve the stagnant difficult position, and to impel some strategies which the new enterprise develops by managing finances wisely, governing by the guest-made management and the innovative design. All produce the core value of designed products.

Step 3

Building up the innovative by the product design value

The product design value builds up the innovative, causes maximization of the product or service value, allows innovation of the product via the method from the user demand and solves ideological modes on question, difference, benefit to know and stress in understanding clearly the user or consumer's demand. Only then can it be possibly proposed that the correct solution created provides the biggest service to the user.

System revision goal of confirmation and achievement

The simulation of goal-testing lies in examining the interaction of product usability, reducing the appraisal system's failure rate, and carrying on the revision, according to the test result, to patch by simulating the test on the spot as each question is encountered. This

Table 1. Grey theory.

Distinction	1	2	3	4	5
x0	x01	x02	x03	x04	x05
x1	x11	x12	x13	x14	x15
x2	x21	x22	x23	x24	x25
x3	x31	x32	x33	x34	x35

simulation will seek the manufacturer coordination, actually to the developing system, to carry on the actual operation and the system on the spot tracing, and to confirm its usability and serviceability.

Step 4

Creation product and competitor's difference value

The value of the open innovation approach is now widely recognized, and the practice has been extensively researched, but still very little is known about the relative impact of firm-level and laboratory-level open innovation policies and practices on R and D performance (Guus et al., 2010). Thus, the product in the competition, the utilization of Fuzzy and Grey theory and the multi-objective decision-making theory, the created product, the service, transport business and so on. With competitor's difference value, enterprises apply these theories in individual, innovative designs and organizations, management to establish the using tendency, to see clearly the users' needs, to grasp the product innovation opportunity, to stimulate the innovation of product-design ability, finally, and to achieve the goal of the product degree of satisfaction for the users.

Pursuing the customer as the biggest benefit

In the product design, pursuing the customer is the biggest benefit, in that promotion of work efficiency increases internal communications with the exterior cooperation, and the application information design enhances the achievements. The designs of the innovation's strategy, the affiliation conformity product, and science and technology define clearly the multi-objective criteria and the attribute of the stimulation innovation energy. Pursuing the product, which is the best quality level and the biggest customer degree of satisfaction finally achieves product crucial goal, such as regular innovation meetings with suppliers and technology roadmaps linking firm strategy, innovation strategy and sourcing strategies (Holger, 2010).

THEORETICAL FRAMEWORKS

The customer uses the product to respond to the feeling

of Fuzzy and Grey idea in the product response feeling question, by application of Fuzzy and Grey theory logic deduction. If it contains two or time two above blurred target, then it belongs to the Fuzzy and Grey plan question, and this type may be used to indicate the product.

Fuzzy theory

(1) Establishment product sets of sub factors
Product sets of sub factors
U = (modeling, quality, cost, price, service)

(2) Establishment product weight set
Product weight set judgment, is different to the product various factors' objective point, thus the judgment result is dissimilar.
Product weight
A = (modeling, quality, cost, price, service)

(3) Establishment product appraisal collection
Goal of the product judgment is understanding a 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, V = (welcome very much, welcome, not too welcome, not welcome)

(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, and R5, this product single factor judgment matrix R
Product judgment matrix, R = (R1, R2, R3, R4, R5)

(5) Result of the Fuzzy synthesis judgment
Result of the Fuzzy synthesis judgment, B = A。R

(6) Judgment standard processing
Because the sum of the judgment results from various factors, it must make normalized processing in order to judge the result. It is very common to change the member to eliminate the denominator.

Grey theory

Using Grey theory, as in Table 1.

Step 1: Starting

X0 number row get starting after X0
X0 = (X01 / X01, X02 /X01, X03 /X01, X04 / X01, X05 / X01)

Computer product

Figure 3. A product of computer product design.

X1 number row get starting after X1
X1 = (X11/X11 , X12 /X11, X13 /X11, X14 /X11, X15 /X11)
X2 number row get starting after X2
X2 = (X21 /X21, X22 /X21, X23/X21, X24/X21, X25/X21)
X3 number row get starting after X3
X3 = (X31/ X31,X32 /X31, X33 /X31, X34 /X31, X35 /X31)

Step 2: Asking difference row △(K)

△1 (K) = |X0(K)- X1(K)|
△2 (K) = |X0(K)- X2(K)|
△3 (K) = |X0(K)- X3(K)|
△1 = (△1 (1), △1 (2), △1 (3), △1 (4), △1 (5))
△2 = (△2 (1), △2 (2), △2 (3), △2 (4), △2 (5))
△3 = (△3 (1), △3 (2), △3 (3), △3 (4), △3 (5))

Step 3:

Asking $\max_{K}$ | X0(K)- Xi(K) |

△1 biggest element

$\max_{k}$ | X0(K)- X1(K) | = △1
△2 biggest element

$\max_{k}$ | X0(K)- X2(K) | = △2
△3 biggest element

$\max_{k}$ | X0(K)- X3(K) | = △3

Three biggest element, smallest is 0.

