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Evaluating Customer Satisfaction in Energy Markets Using a Multicriteria Method: The Case of Electricity Market in Greece

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Abstract: During the last decade, the demand for electricity has increased significantly, both for companies and consumers. Therefore, in every country, there are companies developing and functioning to provide various forms of electric energy. The quality of the services that they provide has been of major concern for these companies for the last few years. The objective of this study is to examine residential customers' satisfaction of electricity providers in Greece regarding various factors, such as the products, services, customer service, and the pricing policy. The present research was conducted with the use of a specially developed website questionnaire; 689 questionnaires were collected from January to June, 2019. The results were analyzed with the multicriteria satisfaction analysis (MUSA) method, which is considered as an aggregation–disaggregation approach developed on the qualitative analysis regression. The results of the study showed that the residential customers were quite satisfied. More specifically, the average global satisfaction index of the residential customers was about 52.15%. Using the results of this study, electricity providers will have the chance to frame their future products and services so as to keep their industrial customers satisfied. This empirical study may serve as a reference for other electricity providers who desire to carry out similar studies in the future.

Keywords: customer satisfaction; electric power industry; electricity markets; multicriteria analysis

1. Introduction

Over the past decade, customer satisfaction has been a very critical strategy for every type of firm. Firms are fully aware of the determining role of their customers' satisfaction concerning their overall success. Furthermore, many researchers have recognized the role of customer satisfaction in creating and maintaining a strategic competitive advantage.

During the last year, many researchers have signified that firms' adaptation to customer needs and changing choices is a vital precondition to their long-term success [1–4]. The research on customer satisfaction and the analysis of comparable results provide policy makers with a unique insight into the motivations and satisfaction of customers [5–10].

Furthermore, some researchers argue that customer satisfaction precedes quality [11–13], while others support the opposite [14–17]. Concerning customer satisfaction, there have been several

research attempts for its definition, quantification, and measurement of impacting customer satisfaction in social contexts [18]. According to Oliver and DeSarbo [19], customer satisfaction is directly associated with the subjective judgment of satisfying customers through the personal experiences accumulated in educational contexts.

Many researchers have proposed different attributes and dimensions to measure customer satisfaction. Customer satisfaction means that customer needs are met, services are judged to be satisfactory, and, therefore, the consumption experience is positive. Yi [20] denoted the variable definitions of customer satisfaction, which are determined by the focus subject and the level of clarification. Such a valuation refers mainly to the key aspects of satisfaction from a product or service, the buying decision experience, the performance attribute, the consume–use experience, the company shop or department, and the pre-buying experience. Kotler [21] determined customer satisfaction from a marketing side, where customer satisfaction is related to the complacency or discontent of a person while comparing his/her expectations with the performance or the result of a product or service. In this context, Kotler and Armstrong [22] conceptualized customer satisfaction while considering expectations generated from the post-purchase evaluation of products or services.

Over the past decade, service quality has been a frequently researched topic in the service marketing literature review. Service quality is linked to several customer outcomes, such as purchase intentions, customer satisfaction, and customer loyalty [23–28]. Service quality is dependent on two variables: expected services and perceived services. Throughout the last few years, many researchers have shown that perceived service quality and expected service quality are an antecedent of customer satisfaction [11,29,30]. Grönroos [31] identified two service quality dimensions: the functional aspect (how the service is provided) and the technical aspect (what service is provided). Two years later, Grönroos [32] again conducted a new model of service quality, which is known as the “Technical and Functional Quality Model.” In this model, the service quality is conceptualized as a three-dimensional construct: functional quality, technical quality, and image.

Over the last few years, the study of customer satisfaction has been of major significance to the electric power industry as a means of understanding future possibilities and competitive forces. Particularly, customer satisfaction is a proven important motivating factor for electric power providers, since the customers that experience a high quality service are prone to trusting the electric power provider.

Therefore, every firm must have a series of answers regarding questions about their customers’ profile, needs, and expectations. Furthermore, all firms must find ways to meet their customers’ expectations and retain their loyalty. This is also applicable in the case of the customers of electricity providers. In electricity markets, customer satisfaction is not analyzed as much as it is in other ones due to the fact that many electricity markets have been liberalized recently. This paper aims to investigate the gap in the existing literature concerning customer satisfaction in the Greek electricity market.

2. Literature Review

2.1. Monopolistic and Oligopolistic Electricity Markets

In contemporary energy markets, energy providers can raise market prices beyond tolerable competition levels, thus, exerting their market power. While electricity markets are undergoing a rapid development in many places, they are certainly impeding such a development through market power [33]. Market power plays a determining role towards the distortion of prices, decreasing the efficiency of market operation and harming the reasonable benefits of market participants. On the energy–supply side, during infinitely repeated games, two phenomena can be signified: firstly, non-pivotal firms are prone to exert market power through strategic conducts or explicit collusive and, secondly, a flexible load is able to shift demands under certain constraints to meet energy consumption requirements based on power generation. Furthermore, on the demand side, the performance of market power is linked with profit pattern and bidding strategies [33,34].

Today, in most of the European countries, field work activities upon electricity distribution markets are either liberalized or in the phase of liberalizing. However, there is not the same level of maturity while moving up the value chain towards services for control room and network operation management. It is in this upper market layer that there currently exists a market gap between supply and demand. The market development is attributed to a wide range of parameters, including companies' readiness to innovate, adopt, and diffuse within certain energy systems, as well as their opportunistic flexibility in certain fields of business and technology [35].

