The Adoption of Marketing Decisions by Using Fuzzy Logic for Market Segmentation and Competitive Advantage Achieving A Hypothetical Application in Automotive Industry

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Abstract

In our contemporary period the businesses environment becomes more and more dynamically and surrounded by uncertainty, in the same time with the continuous increase of globalization and technology development. In this context, taking the most appropriate decisions, either strategical, tactical or operational ones, from different points of view within an organization, here making reference to selecting the most suitable alternative in aspects like for example managerial decisions, marketing decisions, human resources decisions and so on, represents for the organization the vector for survival and development in an uncertain and ambiguous environment. The main purpose of this research is to find out which are the most preferred Dacia car brand in a certain region or country around the world in order to prioritize the production in a proactively and efficient way in accordance to the lean management and just in time production system.

Key words: marketing, decisional process, ambiguity, fuzzy logic, automotive
J.E.L. classification: C63, D12, D47, D81, L22.

1. Introduction

The enterprises in the current period are facing with a lot of challenges in the purpose of surviving and progressing, mainly because of the ongoing changing environment, globalization, technological changes, increased competitiveness of market and also due to more and more higher quality and features expectations and desires of the customers. The issues related to problems such as the proper positioning within the market in the same time with the best selection of the suitable variables of the marketing mix according to exactly demand from the customers from different areas or countries are important aspects which wisely managed can contribute for ensuring the perenniality of organizations, taking into account the high uncertainty of external environment, also doubled by the subjectivity of reasoning of the decisional factors.

Thus, the selection systems which seeks to offer the best decisional alternative from a several given ones in different faced particular situations can offer to firm a competitive advantage against by competition and to accomplish the customers wishes and desires with decreased costs and in conditions of high quality, in concordance with lean management and just in time principles.

2. The main objective and its related reasons of research

The main objective of this research paper is to find out which are the most preferred Dacia car brand in a certain region or country around the world in order to prioritize the production in a proactively and efficient manner according to the lean management and just in time production system. This research ended within a hypothetical application can be based on the preferences and

the opinions of the current and potential customers with respect to the weights of importance of some selection criteria and the related car performances with respect to the chosen criteria. The main reasons in reaching the research objective consist in reduction the production costs and for eliminating wastes, in the same time with guiding the top management and the marketing department to choose the most suitable alternative of mix of marketing and combine accordingly the four components of it for each targeted region or country also with guiding the technical or engineering department for the future car models in order to meet the customers' requirements or expectations.

The reasons for which I chose this topic are the following:

1) Knowing the preferences and the opinions of the current and potential customers with respect to the weight of importance for the selection criteria and the related car performances about them;

2) A more approximate setting up of the volumes of each type of car to be produced weekly or monthly in order to reduce the production costs and wastes;

3) Enabling of establishment and leveling the production capacity in a smooth way according to the lean management principles;

4) Reduction of costs due to the reduction of inventories of raw materials and finished goods according to the just in time principles;

5) Guiding the top management and the marketing department to choose the most suitable alternative of mix of marketing and combine accordingly the four components of it for each targeted region or country in the same time with guiding the technical or engineering department for designing future car models in order to meet the current customers' requirements or expectations.

3. Research methodology and hypothetical application

The purpose of all companies in a competitive environment is the following: to work more efficiently. Thus, the business processes are concerning for taking the best decisions, otherwise they will not be able to be performed, taking into account the increasingly competitive and changeable environment. In this context, the decisional process involves many times multicriterial decisions, which are surrounded by uncertainty and in the same time by the subjectivity of human factor reasoning, for which some methods based on fuzzy logic are or other methods can be very useful.

