MUlticriteria Satisfaction Analysis Application in the Health Care Sector

Dimitrios Drosos[1], Nikolaos Tsotsolas[2], Athanasia Zagga[3], Miltiadis Chalikias[4], Michalis Skordoulis[5]

[1]Piraeus University of Applied Sciences, School of Business and Economics, Department of Business Administration, Business School, 250 Thivon & Petrou Ralli, Egaleo, Greece, e-mail: drososd@teipir.gr
[2]Piraeus University of Applied Sciences, School of Business and Economics, Department of Business Administration, Business School, 250 Thivon & Petrou Ralli, Egaleo, Greece, e-mail: ntsotsol@unipi.gr
[3]Piraeus University of Applied Sciences, School of Business and Economics, Department of Business Administration, Business School, 250 Thivon & Petrou Ralli, Egaleo, Greece, e-mail: athanstell@hotmail.com
[4]Piraeus University of Applied Sciences, School of Business and Economics, Department of Business Administration, Business School, 250 Thivon & Petrou Ralli, Egaleo, Greece, e-mail: mchalikias@hotmail.com
[5]Piraeus University of Applied Sciences, School of Business and Economics, Department of Business Administration, Business School, 250 Thivon & Petrou Ralli, Egaleo, Greece, e-mail: mskordoulis@gmail.com

Abstract. During the last decades the interest of health scientists has been increasingly focused on patients' needs, the quality of the services offered and the satisfaction level from the available health care. The measurement and evaluation of patient satisfaction is a milestone for the improvement of the services provided – procedures, given that these results can provide a useful variety of information and data that will lead to a high level of health services. For the purpose of this project the results presented concern a measurement of the satisfaction level of patients treated by the Greek Red Cross and more specifically by a service called "Nursing at home". For the collection of the data, questionnaires were used in order to better record the patients' views on the health care service overall as well as their satisfaction levels on particular aspects of the service. The analysis of the results has been based on the multicriteria MUSA method, which is part of the wider category of aggregation - disaggregation approach and is based on the principles of qualitative analysis regression.

Keywords: Customer Satisfaction, Quality Services, Health Care Sector, MUSA, Multicriteria Analysis.

1 Introduction

It is common practice in the context of modern medicine, that increasing emphasis is given to the patients' opinion on matters associated with the quality of services as well as the satisfaction level that derives from them. The quality as well as the measurement of the satisfaction levels concerning the offered health care is a powerful evaluation tool for these specific services. The patients, as end users of health care services contribute with their participation to a qualitative improvement provided that the data produced is evaluated sufficiently. Specifically, the recording of patients' views on health care services combined with results from clinical studies can provide solid conclusions for the operation of different health organisations and levels of health care.

During the last decade, an increasing interest in measuring patient satisfaction levels has been noticed, and is certified by a number of studies that have been conducted on the health care systems of Britain, France, Sweden and the United States. The worldwide interest on measuring patient satisfaction levels has been empowered by the need for evaluation and improvement on the quality of health services (Bond and Thomas, 1992).

The international context shows new and innovative ways of organizing and administrating health organizations, the so called managed care. According to Pothos et al. (2014), "managed care deals with the development of healthcare programs that integrate into a single organizational structure both funding and providing healthcare packages". By this way the quality in the provided health services may be achieved.

Another tool for quality assurance in health is benchmarking, the continuous and systematic process of comparing an organization's performance, actions, practices and policies to the so called best in the world, a managerial process which can be useful in: (a) organization's management, (b) costs reduction, (c) business strategy development, (d) services time reduction and (e) insured individuals' services improvement (Pothos et al., 2014).

The concept of patient satisfaction has been presented in the international bibliography as a reliable index for the evaluation of health policy results; it is directly linked to the sufficient satisfaction of the general and particular health needs. In the USA, in 1990, the institute of medicine included patient satisfaction, as an important part of the outcome of health care, in the definition of the dimensions of quality. Although patient satisfaction research projects are not easy or simple due to their nature, they offer multiple benefits. They may contribute to the efforts made for quality improvement enabling the identification of low quality health care services as well as an evaluation on a national level that will contribute to the formation of the appropriate strategy.