In this section, the oligopolistic and monopolistic electricity markets are analyzed. The oligopoly principles at electricity markets are well-developed issues in the relevant literature. Newbery and Greve [36] stressed that the strategic robustness of oligopoly electricity markets lead to the determination of electricity provider decisions on what electricity supply to offer. These authors determined the level of prices and profits in the case of the Cournot oligopoly model in alignment with the Nash choice of the optimal proportional mark-up on marginal costs.

In the study of Salarkheili et al. [37], the capacity of withholding in an oligopolistic electricity market that all generating companies (GenCos) bid in a Cournot model was analyzed and the capacity withheld index, the capacity distortion index, and the price distortion index were developed and analyzed. Then, the distortion-withheld index (DWI) was utilized to value the potential ability of the market for capacity withholding. Under these indices, the demand elasticity on capacity withholding can be considered, showing the determining role of demand elasticity for capacity withholding and market power mitigation [37].

In an international context, Kalashnikov and Arteaga [38] stressed that the Mexican electricity market is determined by a state-regulated monopoly, so that a competition market is not yet established. Nevertheless, almost 25% of the electricity is currently produced by private firms, therefore, offering the potential to provide electricity commodity to the customers directly so that an oligopolistic-type competition could be developed. In such a competition, various scenarios and numerical experiments based on the mixed duopoly and oligopolistic models of the Mexican electricity market can be structured, described, and analyzed [38].

In the same context, Huang et al. [39] considered a market in which there is a monopolistic resource provider and agents who enter and exit the market following a random process. Self-interested and fully rational agents can continuously update their resource consumption decisions over a specific timeframe under the precondition that the total resource consumption requirements are met before each individual's deadline. These authors unveiled that whenever the agents cooperate together to optimize their total cost, a higher market efficiency can be accomplished at the cost of a higher probability of demand spikes. Therefore, it was imposed that the origins of endogenous risk can be considered as an inherent characteristic in such systems that may refer to the market architecture.

In the case of an oligopolistic market, Dahlan and Kirschen [40] signified that generators tend to increase their profits by raising their bid prices, increasing the market price and, hence, favoring the investment in a new power plant. Another critical issue of oligopoly in the electricity market is the transmission capacity. In this context, Hesamzadeh et al. [41] denoted that the electricity market can be benefited under two key aspects of increasing transmission capacity: firstly, achieving energy efficiency while improving the social welfare of the electricity industry, and, secondly, achieving competition benefit that results in increasing competition among electricity industry companies. The social welfare dimension of the electricity industry towards urban environmental sustainability has also been extensively studied in other relevant published studies [42–45].

In an international context, Wang and Chen [46] signified the fact that since the 1980s, there has been an emerging global trend towards the marketable reforms of the electricity industry, while early signs of reforms in the electricity industry in China were initiated in 1978 and a mature and substantial reform has developed from 1985. This reform coincided with the time when the Chinese government included and called for non-central, state-owned investments and foreign investors or power supplies to resolve the problem of prolonged power shortage. Particularly, the Chinese government enacted the

Scheme of the Reform for Power Industry in 2002 as a promising plan of electricity reform, though the concurring electricity supply shortages resulted in a delayed implementation of this plan. Moreover, in later years, under the conceptualization of “the state advances, the private sector retreats,” a new viewpoint of monopoly has emerged.

In a European context, Borkowska and Klimczak [47] argued that key aspects in achieving competitive performance results are ruled by the transformation from a monopoly to an imperfectly competitive market upon industry restructure and the transparent wholesale spot energy market, as well as other necessary institutions, to create clear rules at the energy market. A lack of success was the cause of the predominance. It is also worth noting that the state ownership and the strong politicization of the electricity market are making the regulatory capture essential, whereas the occurrence of asymmetric information and the lack of safeguards against opportunism can affect companies to provide such data and expertise to preferred industrial solutions in the way these companies want it [47].

Since the residential retail electricity market in developed economies remains highly concentrated, the retail rates are not following the changes in the wholesale market price. Therefore, there is a need for central governmental policies to actively engage the end-users in the market and to reach a fully liberalized electricity market through the deregulation of the retail market by phasing out regulated electricity prices and reducing the abiding administrative burdens [48]. An indicative governmental policy that was proposed in the Ontario electricity market of Canada aimed at reducing the electricity charges of a customer paying the wholesale price and participating in the industrial conservation initiative (ICI). Such a governmental policy involved a new operation method for an energy storage system (ESS), assuming that electricity charges were reviewed and classified into four components: fixed cost, electricity usage cost, peak demand cost, and Ontario peak contribution cost (OPCC) [49].

In earlier studies, it has been denoted that the direct participation of customers to regional price-responsive load programs causes them to exert some downward pressure on market pricing and price volatility [50]. The effective contribution factors in the success of electricity market deregulation should contain the elimination of a mixed charged, which burdens the consumers who decide to change suppliers, having this right at regular (mainly weekly) intervals. Other successful factors are that small consumers can pay their bills upon the actual consumption and the local network outline, as well as the setting price data outlined by the competition authority on a monthly basis [51].