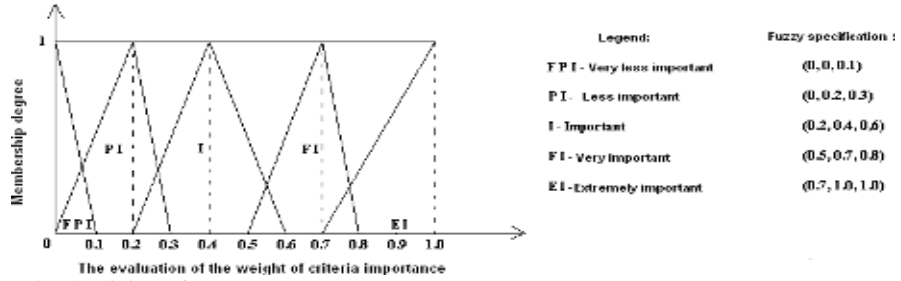
In the literature are founded similar marketing researches that are based on fuzzy logic, such as for example the one of Al Ganideh et al. (2012), who are using fuzzy logic to analyze "marketing data with respect to the impact of socio-psychological variables on the national identity of Jordanians". Another examples for this topic would be Donze and Meier (2012), who apply fuzzy logic and fuzzy methods to different marketing researches or studies, while Enache (2015) implements fuzzy logic marketing models for sustainable development. Additionally, the reasoning of the decisional human factor is often a subjective one, taking into account that many times it tends to be expressed by vague expressions, through qualitative linguistic values, and not by fixed figures. The marketing decisions, especially the strategic ones, are falling in the same framework, so that the implementation of some effective mathematical tools for treating the subjectivity of human factor reasoning in the marketing field using fuzzy logic and its fuzzy numbers represents a powerful tool for handling all these kind of uncertained aspects regarding the mix of marketing components, marketing research projects and other related issues from this important field of activity in any organization called marketing.

Zadeh (1965, 1999), considered the father of fuzzy logic, stated that the "fuzzy term has concreteness, is immediately and descriptive and the fuzzy representation consists in using fuzzy sets theory and especially fuzzy logic as part of theory". In this context, Zadeh mentions about the principle of incompatibility, which converges towards "vague (fuzzy) sentences and fuzzy logic tries to create a formalism for the imprecision and ambiguity that are specific to the natural language. Through fuzzification, the linguistic values can be converted into fuzzy sets, which allow an elastic and flexible mathematical simulation and modelling for providing reliable results."

For obtaining some accurate, reliable and fast results, I have used a software designed in the Java programming language, which is staying behind the following methodology, whose steps are described below:

1) The definition of the triangular fuzzy sets for the importance of criteria, through fuzzification process, according to figure 1.

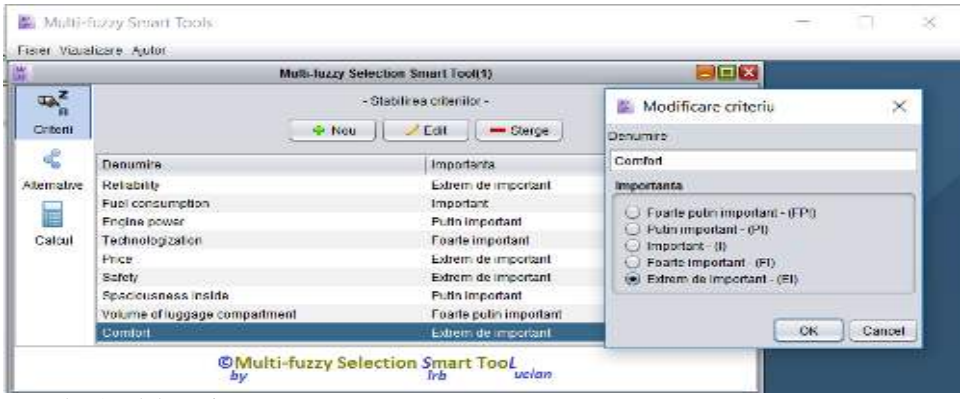
Figure no. 1. The triangular fuzzy numbers of the importance of criteria



Source: Author's elaboration

The interface of the software that manipulates the input data with respect to the assessment of the importance of criteria can be view below:

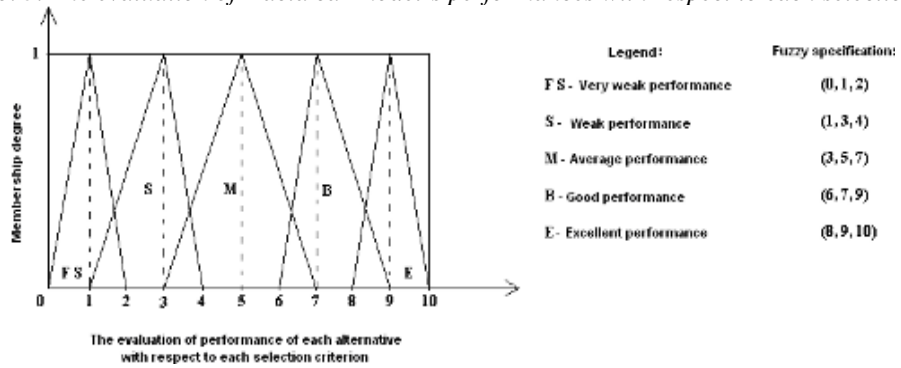
Figure no. 2. The fuzzy software interface regarding the first step of described methodology



Source: Author's elaboration

2) The definition of the fuzzy sets regarding the evaluation of performance of each alternative with respect to the selection criterion by the fuzzification process, according to figure 3.