Step 4: Asking ξi (K)

$$\xi i\ (K) = \frac{\min\limits_{i\varepsilon\ I}\min\limits_{K}\ |\ X0(K)- Xi(K)\ |\ +\ \max\limits_{i\varepsilon\ I}\max\limits_{K}\ |\ X0(K)- Xi(K)\ |}{|\ X0(K)- Xi(K)\ |\ +\ \xi\max\limits_{i\varepsilon\ I}\max\limits_{K}\ |\ X0(K)- Xi(K)\ |}$$

An empirical R and D Management case: A computer of product design

The design product appraisal criterion is established and applied in the computer product study done on two parts, after which the computer product was taken, as an example, and a test was carried on 24 attending enterprises as shown in Figure 3.

Problem descriptions

How to built industry reputation on offering advanced wafer production processes and unparalleled manufacturing efficiency, from its inception, consistently offered the foundry's leading technologies to its customers. in 2009, according to the IC Insights research report, due to unique integration of product process technologies, design services, manufacturing productivity and product quality, in customers and manufactured more than seven products for various applications for the computer of communications and consumer electronics markets. Total capacity of the manufacturing facilities was managed in order to better manage long-term strategic growth opportunities invested in related-industries. With differentiated technology offerings and with unique value proposition to customers, new opportunities were pursued in these fields. As an example, the product's computer appraisal criterion was designed, and the appraisal standard and union standard state was used. It was divided into
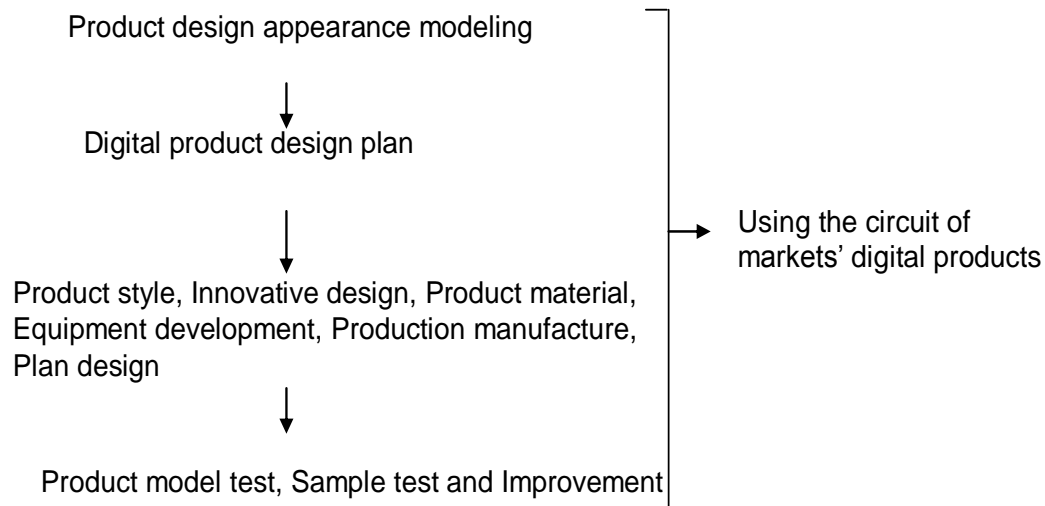
Product design appearance modeling

↓

Digital product design plan

↓

Product style, Innovative design, Product material, Equipment development, Production manufacture, Plan design

↓

Product model test, Sample test and Improvement

→ Using the circuit of markets' digital products

Figure 4. A digital product design of industries development.

Assessment → Experienced in the past → Promotes market
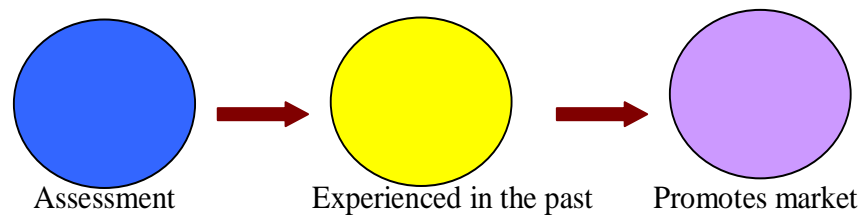
Figure 5. Tradition industries product development.

producer projects on standard marketing production, product technology, condition purchase and use period.

