

## Brand Evaluation to Promote the New Product Using Data Envelopment Analysis

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**Abstract:** Today, new products and the necessity of considering it as a necessary strategy for survival in business has become. Industries on value innovation and improving the quality of the new product development process for the efficient performance of the product development focus. In this study, using the same brand in new product development is discussed and to this end the company was selected as a case study of in this approach, the assessment of its brand in order to obtain a position with the DEA technique is discussed. The hierarchical analysis methods to assess the effects of innovation and the quality of the new product development process are used on performance product development, a total of 13 indicators for which it was collected. The manufacturers of medical equipment in Isfahan province were studied. The sample was determined that 84 subjects were selected by random cluster sampling. As a result of the segmentation of different states of the same brand position and brand in new product development based on the product features were also investigated.

**Keywords:** New product development, branding, innovation, value, quality product development process

### 1. Introduction

Many scientists, management science, the essence of management are decision making. Managers to perform a particular task may be faced with different options and prioritize them have collapsed among them are the best option. Different methods to support the process of prioritizing and selecting the best option is offered, in this regard, DEA and analytic hierarchy process are two powerful and well-known that in recent decades has been considered by many scholars and experts. Science data envelopment analysis (DEA), including techniques for performance measurement or evaluation of the efficiency of Decision Making Units, because of its many capabilities is of interest to scholars and researchers. AHP is one of the most comprehensive systems designed for multi-criteria decision making the possibility of considering various quantitative and qualitative criteria in the problem. In recent years, the importance of brand in the effectiveness of activities, creation and maintenance of the

financial performance of businesses in various industries is obvious to everyone. Recognizing this role, organizations need to assess their situation and Self comparison with the other competitors and the need to strengthen its value using the newest methods and quality tools and has little reminder. Achieve a competitive advantage in today's world, only relying on the functional characteristics of products and services can be made, but at present, are the most important factoring in distinguishing a business from competitors. Of this research was to assess the status of your order and brand using data envelopment analysis which has not been considered in this context seems useful.

### Research Questions

In what circumstances can a brand new product for the same use?

### Research hypothesis

Brand awareness in the market has an impact on the sales of new products.

Brand loyalty in the market affects the sales of new products.

Perceived quality, brand new products on the market impact on sales.

Brand associations influence the market to sell new products.

### Methodology

In order to do research or investigative action research framework to test hypotheses or answer the research question provides in answer to the question of how to interpret the data collected is placed, the ambiguity is reduced to a minimum so that they are related to research methodology (Bazargan, 2001). The investigation of the orientations of research, the nature and purpose of the research is applied and the data collection method to collect the literature of library and to evaluate the assumptions of the field.

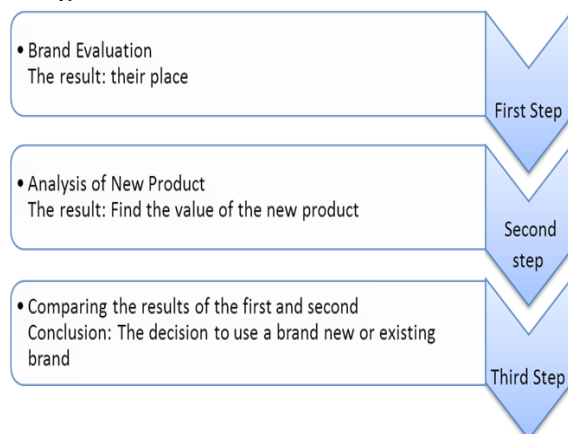
### Data collection

Information needed for literature research using books and articles inside external review of the methodology and assumptions sample questionnaire is used. Type of measure in the questionnaire is based on the seven-item Likert range "at all, very small allotment, low, and medium, high, very high.

### Methods of analysis

To analyze information and solve the corresponding model of computer software such as Expert Choice Gams was used.