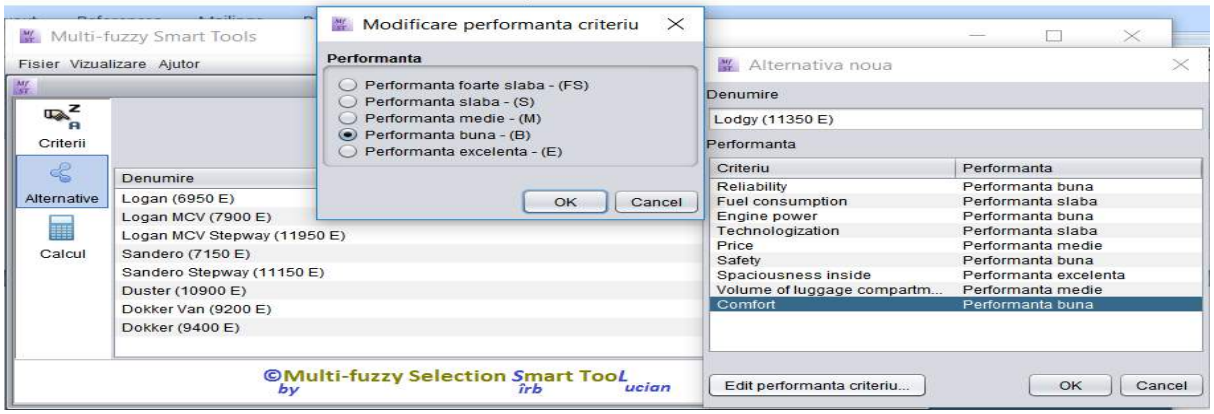
Figure no. 3. The evaluation of Dacia car model's performances with respect to each selection criterion



Source: Author's elaboration

The interface of the software that manipulates the input data with respect to the assessment of the performance of each alternative (Dacia car model) can be view below:

Figure no. 4. The software interface describing the potential performance of each car model with respect to each selection criteria



Source: Author's elaboration

As we can see in the previously figure, every potential decisional alternative was evaluated through the prism of its performance with respect to each selection criterion, but in this example which is a hypothetical one as the title of the paper says it, only for the Lodgy (11350 E) model can be seen the evaluation, the other evaluations being stocked before in software after they have been added manually by keyboard of the PC.

3) The establishment of the number of criteria (denote by n, where i=1,...,n).

4) The establishment of the number of Dacia car Models (denote by m, where j =1,...,m).

5) The assessment of the weight of performance of each criterion according to figure 1, in that way that all the weights will be transposed as a matrix with one column and n rows, denoted by I, as follows:

$$I = \begin{pmatrix} weight\ of\ importance -> criterion\ 1 \\ weight\ of\ importance -> criterion\ 2 \\ . \\ . \\ . \\ weight\ of\ importance -> criterion\ n \end{pmatrix}, i = 1,...,n. \qquad (1)$$

6) The assessment of the potential performance of each Dacia car model with respect to each criterion of selection according to figure 3, in that way that all the evaluations will be transposed in a matrix with m rows and n columns (m × n), denoted by P, which has on each row the performance evaluation of each Dacia car model with respect to each selection criterion, so:

$$P = \begin{pmatrix} P_{11} & P_{12} & \dots & P_{1n} \\ P_{21} & P_{22} & \dots & P_{2n} \\ . & & & \\ . & & & \\ . & & & \\ P_{m1} & P_{m2} & \dots & P_{mn} \end{pmatrix}, \text{where } i = 1,...,n,\ j = 1,...,m. \qquad (2)$$

7) Through the multiplication of the matrices P and I above, it will result the aggregate fuzzy matrix denoted by S from "solution", with 1 column and m rows, which will contain on every row the fuzzy scores corresponding to each Dacia car model susceptible to be selected within decisional-making process of selection and which shows the ranking of the customers regarding their preferences and afterwards shapes the way in which the company will produce cars and will prioritize the production depending on the customer needs and wishes.