Building R and D Management in digital product design of industries development

For customer modeling design, participant in the project work, has the following several main abilities, including product detail conception, composition order, design conception, basic plan, design confirmation several design product integrated design and plan step as shown in Figure 4.

Product design plan

Product technology of cornerstone and Innovation of passion are the largest resources in the industry competitive power, so for worldwide customers and cultivate mutually beneficial, long-term partnerships, as the industries create market leading. Quality policy will strive to provide superior product manufacturing services for worldwide customers and cultivate mutually beneficial, long-term partnerships, whose dedication is applied to

the quality of every facet of the company and sustain a culture of continuous improvement to assure customer satisfaction. Adopt expedient containment programs to shield our customers from any insufficiency until each has been permanently corrected are responsible for and to each other regarding this goal.

The product of R and D Management decision method

The procedure of the computer product is the implementation tests of 24 attending enterprises. After statistical decision-making of Fuzzy and Grey theory, the statistical computation, research of the situation and the result were done by fast and accurate discovery as in Figure 5.

(1) Industries development
A. industry of honest and Integrity
B. Product development service

(2) Product design plan
C. Internationalization management
D. The attention long-term strategy, and continues the

Table 2. Product Fuzzy weights.

Fuzzy weights	Judgment target product				
	1	**2**	**3**	**4**	**5**
	Industries development	**Design plan**	**Customer satisfaction**	**Technology innovation**	**Communication management**
Weights (%)	22	23	25	12	21

pursue forever to manage

(3) Customer satisfaction of degree
E. Customer competitive power
F. The quality is the customer satisfies comprehensively

(4) Product technology innovation
G. The technology innovation, guarantees highly the enterprise vitality
H. Building has the technology innovation challenging, to pleasure working

(5) Product Communication management
I. Establishes the open-type communication management
J. Gives dual attention to the employee benefits and effort back coupling society

X: Expresses group of possible bitter experience natural disposition condition
$X = \{X_k \mid k = 1,2,\text{---}, m\}$

m: To possibly have the natural disposition condition number.

Due to 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 globalize competition and meager profit time approaching, only the design product most suitable solution, can promote the 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.

R AND D MANAGEMENT RESULTS AND ANALYSES

Fuzzy theory

As shown in Figure 4, the 24 attending enterprises of statistical (step of the design 1-5 judgment) target products evaluative criterion establish several design product appraisal criteria and apply them in different item product designs. It then takes the 1-5 plans, as every

plan is carried on the 24 enterprises' samples to Fuzzy weights and performance matrix, as shown in Table 2 and 3.

(1) Weights

$A = (0.22, 0.23, 0.25, 0.12, 0.21)$

(2) Performance matrix

$$R = \begin{pmatrix} 0.36 & 0.32 & 0.4 & 0.28 & 0.42 \\ 0.44 & 0.44 & 0.41 & 0.32 & 0.45 \\ 0.42 & 0.3 & 0.44 & 0.39 & 0.27 \\ 0.4 & 0.26 & 0.33 & 0.36 & 0.41 \\ 0.39 & 0.33 & 0.39 & 0.36 & 0 \end{pmatrix}$$

$B = A \circ R$

$B = A \circ R = (0.22, 0.23, 0.25, 0.12, 0.21) \circ$

$$\left\{ R = \begin{pmatrix} 0.36 & 0.32 & 0.4 & 0.28 & 0.42 \\ 0.44 & 0.44 & 0.41 & 0.32 & 0.45 \\ 0.42 & 0.3 & 0.44 & 0.39 & 0.27 \\ 0.4 & 0.26 & 0.33 & 0.36 & 0.41 \\ 0.39 & 0.33 & 0.39 & 0.36 & 0 \end{pmatrix} \right\}$$

After, $B = A \circ R = (0.44, 0.26, 0.41, 0.39, 0.12)$

$0.44 > 0.41 > 0.39 > 0.26 > 0.12$

So, max = 0.44

Therefore, Industries development > customer satisfaction > technology innovation > design plan > communication management as shown in Table 4.

Grey theory

Grey theory of statistical step, as in Table 5.