The aim of this study is to present an original customer satisfaction survey in the health care sector and especially in the Greek Red Cross. This paper is organized into 7 sections. Section 2, presents the literature, regarding customer satisfaction, service quality in the health care sector. In section 3 a short description of Greek Red Cross is given.

Section 4 presents the MUSA (Multicriteria Satisfaction Analysis) method, which is the Decision Support System that was used in order to measure the customer

satisfaction. Section 5 presents the methodological frame and section 6 the results of our research. Finally, section 7 the conclusions and limitations are presented along with managerial and research implications of the study finding.

2   Literature Review

2.1   Customer Satisfaction and Service Quality

Customer satisfaction, according to Yi (1991), is fixed with two basic ways: "as a result or, as a process; the first way determines the satisfaction as a final situation or as a result of experience of consumption or use of product or service". Customer satisfaction is central to the marketing concept, with evidence of strategic links between satisfaction and overall service performance (Truch, 2006).

According to Bartikowski and Llosa (2004) "customer satisfaction is typically defined as an overall assessment of the performance of various attributes that constitute a service". There are lots of definitions for satisfaction. According to Engel and Blackwell (1982) satisfaction is an evaluation process, which examines whether this choice is consistent with previous convictions of the client.

Satisfaction is the reaction of consumers in the evaluation process, which examines the discrepancies between prior expectations and actual performance level of the product as perceived by the consumer after use (Tse and Wilton, 1988). As explained by Oliver (1996), Gerson (1993) and Vavra (1997), satisfaction is a measure of how the total offered product or service fulfills customer expectations.

Over the last two decades, service quality has been an essential strategic component for firms attempting to succeed and survive in today's fierce competitive environment. The main function an organization's members must perform is the delivery of quality service to its customers (Parasuraman et al., 1985; Reichheld and Sasser, 1990; Parasuraman et al., 1988). The most common definition of service quality, nevertheless, is the traditional notion, in which quality is viewed as the customer's perception of service excellence. (Berry et al., 1985).

Service quality is the customers' attitude or global judgment of a company's service over time, while customer satisfaction refers to a specific business transaction (Lam and Zhang, 1999). Parasuraman et al., (1985) defined ''service quality'' as the degree and direction of discrepancy between a customer's perceptions and expectations. Parasuraman et al., (1988), in their study with title "A multiple-item scale for measuring consumer perceptions of service quality" defined service quality as "a global judgment or attitude relating to the overall excellence or superiority of the service".

Based on this concept, Parasuraman et al., (1988, 1991) identified the following five generic dimensions of service quality (SERVQUAL) that must be present in the service delivery in order for it to result in customer satisfaction: Reliability, Responsiveness, Assurance, Empathy, and Tangibles.

2.2 Customer Satisfaction & Service Quality in the Health Care Sector

Over the last two decades, one of the fastest growing and competitive industries in the service sector is the health care industry. (Dey et al., 2006). Buyers of health care services are better educated and more aware than in the past. They know exactly what they need. They carefully monitor and study the health care options available to them. (Wadhwa, 2002). The customer satisfaction in the health care services has been measured by different researchers under varied environment. The health care organisation wants to know how satisfied their patients' are in order to be translated into organisation strategy and development.

Andaleeb (1998) stated that "hospitals that fail to understand the importance of delivering customer satisfaction may be inviting possible extinction". Patients, in general, receive various services of medical care and judge the quality of services delivered to them (Choi et al., 2004). Carr-Hill (1992), mentioned seven dimensions that determine patient satisfaction as follows: access, choice, information, readiness, safety, value for money and equity. In the health care sector, customer satisfaction leads to favourable results, such as higher rates of patient retention, positive word of mouth and higher profits (Peyrot et al., 1993; Zeithaml, 2000).

Hall and Dornan (1998) developed a patient satisfaction method that includes dimensions such as humanness, informativeness, overall quality, overall technical competence, beaurocratic procedures, access, cost, physical facilities, continuity, outcomes, handling of non-medical problems. Hasin et al., (2001), in their study demonstrated that the health care organisations have a good level of overall service, there are many areas that need attention to further improve the service.

