Criteria Weighting and 4-P Planning in Marketing Using Analytic Network Process

Elif ALAYBEYOĞLU, Y.Esra ALBAYRAK, Tuncay GÜRBÜZ

Abstract— **The first of two major functions of the enterprises is producing goods and services, and the second is selling them. The relationship between production and consumption shows that marketing plays an important role in enterprises. Nowadays, the concept of marketing is customer-oriented and aims to meet the needs and expectations of customers to increase their satisfaction. And the basics of marketing decisions are the choice of appropriate target markets, their analysis and the creation of strategic marketing plans with the elements of the marketing mix. While creating a marketing strategy, an enterprise must consider many factors. The creation of the strategy begins by deciding what the overall objective of the enterprise should be. The next step is to choose a strategy for the offering that will be most effective in the market. In this study, marketing strategies and marketing decisions in the new-product-development process will be observed, the criteria that are effective in this process will be defined and in order to reflect the real life situations as much as possible, the interactions among criteria will also be taken in consideration and Analytic Network Process (ANP) will be used to handle those interactions.**

Keywords—**Marketing, Strategy Selection, ANP**

I. Introduction

EFFECTIVELY for the success of a company, the invented core product is crucial in the first place and a good product is more likely to bond market. However, nowadays the development of technology and the supply which exceeds demand create difficult conditions in the market and competition. As a result, the concepts that add value to the product such as marketing and branding become much more important. These processes begin now, since the invention of the product because which give or add value to a product are the customer and the point of view of the customer. Thus it is necessary to properly introduce and explain the product to the customer and gain their trust. At the same time, in order to make a possible profit, the product should have a long life cycle in the market [1]. Once the marketing and branding processes are managed in accordance with the life cycle, the product will reach a success.

For reasons such as defend or increase the market share, be superior to the opponents, have an innovative and leader company image in the market and reduce risks by increasing the range of products; companies always need new products. The general expectation of the customer is always toward the new and improved products. Demand tends to approach the new products, without wasting time. New products should be launched at the same speed or faster than competitors. The company must exceed its old product before its competitors, with its own new product. For this reason, the continuity of the company's success is proportional to the activity of new product development. When the new product development is observed as a process, it is found that the majority of the process consists of the marketing strategy decisions that begin at the inception of the concept of the product [2].

However, a larger estimation of the current market, the fact that the product cannot fully meet the expectations / needs of the client, the fact that the product does not differ compared to current products on the market and the incompatibility between product positioning and marketing mix components are the reasons for the grounding of the new product.

During last five years, in the literature, there are three studies about marketing strategy selection,

- using fuzzy ANP for choosing the best marketing strategy [3],
- modeling a marketing strategy decision making problem as a multi-criteria decision making (MCDM) problem and using TOPSIS and ANP methods [4],
- using ANP method for the model that suggests several managerial actions for achieving an ideal web-based marketing [5].

In this study, marketing strategies and marketing decisions in the new-product-development process will be observed, the criteria that are effective in this process will be defined and a MCDM model will be proposed to weigh the criteria and to define the best strategic marketing scenario. In order to reflect the real life situations as much as possible, the interactions among criteria will also be taken in consideration and ANP will be used to handle those interactions.

II. Analytic Network Process

ANP is a more general form of the Analytic Hierarchy Process (AHP) [6]–[7]. ANP is a technique which makes it

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possible to take the dependencies and the interactions between the criteria and the sub-criteria into account. For this reason, the decision structure of ANP has a form of a network showing the relations between different levels of the model. ANP doesn't require a solid hierarchical structure and it is possible to model the relations between the lower level with the higher level elements of the model and the interdependencies between the elements of the same level. Besides, it is possible to define the importance of the alternatives and the importance of the criteria with respect to the alternatives' importance. All these relations are evaluated with comparison matrices and a supermatrix. The supermatrix is built with the priority vectors obtained from the comparison matrices [6]–[8]–[9]. This supermatrix is used to obtain the final priority vectors.

A. Construction of the Model

A multi-criteria decision model containing interactions among criteria cannot be built as a hierarchy. At this stage, the model with its goal, criteria, sub-criteria and dependencies among them has to be clearly defined and the dependencies and relations should be presented in a form of a network.

B. Pairwise Comparison Matrices and Priority Vectors

At this stage, pairwise comparisons for problem's criteria are performed and their relative importance in order to realize the goal is determined. ANP uses the 1 – 9 scale proposed by Saaty for that purpose.

On the other hand, problem's criteria can be either quantitative or qualitative. Therefore, in order to find the scores of alternatives for quantitative criteria, the data can be collected from various sources. However this is not possible for qualitative criteria. In order to find the scores of the alternatives for this type of criteria, the same procedure, pairwise comparisons, has to be made.