Step 1: Starting

By 46 division X0 number row get starting after X0

Table 3. The 24 attending enterprises of statistical.

Enterprise	A	B	C	D	E	F	G	H	I	J	Total
1	5	4	2	5	1	3	5	2	4	5	36
2	5	1	5	5	5	5	3	5	5	5	44
3	5	5	4	5	5	4	5	3	3	3	42
4	3	4	4	5	5	5	3	3	4	4	40
5	5	4	5	5	2	3	3	5	5	2	39
6	2	3	2	2	5	4	3	2	5	4	32
7	5	5	3	5	5	5	4	5	4	3	44
8	5	1	1	4	4	5	2	2	4	2	30
9	4	3	3	2	4	2	2	2	1	3	26
10	4	3	4	4	4	4	3	3	2	2	33
11	5	1	3	5	5	5	2	4	5	5	40
12	5	1	5	5	5	5	3	4	3	5	41
13	5	3	3	5	5	5	4	4	5	5	44
14	4	2	2	4	4	5	4	2	3	3	33
15	4	5	5	5	5	5	3	2	3	2	39
16	3	3	5	4	1	2	1	5	3	1	28
17	3	3	3	3	3	3	3	3	4	4	32
18	4	5	5	5	5	5	3	2	3	2	39
19	5	2	2	4	4	5	3	2	4	5	36
20	5	2	2	4	4	5	3	2	4	5	36
21	3	3	5	5	4	5	5	4	3	5	42
22	5	5	4	4	5	5	4	4	4	5	45
23	4	3	1	3	4	4	3	3	1	1	27
24	5	3	4	5	3	5	5	3	5	3	41
Total	03	74	82	103	97	104	79	76	87	84	

$X0 = (1, 0.91, 0.95, 0.98)$

By 49 X1 number row get starting after X1

$X1 = (1, 0.89, 1, 0.87)$

By 47 division X2 number row get starting after X2

$X2 = (1, 1.12, 1.02, 1, 12)$

By 42 division X3 number row get starting after X3

$X3 = (1, 0.85, 0.85, 0.97)$

By 49 division X4 number row get starting after X4

$X4 = (1, 0.79, 0.77, 0.91)$

Step2: Asking difference row △(K)

$△1 (K) = |X0(K)- X1(K)|$

$△2 (K) = |X0(K)- X2(K)|$

$△3 (K) = |X0(K)- X3(K)|$

$△1= (△1(1), △1(2), △1(3), △1(4)) = (0, 0.02, -0.05, 0.11)$

$△2= (△2(1), △2(2), △2(3), △2(4)) = (0, -0.21, -0.07, -0.14)$

$△3= (△3(1), △3(2), △3 (3), △3 (4)) = (0, 0.06, 0.1, 0.01)$

$△4= (△4(1), △4(2), △4(3), △4(4)) = (0, 0.12, 0.18, 0.07)$

Step 3: $\text{Asking } \max_{K} | X0(K) - Xi(K) |$

△1 biggest element 0.24

$\max_{k} | X0(K)- X1(K) | = 0.11$

△2 biggest element 0

$\max_{k} | X0(K)- X2(K) | = 0$

△3 biggest element 0.1

$\max_{k} | X0(K)- X3(K) | = 0.1$

Table 4. Performance matrix

	Industries development (X0)		Product design plan (X1)		Customer satisfaction (X2)		Technology innovation (X3)		Communication management (X4)		Total
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	
A1											
1	5	4	2	5	1	3	5	2	4	5	36
2	5	1	5	5	5	5	3	5	5	5	44
3	5	5	4	5	5	4	5	3	3	3	42
4	3	4	4	5	5	5	3	3	4	4	40
5	5	4	5	5	2	3	3	5	5	2	39
6	2	3	2	2	5	4	3	2	5	4	32
Total	25	21	22	27	23	24	22	20	26	23	233
A2											
7	5	5	3	5	5	5	4	5	4	3	44
8	5	1	1	4	4	5	2	2	4	2	30
9	4	3	3	2	4	2	2	2	1	3	26
10	4	3	4	4	4	4	3	3	2	2	33
11	5	1	3	5	5	5	2	4	5	5	40
12	5	1	5	5	5	5	3	4	3	5	41
Total	28	14	19	25	27	26	16	20	19	20	214
A3											
13	5	3	3	5	5	5	4	4	5	5	44
14	4	2	2	4	4	5	4	2	3	3	33
15	4	5	5	5	5	5	3	2	3	2	39
16	3	3	5	4	1	2	1	5	3	1	28
17	3	3	3	3	3	3	3	3	4	4	32
18	4	5	5	5	5	5	3	2	3	2	39
Total	23	21	23	26	23	25	18	18	21	17	215
A4											
19	5	2	2	4	4	5	3	2	4	5	36
20	5	2	2	4	4	5	3	2	4	5	36
21	3	3	5	5	4	5	5	4	3	5	42
22	5	5	4	4	5	5	4	4	4	5	45
23	4	3	1	3	4	4	3	3	1	1	27
24	5	3	4	5	3	5	5	3	5	3	41
Total	27	18	18	25	24	29	23	18	21	24	227