Indeed, the intense fluctuation of electricity pricing is a serious problem that is related to the wider phenomenon of restructuring the electricity industry and the liberalization of a competitive electricity market. In response to this problem, earlier studies introduced power line communication (PLC) as a promising communication technology in a household, which could overcome the drawbacks of real-time pricing (RTP), such as that of the necessity of communication systems to handle varied signals regarding power consumption, price, and utility operators [52]. In better understanding the role of end-use customers in electricity markets, the customer's role should be essentially important in cases where they can substitute part of their usage between day and night. In such a case, electricity demands are related to daily (between day and night) and seasonal (mainly during heat waves) variation. Therefore, three alternative demand-side market structures can be determined [53]: firstly, customers should pay the same fixed price (FP) all the time—the base case; secondly, a demand response feature (DRP) is imposed for times of supply shortage, wherein buyers can receive a pre-specified credit for reduced purchase; and, thirdly, a real time pricing (RTP) case, where predetermined prices have been forecasted for the next day/night pair. Thus, the selection of quantity purchases have been sequentially selected, while being charged the actual market-clearing prices. Among the aforementioned structures, that of RTP may lead to the highest market efficiency, though it entails cognitive problems and difficulties for buyers [53].

The active contribution of customers to the electricity market should be expanded to the distribution management and the functionality of the electricity market, including the efficient use of energy, market-based demand response, and quality of supply, as well as the management of active distribution

networks, transmission system operators, service providers, and electricity energy market players [54]. Other main problems of achieving customer satisfaction from the electricity market, especially among developed and industrialized countries, are the following: it is time-consuming not only to develop competition in the electricity industry, but to make retail competition work. Other impeding aspects are institutional barriers regarding metering and the limited unbundling of distribution and supply, as well as limited access to plausible information about contract agreements and tariff pricing that abides to coherent policies upon cleared demand offers in different price scenarios [55,56].

In approaching the demand response (DR) in wholesale electricity markets, the choice of customer baseline has been studied. Alternative customer baseline designs focus on administrative and contractual approaches. Administrative customer baselines have been developed over time to estimate the counterfactual consumption levels that would have prevailed without demand–response programs, but they are vulnerable to opportunities for gaming and cause illusory demand reductions. Alternatively, a contractual customer baseline approach sustains transparent rights and obligations for a robust framework that restores efficient DR under a full locational marginal price (LMP) payment. Since retail rate design can provide two-sided contractual customer baselines, demand subscription services and DR programs form a much-needed connection between the wholesale and retail markets in ways that promote price-responsive demand in a smart grid future [57].

Besides administrative and contractual approaches, there are currently rapidly changing technologies in the power industry that determine the frameworks and business models of the next generation retail electricity market that enter to research interest. Specifically, determining the roles of new customers with considerable demand response awareness and so-called prosumers with localized power generation based on distributed energy resources (DERs) is anticipated. In this respect, the next generation retail electricity market infrastructure will affect local energy transactions, strategic pricing scheme design, new business model design, and building an innovative energy ecosystem. Consequently, it is of utmost importance to trace international experiences and activities taking place in the field of the market mechanism design problem at the distribution level, as well as the role of technology advancements to build customer awareness of the further deregulation of the electricity market [58].

2.2. Electricity Market in Greece

The European Energy Union has been one of the European Commission's priorities since the early 1990s due to the fact that reliable, reasonably priced energy of low environmental impact is one of the key targets of the European Union [59,60]. In this context, the European Union attempted to liberalize the electricity market, which, until the mid-1990s, was dominated by old state-owned monopoly companies in most of its Member States. Following both the European Union's legal framework and the international trends in the energy sector, Greece has undertaken reforms to introduce competition into the energy market.

Consequently, the Greek electricity system is distinguished today between interconnected and non-interconnected grids. In the interconnected network, both the generation and distribution of electricity are completely competitive activities, in which, they participate in both the Public Power Company (PPC) and other firms of the private sector.

More specifically, as far as the electricity production is concerned, 60% is produced by the PPC, 14% is produced by private firms, and 25% is produced using renewable energy sources. Concerning the distribution of electricity, the PPC's share is 92% while private firms' share is 8%. Regarding the interconnected system of the power plants, the installed capacity of the country amounts to 17,188 MW.

Despite the recent reforms, the Greek market of electricity is still different from other European markets. As in many other cases of electricity markets in transition, and based on the gained experience, the fast-evolving Greek electricity market can be gradually adapted to both new and existing rules [61]. Based on the above analysis, the electricity market in Greece cannot be considered as a fully liberalized market.

2.3. Customer Satisfaction Analysis in Electricity Markets

One of the main issues in the assessment of customer satisfaction with energy utilities is the existence of conducted surveys. Satisfaction in the energy market covers the quality of many services, such as pricing and contract terms, provision of a new connection, reliability and performance, professionalism, billing, corporate capabilities, post-sale support, and the handling of customer requests and complaints. Many researchers have examined customer satisfaction in the electricity sector.

According to the Eurobarometer survey in the years 2000 [62], 2002 [63], and 2004 [64], South European countries, such as Italy, Portugal, and Greece, have sustained low electricity price satisfaction, whereas Netherlands and UK sustain high electricity price satisfaction.

Reketye and Pinter [65] analyzed the relationship between customer satisfaction and price acceptance in the context of the Hungarian electric power industry. The findings suggest that satisfied customers have higher price acceptance.

Walsh et al. [66] analyzed whether perceived customer satisfaction and corporate reputation are directly associated with customer intention in the German electricity utility sector. The findings suggest that customer switching intention affects customer satisfaction.