Aragon et al., (2003) conducted a research in emergency department of hospitals and suggested the primary provider theory to measure patient satisfaction considering three latent variables: physician service (SP), waiting time (SWT) and nursing care (SN). A study conducted by Safavi (2006) has revealed that patient satisfaction includes dimensions such as dignity and respect, speed and efficiency, comfort, information and communication and emotional support.

Last years in Greece, there has been an increasing interest from for measuring the quality and the customer satisfaction in the health care services. Kalogeropoulou (2011) revealed that the general profile of the hospital is affected by the cleanliness conditions of stay and quality of the food. Patients require specialized anthropocentric healthcare services, and demand satisfaction of their basic rights, such as receiving information, giving consent and respect of their individuality.

Niakas et al., (2004), made a patient satisfaction survey with a self-administered questionnaire of 1295 adult patients.

This survey show high rates for medical and nursing services and fair rates for hotel services and facilities. The medical-nursing index (which can range from 0 to 100) shows a mean of 86.4 and the rate for the hotel services was 75.9. Matis et al., (2009) developed a patient satisfaction method that includes 5 dimensions: Medical, hotel facilities, organizational, nursing and global patient satisfaction.

The results reveal a relatively high degree of global satisfaction (75.125%), yet satisfaction is higher for the medical (89.721%) and nursing (86.432%) services. Moreover, satisfaction derived from the hotel facilities and the general organization was found to be more limited (76.536%). In their recent survey, Papagiannopoulou et

al., (2008) found that children's escorts were more satisfied that they had expected to be. The hospital personnel and specifically the medical and nursing services were highly rated, improving the general profile of the hospital. Conversely, the children's escorts' satisfaction was negatively affected by the hospital substructure.

Baralexis and Sophianou (2005) mention that public hospitals managers should realise that in order to confront effectively the increasing competition of private Greek hospitals, they should first measure the quality of their services in order to improve their performance. Matis et al., (2010) to another patient satisfaction, revealed a high degree of global satisfaction (73.31%), yet satisfaction was higher for the medical (88.88%) and nursing (84.26%) services. Moreover, satisfaction derived from the accommodation facilities and the general organisation was found to be more limited (74.17%).

As the number of health care organisations increases, competition in health care industry becomes tough and service quality becomes an imperative (Ennis & Harrington, 2001) to provide patient satisfaction and gain competitive advantage in the market because delivering quality service directly affects the customer satisfaction.

According Lim and Tang (2000) argue that customer based determinants and perceptions of service quality play an important role when choosing health care organisations. Wisniewski and Wisniewski (2005) in their study with title "Measuring service quality in a hospital colposcopy clinic" mention that service quality from the patients' perspective should be routinely monitored and assessed. On the other hand Silvestro (2005) proposes that the development of a tool for measuring the gap between patients' priorities and their perceptions and the match between the patient and management perspective.

3   About the Greek Red Cross

The Greek Red Cross was founded on 10 June 1877 following an initiative by Queen Olga. It was immediately recognised by the International Committee of the Red Cross and is now a member of the "family" of the International Red Cross and Red Crescent Movement. During its long history it has remained committed to international humanitarian principles and voluntary help to fellow human beings.

The Greek Red Cross is the largest non-governmental organisation in Greece, with a complex mission based on voluntary action and direct response by citizens. Its aim is to relieve human suffering in time of war and peace, supporting the wounded, the sick, refugees, the elderly, the poor and people from every vulnerable population group. Its actions are based on vigilance, solidarity and altruism, and it is synonymous with disinterested service and selflessness. The basic aims of the Greek Red Cross are:

- In time of war: the support and reinforcement of the Military Health Service, provision of medical treatment to the sick and wounded, and the protection of prisoners of war, the civilian population and war victims.

- In time of peace: the provision of relief and assistance to victims of disasters and epidemics, and humanitarian activities on an individual basis or in collaboration with the State and social services.

