Measuring Customer Satisfaction Using Multicriteria Analysis Methods: The Case of THESgala Cooperative Milk Vending Machines

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Abstract

Agri-food has proven a predominant sector that supports the Greek economy over time. According to the annual financial reports of Bank of Greece the agri-food sector in Greece represents 3% of GDP, compared to an average of 1.5% of EU GDP. The purpose of this research study is to examine customers' satisfaction with the products produced and offered by THESgala in Greece in relation to various factors, such as products, stores, human resources, customer service and prices. A specially developed questionnaire was conducted and circulated from February to May 2020, thus, 500 questionnaires were collected. The research outcomes of customers' satisfaction were analyzed with the Multicriteria Satisfaction Analysis (MUSA) method. MUSA is considered as an aggregation–disaggregation approach developed on the qualitative analysis regression. The results given by MUSA method showed that customers seem to be totally satisfied (90.84%) from the quality of the products that were offered by agricultural cooperative.

Keywords

Agricultural Cooperatives, Customer Satisfaction, Multi-Criteria Analysis.

1. Introduction

In recent years companies are particularly active at pursuing an international competitive and economic environment. In this competitive environment both the quality of products and services offered by a company and the consequent satisfaction or dissatisfaction of customers, are very important issues for companies' profitability and marketing growth (Drosos et al., 2021a, Skordoulis, et al., 2020). Such businesses' philosophy is that the continuous improvement of business performance can be directly or indirectly related to the optimal satisfaction of customers while creating added value for them.

On the other hand, the rapid international developments in the business world are creating new standards and organizational conditions of the production sector. Within this framework enterprises would develop and utilize more effective implements and methods, enabling them to evaluate the service and product quality as well as the satisfaction of their domestic and foreign clients (Drosos et al., 2021b, Karagianni, et al., 2017).

Attracting new customers while retaining existing ones and building relationships with all customers is a strategic tool for companies' competitive advantage, while achieving long-term and sustainable growth. Modern business units are pursuing to attract a loyal and satisfied customers in order to increase

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sales, reduce production and operating costs, while building significant market shares (Papasotiriou et al., 2019).

Over the past two decades customers' satisfaction is a primary target of companies aiming to be at the top of the modern business market. The main purpose of businesses is, foremost, to meet the customers' expectations through the products or services offered in order to create loyal customers over time (Boshoff and Gray, 2004).

It is also noteworthy that customer satisfaction is a very important factor of companies' survival in today's competitive market. According to Rust and Zahorik (1993) and Trubik and Smith (2000), high levels of customer satisfaction can lead to customer retention, especially in highly competitive and saturated markets, such as financial services. Research has shown that improving the quality of services and consequently customer satisfaction is critical to the success of financial institutions (Allred and Addams, 2000). Similarly, the litarature-noted key-factors of quality in the agri-food sector are linked to a) simultaneously analyzing system (or functional) quality and information (or technical) quality, and, b) to interpret how to measure these factors. The relevant research approaches are able to capture quality and to provide useful insights for managers and professionals in the agri-food sector (Moretti et al., 2017).

An important category of collective, national and international, entrepreneurship are agricultural cooperatives. Like any modern business, agricultural cooperatives are called to cope with a highly competitive business environment, formulating strategies to enhance customer satisfaction and to provide quality products and services (Elliott et al., 2018, Gezahegn et al., 2019). The agricultural sector mostly through cooperatives can also promote new innovations and methods in farming industry (Leontopoulos et al., 2015). Particular emphasis is given to the new generation of cooperatives that are considered a modern organizational model of rural collective entrepreneurship. New Generation Cooperatives are appearing more and more often, as producers attempt to increase their marketshare and to generate added value products (Grashuis and Su, 2019, Gava et al., 2021)

THESgala Cooperative was founded in 2011 by a group of producers with radically new views and philosophy. The year 2013 was a milestone year for the cooperative, when it decided, in addition to the primary production sector, to expand into the production and distribution of dairy products. In 2013 the network of stores with Milk Vending Machines THESgala was developed in Larissa, followed by Thessaloniki in 2015 and Athens in 2016, respectively. From 2017 onwards the business plan was the transformation of the stores into cooperative corners of Greek daily food products and the development through franchise stores of managerial and marketing expansion. However, this innovative idea subsequently failed due to increased economic debts and miscalculated expansion policy; the company declared bankruptcy in 2020 and by mid-2022 the company has ceased its last Milk Venting Machines.