Through the use of the European consumer satisfaction index (ECSI) model, Mutua et al. [67] proposed a study of customer appreciation upon various energy sources in the industrial sector in Kenya. The results showed that the electricity sector has the lowest satisfaction scores at 53.06%.

Medjoudj et al. [68] used the analytic hierarchy process (AHP) method to analyze the customer satisfaction of power users in Bejaia City, Algeria. Their results confirmed the advantage of investment to improve consumer satisfaction and firm profitability. Following the same path, a year later, Medjoudj et al. [69] used three different multicriteria decision making (MCDM) models: (1) analytic hierarchy process (AHP), (2) cost benefit analysis (CBA), and (3) economic criteria inspired from game theory (ECIGT) to analyze customer satisfaction and enterprise profitability in Algeria's energy provider. The findings revealed that a regular and long-term tracking analysis of customer satisfaction will encourage power enterprises to improve their operations and service.

Chodzaza and Gombachika [70] analyzed the customer satisfaction of the industrial users served by the public electricity distribution company of Malawi. The findings suggested that the industrial customers were dissatisfied with the public electricity utility's service.

J.D. Power and Associates [71] estimated business customer satisfaction with electric utility companies in four U.S.A geographic areas (West, Midwest, East, and South). The research is based on responses from more than 21,000 online interviews with business customers who spend at least \$200 a month on electricity. The overall business customer satisfaction with electric utilities is 779 on a 1000-point scale. The American customer satisfaction index (ACSI) analyzed customer satisfaction with investor-owned energy utilities serving U.S.A residential customers (natural gas and electric service). According to the ACSI customer satisfaction reports [72], customer satisfaction with gas and electric service providers fell by 2.7 percent to a score of 73.2 on a scale of 0 to 100.

Li et al. [73] conducted a study on the role of local electricity small and medium enterprises (SMEs) in Ghana and reported that the customer's behavior was affected by the service quality offered by public institutions.

3. Materials and Methods

An electronic questionnaire was used for the collection of the data for this specific research. The non-probability sampling method of convenience samples was used for the collection of the answers. An a posteriori correlation evaluation was implemented on the collected questionnaires concerning the demographic characteristics and the satisfaction answers using the non-parametric chi-square test, and no significant correlation was found.

The survey period started in January, 2019 and lasted for 6 months. A total of 689 answers were recorded and the demographic profile of the sample is provided in Table 1.

Table 1. Sample demographics.

Demographics	Groups	Frequency	% Percent
Gender	Male	386	56.0
	Female	303	44.0
Age	18–30	36	5.2
	31–40	154	22.4
	41–50	263	38.2
	51–60	181	26.3
	Older than 60 years	55	8.0
Income	Less than 10,000	84	12.2
	10,001–20,000	245	35.6
	20,001–30,000	173	25.1
	30,001–40,000	51	7.4
	More than 50,000	59	8.6

Based on the above table, we denoted that the number of males and females in the sample was about the same. Furthermore, we denoted that the majority of the sample was between 31 and 60 years old (86.9%). Lastly, most of the respondents' (60.7%) annual incomes were between €10,001 and €30,000.

The multicriteria satisfaction analysis (MUSA) method and the corresponding software, MUSA 2 Application (Version 4.1.2.2, University of Piraeus, Piraeus, Greece), was used for the analysis of the data, along with the IBM SPSS software (Version 20.0., IBM Corp., Armonk, NY, USA). The MUSA method is a multicriteria preference disaggregation analysis technique [74,75] that assumes that the customers' overall satisfaction is connected to the partial satisfaction of these customers over a set of multiple criteria, which represent characteristic dimensions of the provided service.

The various customer satisfaction dimensions were considered as multiple criteria, which were used to assess an overall satisfaction score for a group of customers based on their experience by using a value function according to the multi-attribute utility theory (MAUT) [76,77]. The most common form of a value function is the weighted additive form, in which, weight factors are provided in the model. In the customer satisfaction evaluation problem, these factors expressed a preference model of the population in question. However, the description of a preference model was not an easy task, particularly when we were dealing with collective rather than personal preference models—meaning with models that described the behavior of a group. A popular approach for inferring a collective preference model is machine learning methods, where the criteria evaluations and the global value are known a priori and the function that aggregates the partial values are estimated.

One of these approaches is the aggregation–disaggregation approach, in which, the preference model is inferred from a given global preference [78]. In this research, we chose this latter approach, and, more specifically, the MUSA method, to infer the preference model of customers in energy markets, given the fact that the needed information for running such a method could easily be collected through the use of structured questionnaires, which included both partial and global satisfaction questions, without asking for anything further concerning the underlying preference model.