### Stages of research



### Financial perspective, brand equity

Financial perspective, brand equity can be defined as the difference between the financial benefits of a product that was once the brand and brand management is offered as a definition offered no brandy. Surely a product is offered by a particular brand to increase or decrease the

value to the customer. And financial results for the combined organization; this is what is defined as ' financial brand equity (Simon and Sullivan, 1993).

### Aaker Model

Usually operating in the marketing literature on consumer-based brand equity can be done in two ways: Those who have examined consumer perceptions (such as brand awareness, brand associations and perceived quality) and those who study consumer behavior (Such as brand loyalty and willingness to pay higher prices, etc). Acres of the few writers have combined two aspects of cognition and behavior (Myers, 2003). According to Aaker (1991) brand equity is a multidimensional concept, which includes brand loyalty, brand awareness, perceived quality, brand associations and other proprietary brand assets.

### Loyalty to the brand

Loyalty to a brand that has long been considered one of the main Construction Marketing is often the core of the brand's equity. If customers are indifferent to the brand, in fact, according to the features, price and product related facilities, as well as almost without regard to brand it, buy it. In this case, probably very little brand equity. But if customers continue to purchase from a particular brand, if the competitor, better features, better price or provide facilities, it is a remarkable brand value (Aaker, 1991).

### Awareness of the brand

Brand awareness, the ability to recognize (recognition) and remind potential buyers of a brand as a member of a particular class of products. In other words, a product category (eg cars) is reminiscent of a like-Benz brand (Aaker, 1991). Consumer-based brand equity, which occurs when high levels of consumer awareness and is familiar with the brand and also evokes a unique, desirable and powerful mind.

### Model Brand Value Chain (BVC)

The brand value chain model of the structured approach to assessing the risks and consequences of equity offering and suggest a framework by which marketing activities create value for their brands.

Figure 1 chain model of Keller's brand equity and Lehman (2003) shows.

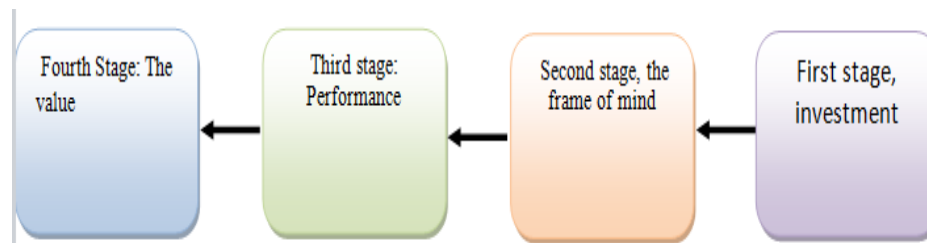


Figure 1: Chain model of brand equity

### Model of brand equity from the customer's perspective

Customer-based brand equity, the vision References the customers looked brand value and the resulting effects on the behavior of brand recognition for all of their customers know. The distinctive response of customers to the brand, brand equity and brand distinction and recognition will come. All activities have the brand recognition of the work done. The experience gained from the short-term marketing activities impact on the long-term success. As is evident, both for the customer and for the organization's brand value, the main source of customer value lies and that is the mentality of real value to the organization's stakeholders. Due to customer-based brand equity, the overall process of creating a strong brand, the four-step process is as follows. Firstly, brand identity: developing the mindset that you are going to make brand recognition and trust of customers by linking it to a specific category of need, secondly, the meaning of the brand: to build a set of tangible and intangible brand attributes, third, the answers are: extracting a favorable response from customers based on judgments and feelings, fourth Stage, the resonance Brand: Become A Brand building a strong relationship based on loyalty between customers and brands. During the four-Stage, all activities of the organization must be aligned to the six intellectual property values (salience, Performance, imagery, feelings, judgments and brand resonance) to be created in the minds of customers. In fact reflects the six assets in the customer's mind will create customer-based brand equity (Kapferer, 2008). Therefore the source and root cause of customer-based brand equity, brand perceptions are shaped. In other words, what makes a strong brand; reflection activities are created in the minds of customers,

in order to form a building block brand in their minds. This statement formed the basis of brand recognition, to find. Brand recognition, brand refers to the mentality of people in relation to all aspects of descriptive and evaluative brand-related information.