One of the main services offered by the Hellenic Red Cross is "Nursing at Home." The "Nursing at Home" service is an autonomous nursing care unit, aimed for patients leaving the hospital and for whom it is considered necessary to continue treatment at home. The Service has a specialized team of scientists consisting of Nurses – Health Visitors, doctors and physiotherapists who visit and monitor patients, supporting them and their families. The relatives are trained and supported to care for the member in need. This way every patient gets the chance to be treated in his own space, amongst his relatives and simultaneously contributes to the decongestion of hospitals and reduction of hospitalization costs.

4 The MUSA Method

The MUSA (Multicriteria Satisfaction Analysis) method of Grigoroudis and Siskos (Grigoroudis and Siskos, 2002; Siskos and Grigoroudis, 2002) has been chosen to be used in order to measure customer satisfaction in this research. The basic principle of MUSA is the aggregation of individual judgements into a collective value function, assuming that customer's global satisfaction depends on a set of criteria representing service characteristic dimensions (Figure 1). The global satisfaction is denoted as a variable Y and the set of criteria is denoted as a vector **X = (X_1, X_2,...,X_n)**. MUSA was chosen over other statistical, econometrical methods because it gives reliable answers to the following criticism of other methods, namely:

1. Most of the statistical models that are used to analyze consumers' behavior cannot deal with qualitative variables, and whenever this happens, the variables are a priori encoded which results to a loss of the information provided by the consumer.
2. In several methods strong hypotheses are concerned which is difficult to be proved. These hypotheses may refer either to consumer behavior or to the estimation model (e.g. satisfaction assessment using a specific probability function).
3. Many methods focus mostly on the description of the characteristics which affect customer's satisfaction and not on the synthesis of these characteristics to a global satisfaction index.
4. Finally, several methods need information which is difficult to be collected (e.g.: customers' expected utility, tradeoffs, etc)

This preference disaggregation methodology is implemented through an ordinal regression based approach in the field of multicriteria analysis used for the assessment of a set of a marginal satisfaction functions in such a way, that the global satisfaction criterion becomes as consisted as possible with customer's judgments (Jacquet-Lagreze and Siskos, 1982; Siskos, and Yannacopoulos, 1985). According to the survey, each customer is asked to express his/her own judgements, namely his/her global satisfaction and his/her satisfaction with regard to a set of discrete criteria, representing characteristics of the provided products and services. Based on

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these assumptions, the problem is approached as a problem of qualitative regression and solved via special linear programming formulations where the sum of deviations between global satisfaction evaluation expressed by customers and the one resulting from their multicriteria satisfaction evaluations is minimized. The main results from the aforementioned preference disaggregation approach are focused on global and partial explanatory analysis.

Global explanatory analysis lays emphasis on customers' global satisfaction and its primary dimensions, while partial explanatory analysis focuses on each criterion and their relevant parameters separately. Satisfaction analysis results, in more detail, consist of:

- Global satisfaction index: it shows in a range of 0-100% the level of global satisfaction of the customers; it may be considered as the basic average performance indicator for the organisation.
- Global demanding index: it shows in a range of -100%-100% the demanding level of customers according to the following:
  - demanding index 100%: extremely demanding customers
  - demanding index 0%: "normal" customers
  - demanding index -100%: non-demanding customers
- Criteria/sub-criteria satisfaction indices: they show in a range of 0-100% the level of partial satisfaction of the customers according to the specific criterion/sub-criterion, similarly to the global satisfaction index.
- Weights of criteria/sub-criteria: they show the relative importance within a set of criteria or sub-criteria.
- Demanding indices: they show in a range of -100%-100% the demanding level of customers according to the specific criterion/sub-criterion, similarly to the global demanding index.

5 Methodology - Criteria Selection

This research process consists of the steps below (Hayes, 1992):

- Preliminary analysis: Customer satisfaction research objectives should be specified in this stage; preliminary market and customer behavioural analysis should be conducted in order to assess satisfaction dimensions (customers' consistent family of criteria).
- Questionnaire design and conducting survey: Using results from the previous step, this stage refers to the development of the questionnaire, the determination of survey parameters (sample size, collection data form, etc.) and the survey conduction.
- Analysis: The implementation of the model is included in this stage providing several results as described in the previous paragraph. Analysis is performed into the total set of customers, as well as into distinctive customer segments. Provided results involve basic descriptive statistical models, as well as the multicriteria preference disaggregation MUSA model.