The main objective of the MUSA method is the aggregation of individual judgments into a collective value function [55,56,79–81]. It uses an ordinal–regression based approach that is used for assessing a set of collective satisfaction functions in a way that the overall satisfaction value becomes as consistent as possible with customers' partial satisfaction judgments, namely per criterion. The basic aim of the method is to infer a collective value function Y^* , which has an additive form and a set of partial satisfaction value functions X_i^* , using customers' global satisfaction Y and partial satisfaction X_i for each i -th criterion. The method uses ordinal scales for both global and partial satisfaction. The achievement of the maximum consistency between the value function Y^* and the customers'

judgments Y is the basic objective of the MUSA method. The ordinal regression equation of the aforementioned preference disaggregation approach has the form of Equation (1):

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

where \tilde{Y}^* is the estimation of the global value function, n is the number of criteria, b_i represents a positive weight of the i -th criterion, σ^+ and σ^- are the underestimation and the overestimation errors, respectively, and the value functions Y^* and X_i are normalized in the interval $[0,100]$. The global—as well as the partial—satisfaction Y^* and X_i^* are monotonic functions normalized in the interval $[0,100]$. A set of transformation equations are used for reducing the size of the linear program in order to remove the monotonicity constraints for Y^* and X_i^* :

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

where y^{*m} is the value of the y^m satisfaction level, x_i^{*k} is the value of the x_i^k satisfaction level, and a and a_i are the number of global and partial satisfaction levels.

The formulation of the linear program that is used for the estimation of the values of the MUSA method is as follows:

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

where n is the number of criteria, M is the number of customers, and x_i^{*j}, y^{*j} are the j -th level, in which, variables X_i and Y are estimated.

An integral part of the MUSA method is the stage of the post-optimal analysis, during which, the stability of the inferred model is evaluated. Within this stage, a hyper-polyhedron of near optimal solutions is produced and its exploration leads to the final solution. This hyper-polyhedron is generated by solving the above linear program using the original objective function as a new constraint. The final solution is calculated by solving n linear programs (n is the number of criteria) of the following form:

$$\begin{cases} [\max] F' = \sum_{k=1}^{a_i-1} w_{ik} \quad \forall i = 1, 2, \dots, n \\ \text{under the constraints :} \\ F \leq F^* + \varepsilon \\ \text{all the constraints :} \end{cases} \quad (4)$$

where ε is a small number, and F^* is the optimal value for the objective function of LP (3). The final solution equals the mean value of the n calculated solutions given by the LPs (4). If the stability of the system is low, this average solution shall be considered as less representative.

In the customer satisfaction analysis, the assessment of performance indices may be very useful. In the MUSA method, the average global and partial satisfaction indices are calculated according to the following equations:

$$S = \sum_{m=1}^a p^m y^{*m} \text{ and } S_i = \sum_{k=1}^{a_i} p_i^k x_i^{*k} \quad (5)$$

where S and S_i are the average global and partial satisfaction indices, and p^m and p_i^k are the frequencies of customers belonging to the y^m and x_i^k satisfaction level, respectively.

Other indices are also provided by MUSA software for facilitating the in-depth analysis of the customers' satisfaction [82,83]. These indices include satisfaction indices, demanding indices, and improvement indices [75], which lead to the construction of action diagrams also [10]. These diagrams are based on the combinations of criteria weights and satisfaction indices and they indicate a prioritization of the satisfaction dimensions that should be improved [79,82].

A set of satisfaction criteria and sub-criteria were analyzed according to the literature review and the specific characteristics of the electricity market in Greece. The satisfaction criteria that was used were the following: services, staff, customer services, and payments. As in other cases [80], a five-point Likert scale was used in order to measure the respondent's level of satisfaction. The scale was rated from totally dissatisfied (1) to totally satisfied (5).

4. Results and Discussion

The first part of the questionnaire concerned the respondent's ecological behavior (Table 2). Ecological behavior is found to be correlated with customer perceptions on the amount of money they are willing to pay for the energy they use. More specifically, it is argued that customers with a positive ecological attitude are willing to pay more in order to use the electricity produced using renewable energy sources [60–62,84–87].

Table 2. Respondents' ecological behavior.

Variable	Never	Rarely	Sometimes	Often	Always
Usage of ecological lamps in homes	1.3%	2.3%	11.2%	32.9%	52.2%
Turning off lamps when leaving a room	0.1%	2.0%	6.4%	30.0%	61.4%
Focus on energy labels when buying home appliances	1.5%	2.6%	9.0%	27.7%	59.2%
Home air conditioners maintenance	32.0%	15.7%	18.2%	24.1%	10.0%

Based on Table 2, most of the respondents had a positive environmental attitude. This outcome was in agreement with recent research, where the positive relationship of socio-economic development and energy consumption was reported [88,89]. More specifically, most of the respondents often or always use ecological lamps (85.1%), turn them off when they leave the room (91.4%), and focus on energy labels when they buy home appliances (86.9%). On the contrary, a percentage of 34.1% maintain home air conditioners often or always. Furthermore, on the question about the operation of the TV when it is not in use, 65.5% of the respondents stated that they leave it on standby, while 34.5% of them turn it off. Despite the fact that this does not seem to be an ecological behavior, we should note that even turning the TV off will save a small amount of electricity, and many manufacturers have completely removed the ability to turn the TVs off over the last few years for many reasons.

As already mentioned, for the satisfaction measurement, four main criteria were used. The importance of these criteria was calculated in the MUSA method. It was shown that the criterion with the greatest importance was that of payments (42.67%), while staff (14.83%) was the least important (Figure 1).