Shaped the mentality of the brand, model brand recognition, brand awareness and brand image is composed of two dimensions (Gedsoor, 2008).

### Review of Literature

Based on the studies of success factors associated with key factors in new product development, the following is noted: A study by Little (1991) was conducted among Japanese companies, suggests that 87 percent of the companies under study system failure and guidelines NPD and 90% not paying enough attention to product specifications according to customers' needs as the most important barriers and challenges in improving innovation in the product development process have mentioned.Cooper (1997)

During regular research on the factors that accelerate new product success during the 20 years from 100 to 350 perennial crop in Europe and North America from chemical manufacturers with the failed and successful firms in manufacturing the product was developed and demonstrated, marketing agents (customer needs, production, profit, market share, the economic impact on customers and create value for the customer), technology (technical success, the technology and cost reduction) and commercialization of the index, the index company, competitive product performance product management team, in order of most important indicators of the NPD process in these companies during this period. Cierpicki approximate failure rate of commercial products introduced to the market in the West is really shocking and economy between 35 and 45

percent stated. Rudolph (1995) argues that the failure to offer a new product can cost from lost sales targets, unearned income, deferred income to be derived plus the waste of references. Morris quotes a cost breakdown in the food industry in America due to improper development of new products has been estimated at \$ 20 billion.

Thus, the success of NPD projects past and present challenges for managers are crucial. Lin et al.'s (1999) model of the determinants of success of new product development consists of eleven indicators, including:

Having a structured process, clear vision, review the product after the launch of its target markets, long-term vision, optimize product development team skills, understanding of the market and its dynamics, support from senior management, using the experience gained from previous projects, supply good team, keeping the team members with relevant experience in product development have shaped the project. Inspection of the sample assessment using the product, use of market research in guiding research and development projects, the use of marketing research before beginning research projects and the development and use of marketing research in determining the position of the first invoice pricing (marketing research), knowledge sharing within the team, knowledge sharing within teams, sharing knowledge in teams, the ability to track information on new products, informal communication during the work process, new product ideas focus on the qualifications of the company in the second factor (ICT), announce a new product as organizational competence, commitment and support from senior management of new product development projects, with plans for new product development and new product development of an instrument to measure the third factor (Planning and New Product Strategy), relationship with suppliers of raw materials for the food industry and food industry equipment suppliers in connection with the fourth factor (rings suppliers). Lee and Kim (2000) to integrate the group's ideas and understanding relationships between selected parameters of the analytic network process (ANP), and zero-one goal programming (ZOGP) were used for the

selection of an information system. Al-Harbi (2001), using the analytic hierarchy process (AHP) to assess the degree of importance of each indicator for projects estimated to calculate the weight of each indicator to decide. Meade and Presley (2002), the ANP technique for quantifying the degree of importance of the quality criteria used for selecting R & D projects.

Cooper (2003) look at the tools and features desired by the NPD research agenda to reduce risk in new product development through knowledge management is proposed. Model of multi-criteria decision making (MCDM) is high-level managers in selecting one option among several options. The Aberdeen Group benchmarking study (2005) of world class manufacturing companies, the study suggests that the majority of companies in the manufacturing and new product development, five goals were not able to consistently produce the expected revenue from new products, including new product production costs, time-to-market, quality objectives and goals in mind gain product development costs.

In another study by Sun and Wing (2005) has taken the Hong Kong toy industry, of the 54 initial success, the eight key success factors have been described. These are the four Stage of new product development and definition of the target market (idea and concept formation), introduction of quality standards, clear goals and projects considered important in the early stages, in the second phase (product definition and specification), internal communication within the project team, in the third phase (the prototype and development), timely delivery of product to the customer, setup time, cost of production, in the fourth stage (commercial product). Sowlati and et al (2005), using the AHP weights of selection criteria obtained by using data envelopment analysis (DEA) chose a potential NPD projects. Eilat and et al (2006), using Mtvavn Scorecard (BSC), the values obtained to evaluate Performance qualitative criteria and the DEA model is then used to select projects. Feyzioglu et al (2006), by combining neural networks and fuzzy theory is an integrated decision-making methodology developed using previous knowledge, of

evaluated NPD. NPD projects in the advanced industrial countries studied biochemistry showed that: 1) the use of multi-functional teams and also focus on the individual, 2) the use of detailed market research, 3) test the market, the initial assessment of the product and also customer reviews final, 4) quality advertising and 5) the degree or extent to which the company has a presence in international markets, can be considered as factors affecting the success of NPD projects (Kandemir, Kalantv and Garcia, 2006).