2. Materials and Methods

In this research work a survey was conducted to measure customer satisfaction who buy milk from the milk vending machines of the THESgala cooperative. The survey was conducted from February - May 2020 on a total sample of 500 people in the Prefecture of Attica. In this research, customer satisfaction criteria and subcriteria are selected based on an extensive review of the relevant literature (Drosos et al., 2019, Skordoulis, et al., 2018, Drosos & Tsotsolas, 2014, Drosos et al., 2015, Drosos et al., 2018). The satisfaction criteria were based on the relevant literature concerning customers' satisfaction, as follows:

- Products: satisfaction with the offered services and products of every mobile telephony company
- Stores - Branch network: a criterion that concerns the space of the branches and their network.
- Human resources: satisfaction from the company staff.
- Customer service: refers to the satisfaction of consumers with the service they receive
- Pricing policy: a dimension that focuses on the cost of services.

According to the data presented in Table 1 the percentage of women who participated in the survey amounted to 53.00% with the corresponding percentage of men reaching 47%. According to the research data, the age group of 18-25 years was the age group with the highest participation rates in the research. The percentages of this solar group amounted to 26.21%. The age group with the lowest

participation rates was that of <18. The percentages of this solar group reached 6.21%. Regarding the monthly gross family income, as shown in Table 1, the largest percentage of participants (51.03%) gained a monthly income of less than 1,000 Euros.

Table 1
Sample Demographics

		% Percent
Gender	Male	47
	Female	53
Age	<18	6.21
	18-25	26.21
	26-34	14.48
	35-44	16.55
	45-54	24.14
	>55	12.41
Monthly Income	<1000	51.03
	1001-2000	38.62
	2001-3000	6.90
	3001-4000	3.45
Educational Level	Lower Secondary School	1%
	Upper Secondary School	29%
	Vocational Training	21%
	Graduate	22%
	Postgraduate/Doctorate	27%

The satisfaction survey results were based on the multicriteria model MUSA (Multicriteria Satisfaction Analysis). The Multi-criteria Satisfaction Analysis (MUSA) method was used in order to measure customer satisfaction. The method is an ordinal–regression-based approach used for the assessment of a set of collective satisfaction functions in such a way that the global satisfaction criterion becomes as consistent as possible with customers' judgments (Grigoroudis and Siskos, 2002). This method inferred an additive collective value function Y* and a set of partial satisfaction (value) functions Xi*, given customers' global satisfaction Y and partial satisfaction Xi according to the i–th criterion (ordinal scaling). The main research objective was to achieve the maximum consistency between the value function Y*and the customers' judgments Y. Based on the modeling of preference disaggregation approach (Jacquet-Lagreze and Siskos, 1982, Siskos and Yannacopoulos, 1985) the ordinal regression equation was termed as follows:

$$\begin{cases} Y^* = \sum_{i=1}^{n} b_i X_i^* \\ \sum_{i=1}^{n} b_i = 1 \end{cases} \quad (1)$$

Where $\tilde{Y}^*$ represents the estimation of the global value function, n represents the number of criteria, bi is a positive weight of the i–th criterion, σ+ and σ− are the overestimation and the underestimation errors, respectively, and the value functions Y* and Xi are normalized in the interval [0,100]. The global and partial satisfaction Y* and Xi* are monotonic functions normalized in the interval [0,100]. Thus, in order to reduce the size of the mathematical program, removing the monotonicity constraints for Y* and Xi*, the following transformation equations were utilized:

$$\begin{cases} z_m = y^{*m+1} - y^{*m} & \text{for } m = 1,2,\ldots,a-1 \\ w_{ik} = b_i\left(x_i^{*k+1} - x_i^{*k}\right) & \text{for } k = 1,2,\ldots,a_i - 1 \text{ και } i = 1,2,\ldots,n \end{cases} \quad (2)$$

where y*m is the value of the ym satisfaction level, xi*k is the value of the xik satisfaction level, and α and αi are the number of global and partial satisfaction levels. According to the aforementioned definitions and the assumptions, the basic estimation model can be written in alignment with the following linear program formulation:

$$\begin{cases} [\min] F = \sum_{j=1}^{M} \sigma_j^+ + \sigma_j^- \\ \text{under the constraints:} \\ \sum_{i=1}^{n} \sum_{k=1}^{t_{ji}-1} w_{ik} - \sum_{m=1}^{t_j-1} z_m - \sigma_j^+ + \sigma_j^- = 0 \;\forall j = 1,2,\ldots,M \\ \sum_{m=1}^{a-1} z_m = 100 \\ \sum_{i=1}^{n} \sum_{k=1}^{a_j-1} w_{ik} = 100 \\ z_m, w_{ik}, \sigma_j^+, \sigma_j^- \geq 0 \;\forall m,i,k,j \end{cases} \quad (3)$$

where M is the number of customers, n is the number of criteria, and xi*j, y*j are the j–th level on which variables Xi and Y were estimated.