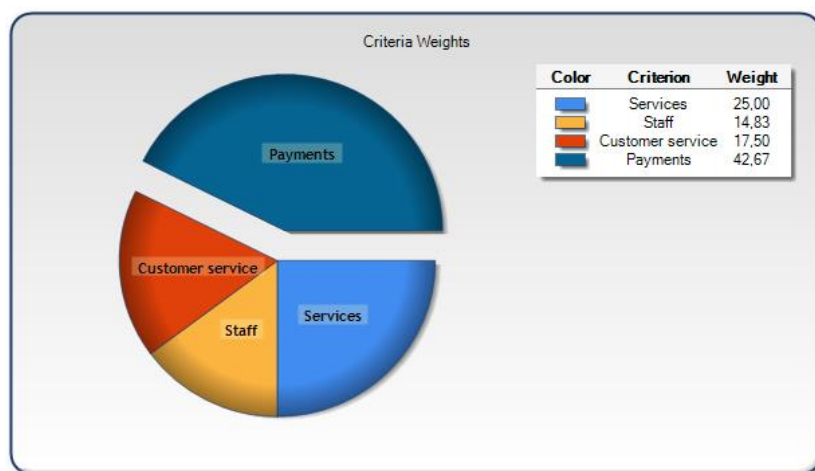


Figure 1. Satisfaction criteria weights (importance).

As far as customer satisfaction with the main criteria was concerned, the criterion with the highest level of satisfaction was this service (86.46%), while the one with the lowest level of satisfaction was that of payments (21.15%), as seen in Figure 2.

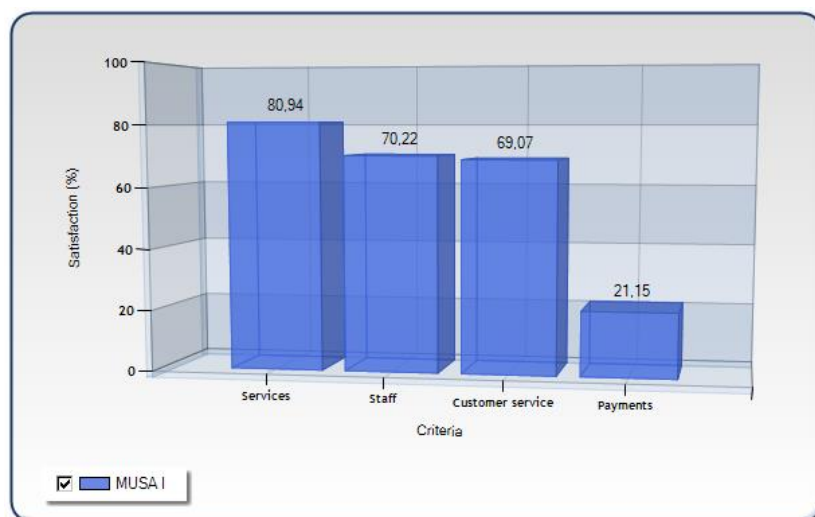


Figure 2. Customer satisfaction with the main criteria (performance).

Regarding the customer's level of demanding, the analysis results unveiled that customers had a low level of total demanding (4.6%), as all the criteria demanding levels were negative, except for payments, as seen in Figure 3.

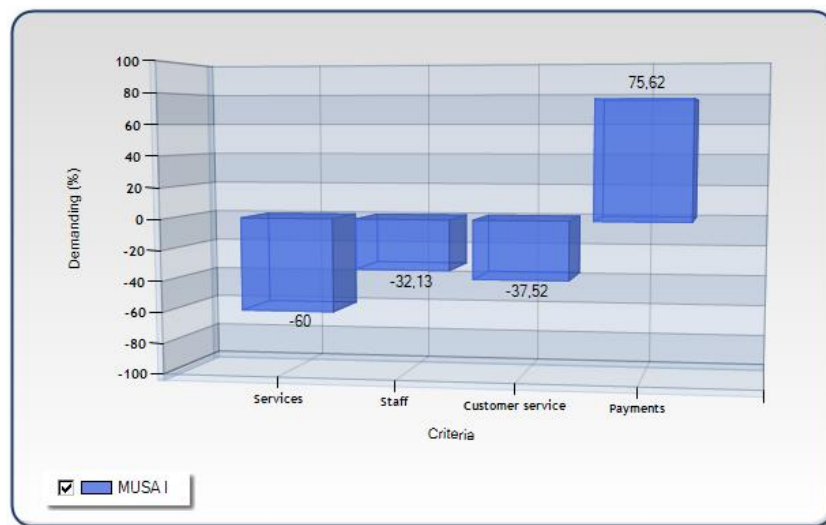


Figure 3. Customer satisfaction with the main criteria (performance).

As far as the customer's level of global satisfaction was concerned, 18.60% were completely or somewhat dissatisfied, 28.16% were neutral, 25.98% were somewhat satisfied, and 17.27% of them were completely satisfied, based on the data provided in Figure 4.

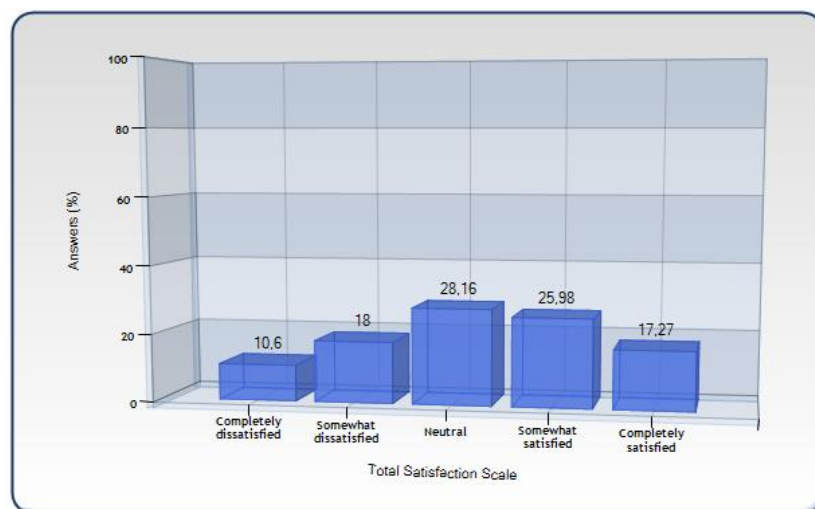


Figure 4. Levels of customer satisfaction.