Mu et al (2007) Key factors in new product development for industrial managers in 74 industrial enterprises in China showed that 4 factors, manufacturing, marketing, management, for the commercialization of new product in all industries in the process of decision making for new product key and important. Mahmoodzadeh et al (2007), using AHP and fuzzy theory, fuzzy judgment matrix created the fuzziness of subjective judgments of decision makers show TOPSIS method is used for ranking projects. Key factors of new product development in China indicates that factors a) process, b) Marketing c) Administrative and d) effective brand building on the success of new product development (Mu et al., 2007). One of the most common risks in new product development, product strategy and image gap between customer's perceptions of the new product. In other words, the customer's perception of the new product may not coincide with the company's expectations. This risk may be losing customers or even leads to a threat to business performance (Cheng and Liao, 2007). Kayis et al (2007), a methodology for reducing the risk of new product and product design in concurrent engineering projects are developed. The most significant risks are identified in the product lifecycle and the risks were relatively small quantities. Then, using five computational algorithms and simulated three scenarios innovative solutions to reduce the risks presented. 2008). Ahn and Choi (2008), AHP, and simulation techniques can be combined together to create simulation-based AHP. The flexibility of this approach by choosing an ERP project evolved. Wang and et al (2008), using the fuzzy multi-criteria decision making

(FMCDM) optimization options used in the project selection process. Wang and Lin (2009) developed a model for determining risks of proposed timing for new product development. And a simulation algorithm is developed to impact on the delivery process and analyzes their structure. Suwannaporn and Speece (2010) the success of new product development in the food industry in Thailand do have another inquiry 15 basic elements extracted in 4 main categories are listed below:

Inspection of the sample assessment using the product, use of market research in guiding research and development projects, the use of marketing research before beginning research and development projects and use of marketing research in determining the position of the first invoice pricing (marketing research), knowledge sharing within teams, knowledge sharing within teams, knowledge sharing across teams, the ability to track information on new products, informal communication during the work process, new product ideas focus on the qualifications of the company in the second factor (ICT), announce a new product as organizational competence, commitment and support from senior management of new product development projects, with plans for new product development and means for measuring the organization's new product development in the Third Factor (new product planning and strategy), relationship with suppliers of raw materials for food industry the fourth factor is related to the food industry and equipment suppliers (suppliers circles).

Choi and Ahn (2010) proposed a model for risk analysis to determine the degree of risk in new product development. The model of fuzzy theory and Markov processes relies on simultaneous engineering. Risk factors that determine the values of fuzzy models and Markov processes determine the probability of risk.

Chiang et al (2010) using Bayes networks and data envelopment analysis (DEA), a fuzzy evaluation model for the selection and ranking of new product development projects. They consider three types of risk for NPD projects that include: Time to market risk, the risk of profit expectations and risk making ability. They are using fuzzy AHP, the risk and cost and revenue



aspects of the weighting after creating a Bayesian network for risk assessment using fuzzy DEA NPD projects selected and ranked. Tang et al (2011) for an analysis of risk perception (sense of) customer (CPR) in developing a new product, a new method is proposed and different because of the lack of information on factors CPR, using method (RIMER) analyzed out. Wei and Chang (2011) is a new approach for the selection of new product development projects. By combining the fuzzy theory and multi-criteria group decision-making, select the model for new product introduction. Model of project performance, project delivery, and risks involved in new product development projects NPD project selection is formulated as a fuzzy linear programming problem.