3. Results

The results given by MUSA method showed that customers seem to be totally satisfied from the quality of the products that were offered by THESgala. Based on Figure 1 the total customer satisfaction amounted to the high 90.84% scoring.

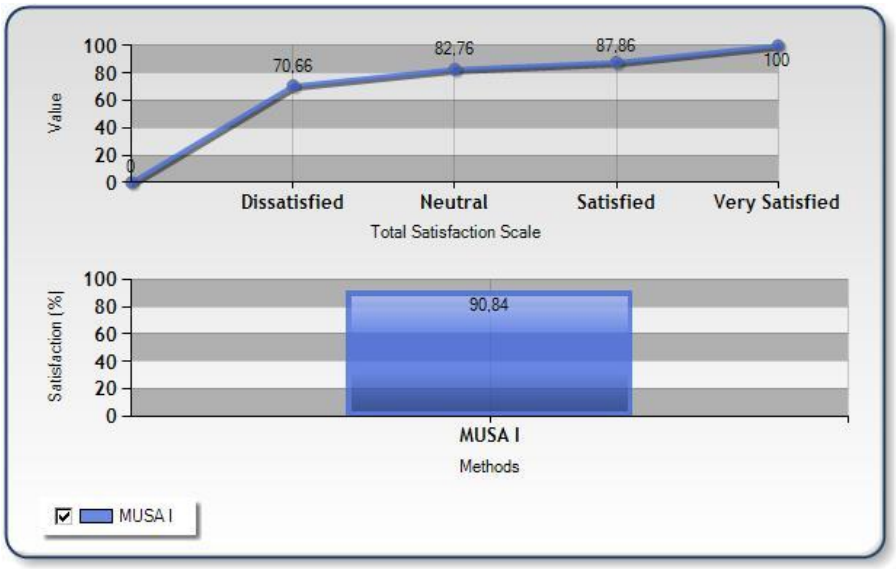

Figure 1: Satisfaction Function

In the context of the research conducted the criterion of "Prices" sustained the greatest weight (33.98%), followed by the criteria of "Products" with a percentage of 25.82%, the "Stores - Branch

Network" (17.97%), the "Customer Service" (11.72%) and finally the "Personnel" with a percentage of 10,81%.

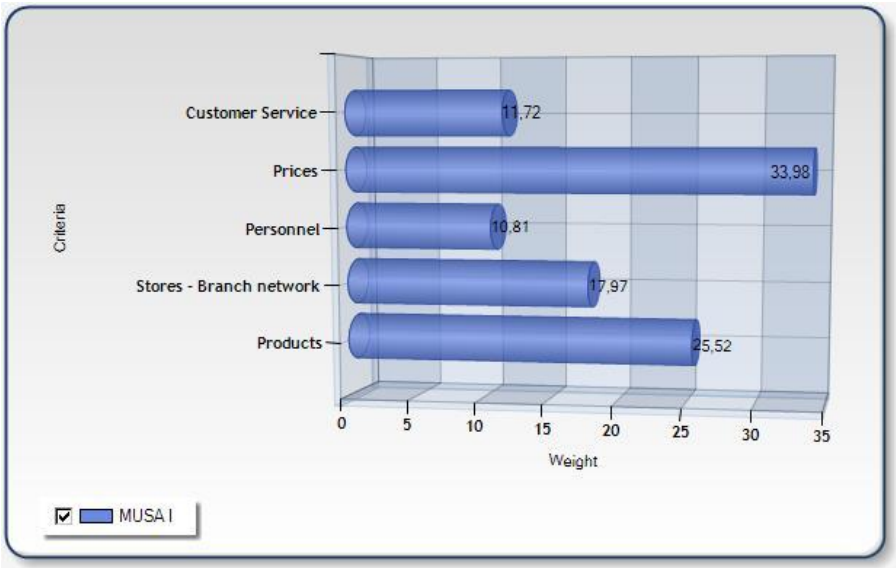

Figure 2: Satisfaction Criteria Weights

Figure 3 pointed out that most of the survey criteria showed a fairly high satisfaction rate. The criterion of "Prices" sustained the highest satisfaction with a percentage of 93.17%, followed by the criterion "Product" with a 91.82% scoring, while customers were also very satisfied with the criterion of "Stores - Branch Network" (87.65%). Finally, the criteria with the lowest satisfaction rates were those of "Personnel" and "Customer Service", being amounted to 79.33% and 78.53%, respectively.