Figure 5 shows that customer satisfaction was considered at an average level, as the global satisfaction index was about 52.15%. However, as already mentioned, the level of demanding was low.

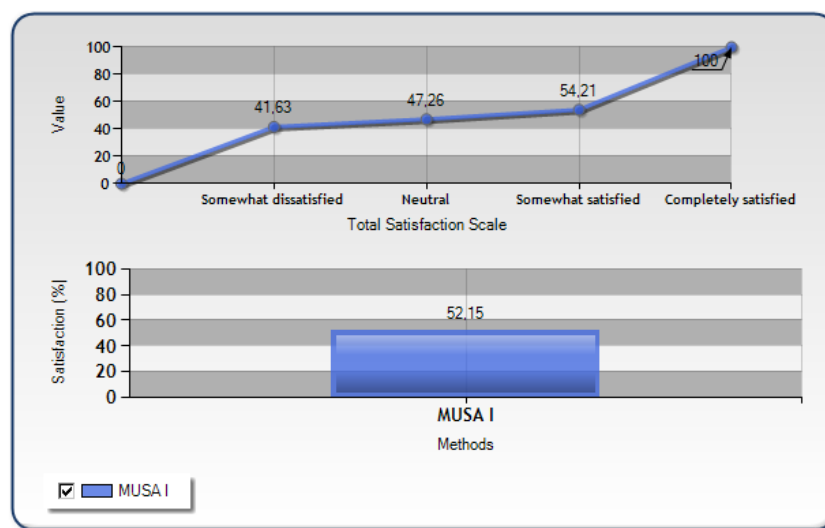


Figure 5. Satisfaction function.

Finally, Figure 6 shows the strong and weak points of the electricity providers examined.

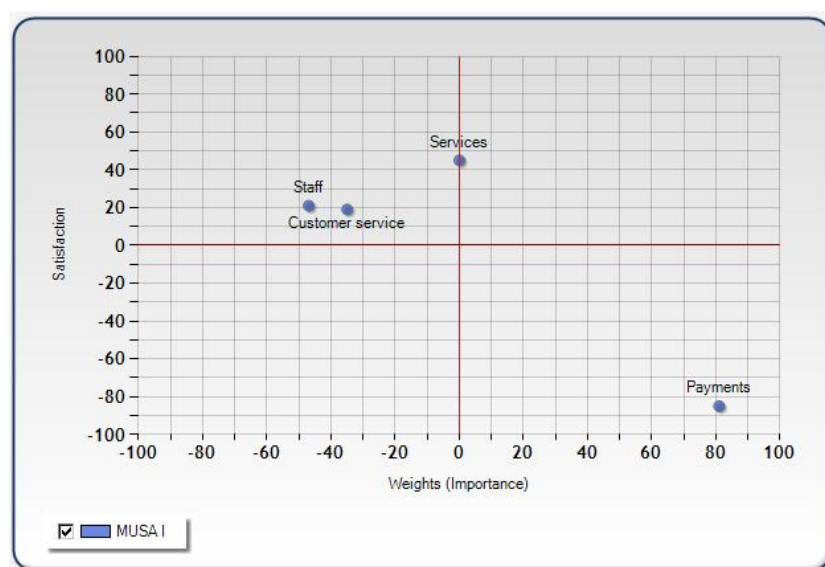


Figure 6. Action diagram.

The satisfaction criteria concerning staff, customer service, and services are located in the transfer resources area of the action diagram, which means that no funds should be invested for improving them as they are of low importance and customers are highly satisfied with them. On the contrary, payments are located in the action opportunity area of the action diagram, meaning that this criterion has a low level of satisfaction and, at the same time, is important.

The percentage levels of satisfaction and the percentage levels of importance for each of the customer satisfaction sub-criteria were recorded in the following Table 3. More specifically, we argued that the sub-criterion with the highest level of satisfaction was that of service reliability (90.05%). On the contrary, the sub-criterion with the lowest level of satisfaction was that of charges (11.96%).

Table 3. Satisfaction criteria and sub-criteria % performance and % importance.

Criteria	Sub-Criteria	Satisfaction (%)	Importance (%)
Services	Connection cost	49.97	7.72
	Connection time	79.91	14.42
	Connection process	66.8	8.63
	Technical problem solving	70.31	9.83
	Emergency response	66.69	8.85
	Service reliability	90.5	50.55
Staff	Staff knowledge	90.1	55.27
	Staff skills	63.39	9.57
	Staff courtesy	63.37	9.28
	Staff professionalism	60.2	8.87
	Staff willingness	77.42	17.01
	Promise fulfillment	79.94	20.06
Customer service	Immediate responses	69.71	12.21
	Effectiveness	88.04	45.94
	Information	45.12	10.64
	Change updates	41.66	11.14
	Charges	11.96	51.87
	Discounts	33.36	12.12
Payments	Ways of payment	69.93	8.61
	Terms of payment	62.3	9.51
	Bill clearness	51.58	8.85
	Bill correctness	61.82	9.05

Except for measuring customer satisfaction, a set of four questions about customer loyalty to their electricity provider were asked. Based on the following Table 4, it is shown that 53.4% of the respondents considered the fact that they were going to be customers of the same electricity provider in the future either somewhat or very probable. However, the neutral answers were those with the highest perspective in the case of recommending the current electricity provider to friends or relatives (38.2%) and the case of remaining customers of the same electricity provider in the future in the case of an increase in the cost (37.3%). The same result was obtained in the case of remaining customers of the same electricity provider in the future if another provider provided the same services at lower cost, as neutral answers had the highest percentage (26.9%).