### **Methodology**

Based on objective, scientific research can be divided into three basic groups, divided and scientific applications. Cognitive and applied research using context information obtained through fundamental research, to meet human needs and improve and optimization tools, methods, things patterns and the development of welfare and improves their lives used. Considering that the aim of this study was the same brand value of products is varied, to say the survey, is applied.

### **The population**

The purpose of the research and the practice of collecting data are extracting conclusions about society. It's simply a statistical population is the entire set of real or hypothetical, events and things that happen to generalize their findings-that (Khalili Schwerini, 2001). The study population consists of medical, paramedical, pharmacy; technical officials are all purchasers of medical equipment and laboratory products manufacturing companies in the province.

### **Sampling method and sample size**

Including methods of sampling that in some cases better than simple random sampling method works, cluster sampling. A cluster sampling, probability sample each sampling unit is a collection or group of members. If a complete list of the population under study is not available population can be clustered in bunches.

The clusters are then randomly sampled and all our census of the cluster size.

For this purpose, a list of the clusters produced and it is used as a sampling frame. If cluster sampling is more efficient than simple random sampling, sampling frame (a complete list of members of the public) are not available, the collection consists of individual clusters can be formed and the list of clusters to be easily obtained. It should be noted that as the cluster size increases and the similarity of those variables evaluated in terms of attributes increases, cluster sampling is less accurate.

Several reasons for using cluster sampling. If the cost of providing a framework where all community members are much Index or if the cost of providing observations increases with increasing distance between the members, cluster sampling can be less expensive than the simple random sampling or stratified (Khalili Schwerini, 2001). In this study, due to the large population size and geographic dispersion of the cluster method used.

### **Analysis of data**

Information obtained in this study using the software Lisrel, using inferential statistical methods were analyzed.

H1: brand awareness in the market will affect the sale of new products. According to the T-test at the 95% error level ( $t = 6.10$ ,  $\gamma_{11} = 0.31$ ), this hypothesis was confirmed, so their impact on product sales.

H2: brand loyalty in the market will affect the sale of new products.

According to the T-test at the 95% error level ( $t = 8.55$ ,  $\gamma_{12} = 0.60$ ), this hypothesis was confirmed, so the impact of innovation on product sales.

H3: perceived quality, brand new products will affect the sale.

According to the T-test at the 95% error level ( $t = 9.51$ ,  $\gamma_{13} = 0.77$ ), this hypothesis was confirmed, so it affects the quality of the product.

H4: Brand associations affect the sales of new products.

According to the T-test at the 95% error level ( $t = 6.27$ ,  $\gamma_{14} = 0.17$ ), this hypothesis was confirmed, so it affects the quality of the product.

Table 1: Summary of results of testing hypotheses

| Path                                 | Hypothesis | Standardized coefficients | T-statistics | Results      |
|--------------------------------------|------------|---------------------------|--------------|--------------|
| Brand awareness Sales                | 1H         | 0.31                      | 6.1          | Verification |
| Brand loyalty Sales                  | 2H         | 0.6                       | 8.55         | Verification |
| Perceived quality of the brand Sales | 3H         | 0.77                      | 9.51         | Verification |
| Brand associations Sales             | 4H         | 0.17                      | 6.27         | Verification |

As already mentioned, the dimensions of brand equity based on Aaker's model of "brand awareness", "brand associations", "perceived quality of the brand," "brand loyalty" and "Other assets are" is. However, in practice, four researchers have used it in the form of (2) is observed. David Aaker's other writings include equity considers four dimensions. The fifth dimension because it is much less widely used.