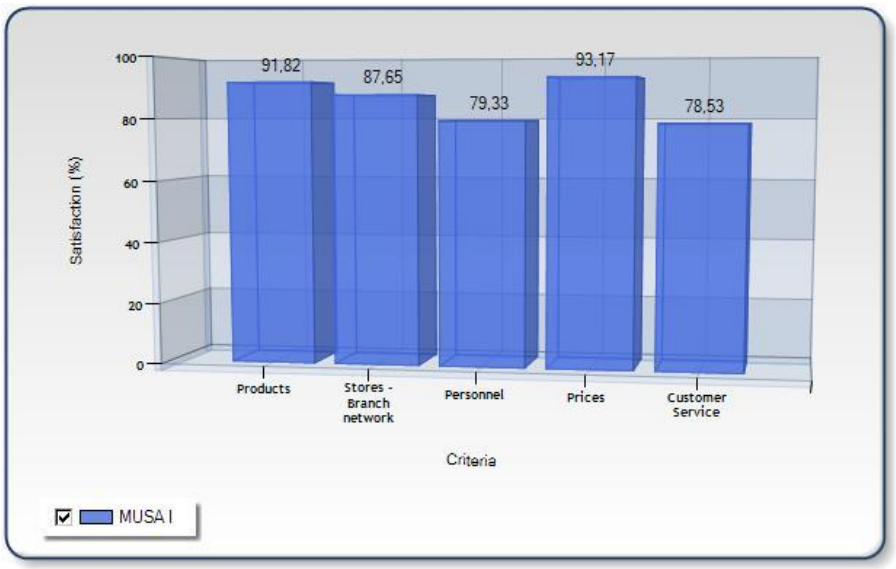

Figure 3: Customer Satisfaction with the Main Criteria

Figure 4 confirmed the initial results regarding the demanding level of customers on the basis of forming a global satisfaction function and the degree of the average total demand index. In particular, customers were less demanding regarding the Prices, which was the criterion with the highest level of importance.

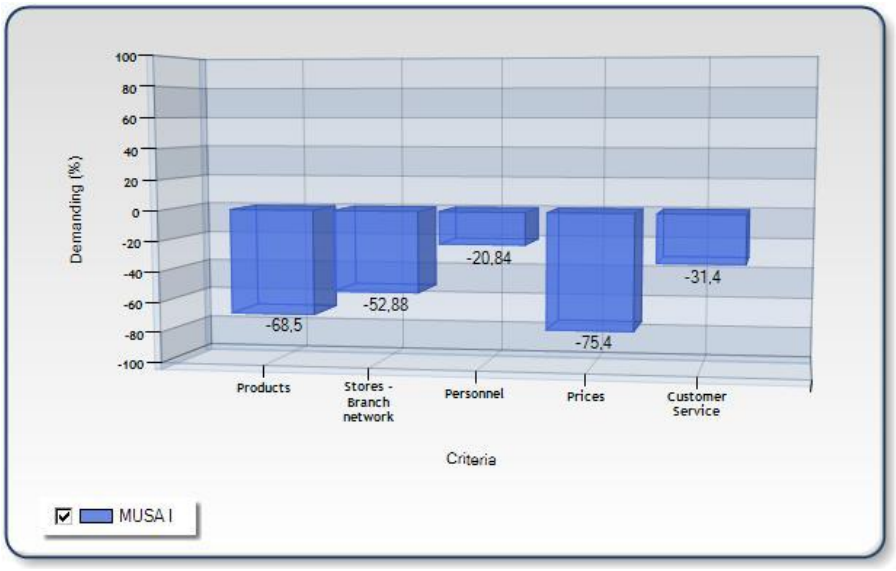

Figure 4: Customer satisfaction Demanding Criteria.

Moreover, the action diagram of Figure 5 denoted that none of the criteria fell in the action area (high importance-low performance). This means that there were no important criteria in which patients were dissatisfied. Furthermore, the criteria of products and prices fell in the leverage opportunity area, so these criteria may be considered as the competitive advantage of THESgala which should be further improved and promoted.