Table 5. The 24 attending enterprises of Grey theory.

Variable	Customers condition			
	A1	A2	A3	A4
Industries development (A+B)=X0	46	42	44	45
Product design plan (C+D)=X1	49	44	49	43
Customer satisfaction (E+F)=X2	47	53	48	53
Technology innovation (G+H)=X3	42	36	36	41
Communication management (I+J)=X4	49	39	38	45

$\triangle$4 biggest element 0.18

$$\max_{K} \; | X_0(K) - X_4(K) | = 0.18$$

This three numbers, biggest element 0.18, smallest element 0

Step 4: Asking $\xi_i(K)$

$$\xi_i(K) = \frac{\min_{i\varepsilon I}\min_{K} | X_0(K) - X_i(K) | + \max_{i\varepsilon I}\max_{K} | X_0(K) - X_i(K) |}{| X_0(K) - X_i(K) | + \xi\max_{i\varepsilon I}\max_{K} | X_0(K) - X_i(K) |}$$

If $\xi = 0.5$

$$\xi_i(K) = \frac{0.5\times0.18}{| X_0(K) - X_i(K) | + 0.5\times0.18} = \frac{0.09}{\triangle i + 0.09}$$

All $\triangle I(k)$ into up type, get

$\xi 1 = 1$ $\xi_i(K) = 0.81$ $\xi_i(K) = 2.25$ $\xi_i(K) = 0.45$

$\xi 2 = 1$ $\xi_i(K) = -0.75$ $\xi_i(K) = 0.47$ $\xi_i(K) = -1.8$

$\xi 3 = 1$ $\xi_i(K) = 0.6$ $\xi_i(K) = 0.47$ $\xi_i(K) = 0.9$

$\xi 4 = 1$ $\xi_i(K) = 0.42$ $\xi_i(K) = 0.33$ $\xi_i(K) = 0.56$

If not consider $\xi_i=1$, so

$r1 = 1/3 \times (0.81+2.25+0.45) = 1.17$

$r2 = 1/3 \times (-0.75+0.47-1.8) = -0.69$

$r3 = 1/3 \times (0.6+0.47+0.9) = 0.66$

$r4 = 1/3(0.42+0.33+0.56) = 0.47$

When, $1.17 > 0.66 > 0.47 > -0.69$
So, r1>r3>r4>r2 Thus, Customer satisfaction >technology innovation > communication management > product design plan

R and D Management system goal of confirmation and achievement

The R and D Management system goal lies in establishing one product design and the manufacture optimization pattern under the product design process. This system may use the customer's needs and the product design incident cross-correlation matrix. After coordinating the customer demand the comparison and sorting, it is necessary to select suits of the mold train module to carry on the disposition to form the selection scheme. During coordinating the customer's needs, the selection scheme will obtain the preferred plan.

DISCUSSION

As discussed in R and D management with the change of consumer's usage, the design trend of the innovative designed computer changes as well. Hence, the newly technologies have shown up. This present study attempts to improve the computer interaction benefit from the product innovative. Therefore, how to explore the potential function demand of consumers providing innovative solutions and integrate the systems has become the challenge of designers.