$$S = P \times I = \begin{pmatrix} P_{11} & P_{12} & \dots & P_{1n} \\ P_{21} & P_{22} & \dots & P_{2n} \\ . & & & \\ . & & & \\ . & & & \\ P_{m1} & P_{m2} & \dots & P_{mn} \end{pmatrix} \times \begin{pmatrix} weight\ of\ importance -> criterion\ 1 \\ weight\ of\ importance -> criterion\ 2 \\ . \\ . \\ . \\ weight\ of\ importance -> criterion\ n \end{pmatrix} = \begin{pmatrix} S_1 \\ S_2 \\ . \\ . \\ . \\ S_m \end{pmatrix}, (3)$$

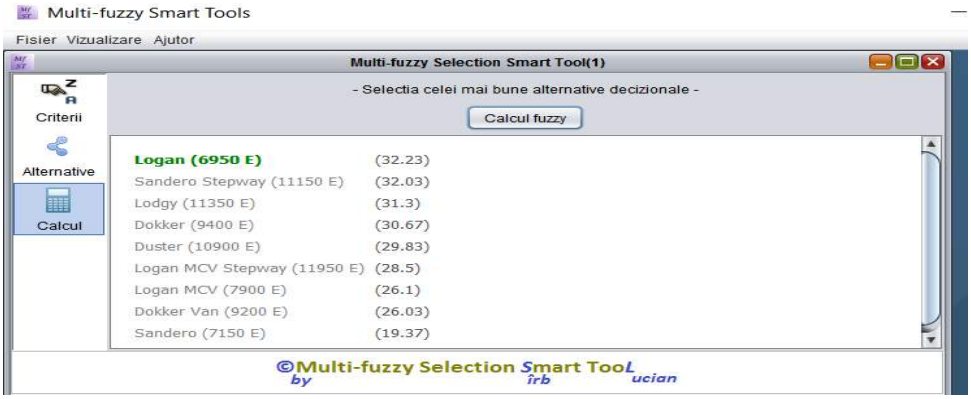
where i=1,...,n, j=1,...,m.

8) Because that every row of matrix S contain a fuzzy score, these will be converted into real numbers, through the process of defuzzification, by using the centroid method, as follows:

$$D(S_j) = \frac{s_j^1 + s_j^2 + s_j^3}{3}, \text{ where } j = 1,...,m. \qquad (4)$$

9) After comparing the real scores, Dacia car model with the highest score will be the final decisional option selected for prioritization in production for the following period, as can be seen in the prinscreen below after running the software.

Figure no. 5. The software interface related to the final result according to the fuzzy methodology



Source: Author's elaboration

4. Main conclusions

The proposed fuzzy methodology, which can be applied within a survey or a sampling for a certain targeted region or country to each of the individuals from the surveyed group and then afterwords the results to be centralized, will lead to the correct positioning of the company on the market through its Dacia car models according to the real demand from different region to region, showing the ranking of these models from the customers perspectives regarding their preferences and desires and afterwards shaping the way in which the company will produce cars and will prioritize the production in order to reduce the costs and to increase the quality and to meet the market expectations.

As main conclusions I have to emphasize that this paper wants to be an efficient and powerfull tool for guidance the top management and marketing department in choosing the optimal decisional alternative regarding the positioning on a certain market, in the conditions of subjective assesments of the current and potential customers with respect to their purchaising decisions. Even the methodology was materialized within a hypothetical example, its usefulness and efficiency in shaping the uncertainty and ambiguity of the human decisional factor reasoning which often is manifesting by linguistic values doesn't loose from value, so this tool can succesfully meet the following features and benefits for the management and marketing departments in making the right decisions:

- powerfull and flexible tool in modeling the decisional process (strategical, tactical and operational) in the conditions of ambiguity and uncertainty, doubled by the subjectivity of human factor reasoning;
- catalyst in improving lean management and just in time principles, in reduction the costs and inventories with raw materials and finished goods;
- leverage for strategic management level and marketing department for choosing the most suitable mix of marketing according to a given geographical area wishes and tastes → possibility of making some different rankings and statistics regarding the weight of importance of selection criteria and of performance of each of the alternatives with respect to these criteria;
- vector for engineering department in improving the quality and designing of new models of cars according to the customer demands and expectations.

5. References

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