C. Supermatrix Formation

This matrix which shows the relations between criteria is used to obtain the final priority vectors. It is built with the priority vectors obtained by pairwise comparisons. The local priority vectors obtained from the pairwise comparison matrices are used to build this matrix which ultimately gives the global priority vectors by taking the limiting powers after it is normalized.

D. ANP Procedure

The outline of ANP steps as follows:

- Describe the decision problem in detail with objectives, criteria, sub-criteria.
- Determine the general network of components / clusters and the elements within the clusters.
- Determine all the inter and inner-dependencies that exist in the decision problem. After this step, the network of the decision problem will also be found.
- Build the supermatrix by performing the pairwise comparisons, prioritization and define the weights of the criteria and the sub-criteria while considering the inter-dependencies between them.
- Perform pairwise comparison on clusters. The derived weights will be used to find the weighted supermatrix.
- Perform consistency analysis of all the pairwise comparisons, made by the experts or decision makers, in order to make the necessary changes if there is any inconsistency above the allowed limit.
- Rate the alternatives according all the criteria and sub-criteria.
- Find the weighted supermatrix.

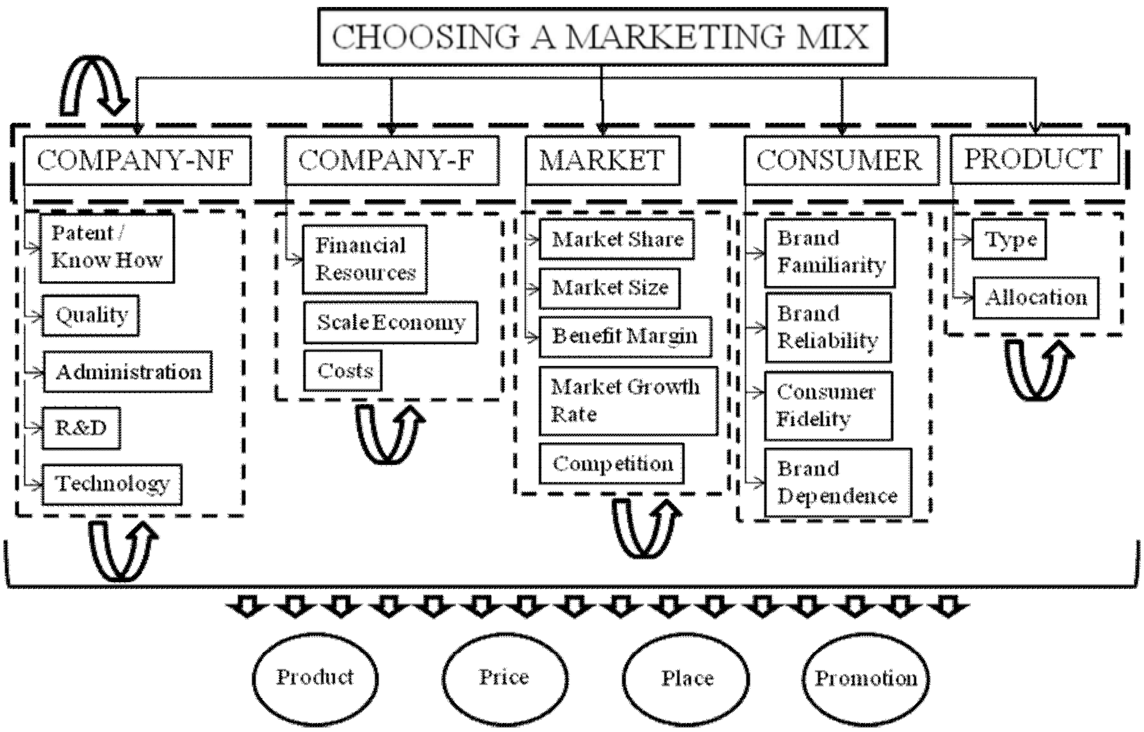

Fig. 1. Criteria, Sub-Criteria and the Alternatives of the Proposed Model.

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- Compute and find the limit supermatrix from which the overall score for the alternatives is retrieved and make the final decision as to choose the best alternative or to obtain the final ranking of the alternatives.

III. Proposed Model

The objective of the model is to determine a marketing strategy for the company to launch the new product to the market and to weigh the elements of the marketing mix. Marketing mix elements are Philip Kotler's 4*P* of the marketing: Product, Price, Place and Promotion [10].