The key elements found and improvement alternatives illustrated

In Figures 1 and 2, from traditional to a digital product R and D management decision for industries development, the industrial management's development (Figure 5 and 6), the use product innovation's technology, promotes the diversification and the rich product, and raises the production efficiency, the elastic delivery, meets the customer need, the creation product opportunity.
In Figure 4, the digital product design of the industries' development, in accordance to the adaptation environment's vicissitude, promotes the new plan of the authority division of labor and the effectiveness of intense subordination with inspection of the staff result, and accelerates them to achieve the industrial operation
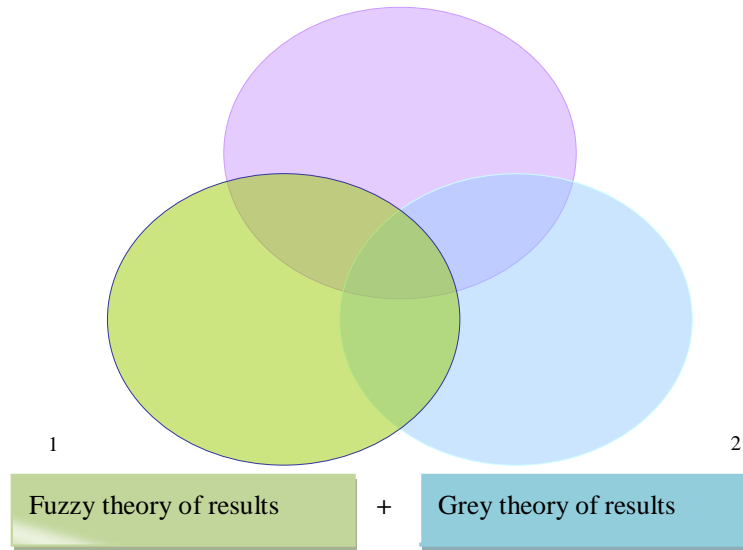
Figure 6. A digital product of R&D management decision for the best selection in Fuzzy industries development.

objectives.

The Fuzziness and Grey theory system in effectiveness perception considered

Research and Development Management, using Fuzzy and Grey theory system, innovative computer synthetic innovative measurements, had shown computer values of performance score with respect to criteria. This study explains that why the evolution of innovative designed computer becomes the highest amongst the satisfaction of customer.

The result of hybrid a digital product of R and D management decision model is consistent with the traditional product design

The results of Figures 6 and 7, the 24 attending enterprises of customer condition, using Fuzzy and Grey theory results, as shown in Figure 8.

(1) Fuzzy theory of results: Industries development > customer satisfaction > technology innovation > product design plan > communication management.
(2) Grey theory of results: Industries development > customer satisfaction ›technology innovation > communication management > product design plan

Tradition industries product development and a digital product of R and D management decision for the best selection in Fuzzy industries development

R and D Management, new functions applied to

innovative designed computer will achieve the goal of innovation and provide appropriate product and service during the transformation. And it can help the enterprise to get rid of traditional cost and management dilemma. With relative performance, market performance, and the performance among consumers, the enterprise has industry, improves organization construction, adopts the established the efficient and competitive strategy. The enterprise can understand the change in global market every where anytime through the performance of global customer satisfaction index, and to catch up with international in service level, and promote satisfaction and reinforce the competitiveness.

CONCLUDING REMARKS AND FUTURE PERSPECTIVES

R and D Management may use the technology of Fuzzy or Grey theory decision-making in studying the evaluation of system computer products, developing in the product quality, the space design, the computer system, the machine operation, and the environment of design method, conforming to study ability and the best choice, making the most effective utilization, and displaying the efficiency fully.

In R and D Management, product study is to design the subject first, second to advance the information, the automated state to increase day after day gradually, third to make several design product evaluation systems, and forth to conform to the industries structure to design. After these processes, it will naturally have the topic to take. When the enterprise carries R and D Management by using Fuzzy and Grey- theory decision-making principle, mainly by the product of several designs and the study's

achievements, it primarily causes a schedule of the product specification with the new product of business planning. The system's transformation product, which is a characteristic of the customer demand, as well as the plan of the study flow, grasps various products and several design keys, and then establishes them because of the pattern and approaches facing the globalized product competition time. Only then can the unceasing product innovation promote the enterprise value. These designs conform to the customer demand product, with promotion product innovation design. Also, they bring the best study efficiency for the learner, and are used in current studies of several design products.

A decision making system for industries technology management uses product innovation's technology, promotes the diversification, and implements phases of the proposed method, building a hierarchical R and D Management system in innovative designed, innovative synthetic innovative measurements, product strategy, and customer need creation rich product, raises production efficiency, elastic delivery opportunity. In digital product design industries development, the industry in accordance to the adaptation environment's vicissitude, promotes the new plan, from industry, improvement organization construction, and adopts the authority division of labor, the effectiveness intense subordinate with inspects the staff result, accelerates to achieve the industrial pursue R and D management results.

Hence, in the product competition, apply product technological innovation, and successfully achieve the goal of the delicate and creative design. So, the journal study establishes the trend in product innovative design, observes customer demand, controls the innovation, and stimulates the design ability. Lastly, it achieves the R and D management goal of user satisfaction toward the product.

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