Table 4. Customer loyalty.

Question	Not Probable	Somewhat Improbable	Neutral	Somewhat Probable	Very Probable
Possibility of customer being with the same electricity provider in the future	4.4%	8.4%	33.8%	36.7%	16.7%
Possibility of recommending the current electricity provider to friends or relatives	10.9%	19.0%	38.2%	19.7%	12.2%
Possibility of remaining a customer of the same electricity provider in the future in the case of an increase in the cost	15.5%	24.1%	37.3%	17.6%	5.5%
Possibility of remaining a customer of the same electricity provider in the future in the case of another provider providing the same services at lower cost	18.4%	24.2%	26.9%	21.2%	9.3%

According to many researchers, customer satisfaction and loyalty are highly correlated. Based on the following Table 5, it can be argued that customer satisfaction is correlated with all the constructs of customer loyalty at the 0.01 level. Based on Spearman's correlation coefficient values, the highest correlation was between customer satisfaction and the possibility of recommending the current electricity provider to friends or relatives, while the lowest correlation was recorded between customer

satisfaction and the possibility of remaining a customer of the same provider in the future in the case of another provider providing the same services at a lower cost. This result stresses that customer satisfaction can retain customers despite the possible entry of new competitors in the market, even if this correlation is not high.

Table 5. Correlation between customer satisfaction and customer loyalty.

Variable		Possibility of Being Customer of the Same Electricity Provider in the Future	Possibility of Recommending the Current Electricity Provider to Friends or Relatives	Possibility of Remaining a Customer of the Same Electricity Provider in the Future in the Case of an Increase in the Cost	Possibility of Remaining a Customer of the Same Electricity Provider in the Future in the Case of Another Provider Providing the Same Services at Lower Cost
Customer satisfaction	Spearman's rho	0.442	0.535	0.366	0.211
	<i>p</i> -value	0.000	0.000	0.000	0.000

By looking more at customer loyalty, it turns out that it was not elastic in terms of income. This result is obtained by the following Table 6, as the loyalty constructs concerning the price were not correlated with the respondents' income.

Table 6. Correlation between customer loyalty and annual income.

Variable		Possibility of Remaining a Customer of the Same Electricity Provider in the Future in the Case of an Increase in the Cost	Possibility of Remaining a Customer of the Same Electricity Provider in the Future in the case of Another Provider Providing the Same Services at Lower Cost
Annual income	Spearman's rho	−0.057	−0.018
	<i>p</i> -value	0.157	0.657

5. Conclusions

Customer satisfaction is conceptualized from the comparison between the actual performance or result of a product or service and the personal expectations generated [90,91]. The optimum use of the term “customer satisfaction” is determined by balancing out the expectations and the post-purchase evaluation of products or services. The main viewpoints of satisfaction are those derived from: buying decision and pre-buying experiences, a performance attribute, as well as a consume–use experience. For the scopes of this study, the term “customer satisfaction” considers the anticipated expectation and it is determined by the post-purchase evaluation of products or services.

In this research framework, the objective of the study was to examine residential customers' satisfaction of electricity providers in Greece regarding various factors, such as the products, services, customer service, and the pricing policy. This research ascertained how perceived service quality in the public utility sector can mediate employees' customer orientation and customer satisfaction. The analysis of a specially developed website questionnaire was based on the multicriteria satisfaction analysis (MUSA) method, and this is based on the principles of qualitative analysis regression, being part of the wider category of the aggregation–disaggregation approach. The method:

- is an ordinal–regression-based approach that can support the assessment of a set of collective satisfaction functions.
- examined ways of achieving optimum consistency between value functions and customers' judgments.

In such a way, the MUSA method provided a multifaceted spectrum of satisfaction, demanding, and improvement indices to support the in-depth analysis of the customer's satisfaction under the development of a series of action diagrams based on the survey results.

The investigated socio-economic and managerial indices of customer satisfaction unveiled that the residential customers were quite satisfied, sustaining an average global satisfaction index of 52.15%. In parallel, the research outcomes revealed that perceived service quality by customers and their satisfaction towards public institutions can be significantly determined by employees' customer orientation behaviors. Furthermore, the research outcomes signified the determining role of customer satisfaction to the electric power industry, mainly in: (a) understanding future possibilities and competitive forces, as well as (b) motivating electric power providers. Specifically, being after-service, satisfied customers commonly trust their electric power provider. Generally, based on the study outcomes, it was concluded that electricity providers will be capable of: (a) framing their future products and services so as to keep their industrial customers satisfied, and (b) including other socio-economic criteria to be applied by other electricity providers worldwide who desire to carry out similar studies in the future.

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