Each *P* represents different strategies for the marketing of the new product and is vital for the success. As a result, in the marketing process, none of them should be ignored. This model aims to give percentages to these strategies, to show their importance and to help the company to decide how to make investment and how to give importance to these strategies. Consequently, the 4*P*'s are the four alternatives of the model. There are five criteria in the model including a total of nineteen sub-criteria (see Figure 1). The criteria are as follows:

- Company (Non Financial - NF): This criterion is about the current situation of the company. It consists of five sub-criteria which are not financial. *Patent/Know-How*, presents the current knowledge and the experience of the company. *Quality* is the sub-criterion that shows the quality of current products and the quality policy of the company. *Administration* represents the success of the current administrative organization of the company. *Research and Development (R&D)* is the criterion that shows the research and development pursued by the company and the current situation of the company in this regard. Technology shows how the company benefits from today's technological developments.
- Company (Financial - F): This criterion is about the financial situation of the company. It consists of three sub-criteria. *Financial Resources* are the resources that the company can use for making investments in all possible areas. This criterion shows the financial position of the company. *Economies of scale* refer to the cost advantages that an enterprise obtains due to expansion. In other words, it means increasing the effectiveness in production due to the increase in production capacity and lower fixed costs per unit. This criterion shows how the company benefits from economies of scale at the moment. *Costs* are the variables that appear when the company is in production, like raw materials and labor costs.
- Market: This criterion is about the current market of the company's products and the company's situation in this market. *Market Share* refers to the percentage of the sales in the market that belongs to the company. *Market Size* is about the number of buyers in the market. *Profit Margin* of a company is calculated by finding the net profit as a percentage of the revenue. It shows the profitability of the company. But in this model, profit margin is calculated for the overall market since the prices are close because of the competition. *Market Growth Rate* shows the increase in the market size in unit time. It takes larger values in new markets. *Competition* is about the number of sellers the market. More sellers mean higher competition in the market.
- Consumer: This criterion is about the customer behavior toward the company's current products in the market. It consists of 4 sub-criteria that can be used for explaining the customer behavior. These sub-criteria are *Brand Familiarity, Brand Reliability, Consumer Fidelity* and *Brand Dependence*.
- Product: This criterion is about the new product that the company will launch to the market. *Type* is the sub-criterion that refers to the classification of the product with a marketing point of view. Product can be a convenience product, a shopping product, a specialty product or an unsought product. *Allocation* is about the positioning of the new product in the company's current product mix. The new product will cause a line extension or a category extension.

IV. Application

The application of the proposed model will be carried on the launch market for a new product of a company producing fast moving consumer goods in the food sector. The company serves the food industry for 40 years, holds second place in the market share, produces products in categories such as biscuits, cakes, chocolates and uses the umbrella branding strategy. It always combines the new brand and the company name. The new product that will be launched will have the same brand as the other chocolates of the company but will be of another type. So the company is making a line extension. This new product, as the other products of the company, is a convenience product.

The criteria, the sub-criteria and the alternatives of the model are weighted with the consensus decision given by a group of experts who are chosen by the company: two engineers from the production department, two managers from the marketing department and two customers of the company.

With criteria comparisons, the Cluster Matrix, which contains the priority vectors of the criteria, is obtained. In order to calculate the weighted supermatrix, this cluster matrix is used. The cluster matrix can be observed in Table 1.

TABLE I
CLUSTER MATRIX

	C1	C2	C3	C4	C5	ALT
C1	0,5	0,26	0,08	0,65	0	0
C2	0,24	0,12	0,29	0,15	0	0
C3	0,09	0,57	0,36	0,15	0,55	0
C4	0,09	0	0,16	0	0,19	0
C5	0	0	0,07	0	0,19	0
ALT	0,09	0,06	0,03	0,06	0,07	0

Final priority vectors are found by taking the limiting powers of the weighted supermatrix. The importance of the alternatives is given as percentages as it can be seen in the Figure 2.

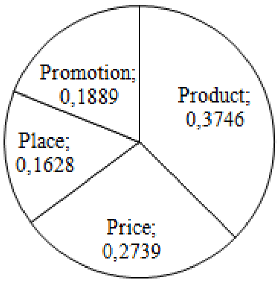

Fig. 2. Final Priorities

V. CONCLUDING REMARKS

According to the result of the model, for the new product, the company must spend:

- 37% of the total investment (financial resources, effort, etc.) to the product itself,
- 27% for the price strategy,
- 19% for the promotion and
- 16% for the distribution.

The reason that the majority is dedicated to the product is that the company is doing a diversification of product. As the company must give significant weight on this new product, the company will conduct R&D and market research; it will create a new production line and will waste time and money in the process of decision. Therefore, it is quite normal that the share of the product including all of these factors will have a much higher percentage than others.

It is observed that the promotion has a significant lower percentage compared to the product and price. This is because the company is making a line extension. The product has the same brand as the other products in the same line. The familiarity of its brand is already high since the company holds the second place in the market share. Therefore, the consumer is already familiar to existing products and brand. As the company does not launch a new brand, it is expected that the share of the promotion is less than those of the product and price.

The importance of the distribution is lower than others because of the current presence of a distribution chain and the absence of the need to invest more just for this new product.

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