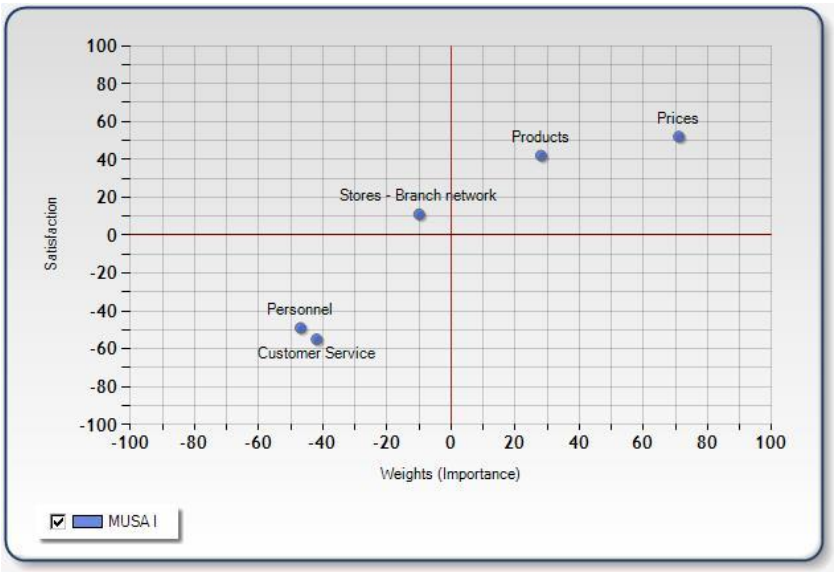

Figure 5: Action Diagram.

4. Discussion

The sale of raw milk from vending machines is allowed in several European Countries. Since unpasteurized milk could harbor food-borne pathogens, the boiling treatment is highly recommended before consumption, thus, the effect of storage temperatures recorded in domestic refrigerators and the domestic boiling of industrial microwaving on the microbiological, and nutritional quality of raw bovine milk from vending machines, all were literature evaluated (Pannella et al., 2019).

The quality of milk is commonly examined using a pH sensor and its quantity is determined using an ultrasonic sensor. The milk can be segregated into third categories depending on its quality as first

quality, second quality, and rejection (Suthagar et al., 2019). The details such as cost, quality, and quantity of milk can be marketable based, thus, a switch can be used for quality selection based on customer preference. Milk is vended based on the monetary note deposited and, on the quality, selected by the customer. The entire system is commonly maintained with a refrigeration temperature of 4°C (Suthagar et al., 2019).

Milk vending machines are considered supply chains showing that consuming milk in proximity, eliminating intermediaries between producers and consumers and, therefore, reducing the use of resources and energy (packaging and transportation), has environmental advantages. Subsequently, milk distribution, electricity consumption and consumer transport caused the largest impacts. When the environmental profiles of pasteurized milk consumption in supermarkets and vending machines are benchmarked, the vending machine has a considerably lower impact (Pereira et al., 2018).

The affectionate parameters of milk selling through milk vending machines are related to technical problems with sales, which intent to diversify milk selling towards high profitability of the sale. Such vending machines operating reasons are correlated with the share of this selling channel on producers' total sales of milk. Vending machines should be inhibited by misinformation from state authorities, while other problems are weak support by media and low consumer awareness. The most realistic expectations of the operators concerning the development of the situation of the milk vending machines cannot be linear optimistic (Doležalová et al., 2014).

It is also noteworthy that the main causes of failure of vending supply chain from a socioeconomic point of view can be attributed to the following: farmers' lack of processing and marketing capacities, the difficulty of networking and collaboration with other key stakeholders, the necessity to raise consumer awareness of the benefits of pasteurized milk and the limited range of dairy products offered. Therefore, a close short supply chain can bring significant environmental and socio-economic benefits, while the isolated entrepreneurship is not sufficient and the transformation of the food system towards a circular model requires political and societal commitment (Pereira et al., 2018).

5. Conclusions

The results of this satisfaction survey highlighted the competitive advantages of the milk vending machines of THESgala cooperative on which the cooperative should continue to invest in order to maintain and increase its customer base. Customers reported a high level of satisfaction from the milk venting company THESgala. Moreover, the most important satisfaction criteria (according to MUSA method) were found to be those of a)products and b)prices. Those are considered as the competitive advantage that the company should work on. On the other hand the criteria of store branch-network are of low importance and high satisfaction, implying that the company could move resources from the branch-network to reinforce the most important satisfaction criteria of products and prices.

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