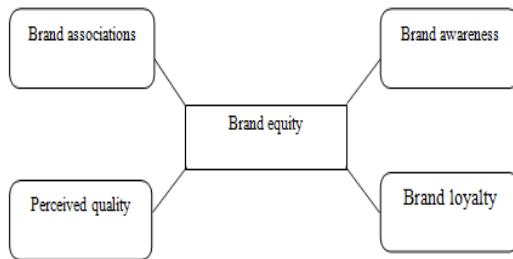


Figure 2: Aaker's brand equity model

According to Cochran formula and the number of applicants to medical facilities in Isfahan, a minimum sample size of 84 was obtained. To make comparisons between companies in the sample in terms of "brand loyalty", "perceived quality of the brand" and "brand associations", These people need to be aware of all these companies. To this end 300 of the Doctors, paramedical, pharmacy, technical authority to population ratio, respectively 78, 171 and 51 were selected and were asked whether the products of all the companies operating in manufacturing medical equipment dating or not? If the answer to the above question is yes, they were asked to complete the questionnaire; as would-be buyer but if the person is not familiar with all of these companies, Wei was not given to any questionnaire. Among them, 96 people

were familiar with all the medical equipment manufacturing companies, eliminate the minimum sample size. It should be noted that the "brand awareness" medical equipment manufacturing companies in the area was clear.

#### Conclusions:

Means for implementing successful brand development, brand new or modified product in a new class is used. Brand development, product causes instant recognition and acceptance it will be faster. The cost of advertising is often necessary to create a new brand makes the save. At the same time, the strategy of brand development, it also has risks. Extension may confuse the image of the brand in the minds of customers. If it fails brand development, consumer interests compared to other products that may be offered by the brand are also destroyed. On the other hand, if they fail to develop resulting in the loss of advertising costs. Because of the bad image in the minds of customers, there is a new product. In addition, the new product, corrects bad image in the minds of customers.

#### References:

1. Bazargan, A., Sarmad, Z. and Hejazi, E. (2001), "Research methods in the behavioral sciences", Tehran, knowledgeable, Fifth Edition.
2. Khalili Schwerini, Siavash (2001), "Research Methods in the Humanities", Memorial Book, Tehran, nineteenth edition.
3. Aaker, David, (1991), "Managing Brand Equity", New York, Ny: Free Press. 402-408.
4. Ahn, B. S., & Choi, S. H. (2008). ERP system selection using a simulation-based

5. AHP approach: A case of Korean home shopping company. *Journal of the Operational Research Society*, 59, 322–330.
6. Cooper, L.P., (2003), “A Research agenda to reduce risk in new product development through knowledge management: A practitioner perspective”, *Journal of Engineering and Technology Management* 20, 117- 140.
7. Kapferer J-N. (2008); *The New Strategic Brand Management, Creating and Sustaining Brand Equity Long Term*. London: Kogan Page.
8. Keller, K. L. & Lehmann, D. R. (2003). How do brands create value? *Marketing Management*, 12(3), 26-32.
9. *Management*, 12(3), 26-32.
10. Mu,J, Peng .G, Maclachlan.D.L, (2008), ” Effect of risk management strategy on NPD performance”, *Technovation*, vol.10 no.16, PP 1-10
11. Myers, A. (2003) "Managing brand equity: a look at the impact of
12. attributes", *Journal of Product & Brand Management*, Vol. 12 Nos. 1, pp. 39-51.
13. Simon, J. C. & Sullivan, W. M. (1993). “The Measurement and Determinates of Brand Equity: A
14. Financial Approach”, *Marketing Science*, 12 (1), pp. 28-52.
15. Tang, D., & Yang, J. B., & Chin, K. S., & Wonga, Z. S. Y., & Liu, X. (2011). A methodology to generate a belief rule base for customer perception risk analysis in new product development. *Expert*
16. *Systems with Applications*, 38, 5373–5383.
17. Wang, J. J., Jing, Y. Y., Zhang, C. F., Shi, G. H., & Zhang, X. T. (2008). A fuzzy
18. multicriteria decision making model for trigeneration system. *Energy Policy*, 36, 3823–3832.
19. Wang, J., & Lin, Y. I. (2009). An overlapping process model to assess schedule risk for new product development. *Computers & Industrial Engineering*, 57, 460–474.
20. Wei, C.C., Chang, H.W. (2011). A newapproach for selecting portfolio of newproduct development projects. *ExpertSystems with Applications* 38, 429–434.