- Results: Using the results from the analysis stage, final proposals for organization's improvement strategy can be formulated; a reliability testing process for the results of the model is also included in this stage.

The results presented in this paper come from a satisfaction survey. For the implementation of this survey a structured questionnaire was developed. The items of the questionnaire are the outcome of a literature review, researchers' visits to the Greek Red Cross patients' and a qualitative analysis at the stage of pretesting. The survey was conducted within the period October – November 2011. Final input data consist of 305 questionnaires. The main satisfaction criteria for the survey consist of:

- Services: Satisfaction from the Greek Red Cross services.
- Nursing Staff: This criterion measures the satisfaction that a patient gains when communicating with the nursing staff of Greek Red Cross.
- Patient service: Refers to patient satisfaction from the Greek Red Cross services
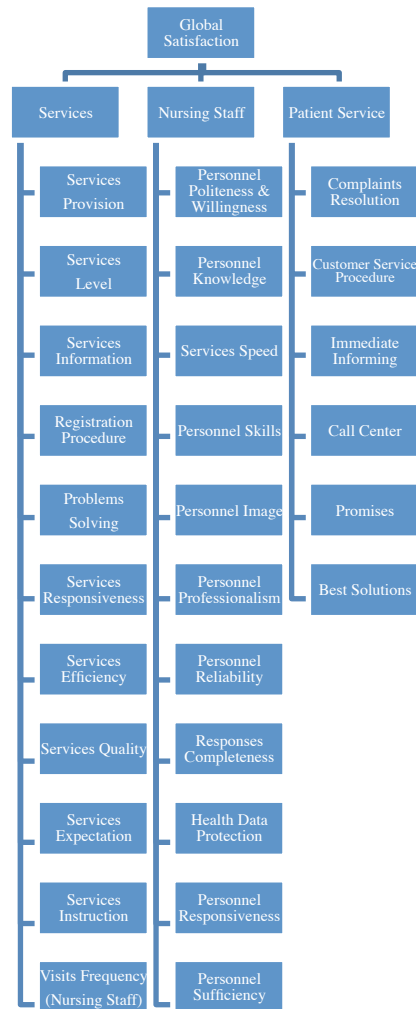
Fig. 1. Hierarchical structure of Customers Satisfaction Dimensions.

The set of satisfaction criteria in this survey is based on bibliographical research. Many researchers (Grigoroudis et al., 1999, Tsintarakis et al, 2001, Grigoroudis and Siskos, 2010, Michelis et al., 2001, Krassadaki et al., 2002, Manolitzas et al., 2010) introduce questionnaires in order to measure the customer satisfaction in several different sectors like banks, shipping, airlines, food & drinks, information technology and the public sector. Each of the 4 criteria above is divided into sub-criteria, which appear in figure 2.

6 Results

6.1 Sample

The sample selected with random sampling and constituted patients of Greek Red Cross. A total number of 203 answers from patients were collected, which provided the input data of the analysis. All the information about our sample demographic characteristics are presented in table 1.

Table 1. Sample Information

		Percent (%)
Gender	Male	31%
	Female	69%
Age	<24	4%
	25-34	7%
	35-44	8%
	45-54	12%
	>55	69%
Educational Level	Illiterate	12%
	Primary School	30%
	Lower Secondary School	15%
	Upper Secondary School	21%
	Graduate	22%
Family Status	Single	22%
	Married	13%
	Married with children	59%
	Divorce	6%
Income Level	No Income	6%
	< 300 €	5%
	301 - 500 €	12%
	501 - 700 €	25%
	701 – 900 €	23%
	> 900 €	29%

Due to the fact that only 61 of the patients have used the web site of Greek Red Cross the fourth criterion concerning the satisfaction from the web site has not been included in the satisfaction analysis process in MUSA method.

6.2 Satisfaction Analysis Results

The results given by MUSA method show that patients seem to be totally satisfied from the quality of the services that are offered by Greek Red Cross. More specifically, the average total satisfaction indicator amounts to 99.62% (fig. 2). Additionally, the concave form of total satisfaction function values in combination with the size of the estimated demand indicators, which are -64% (fig. 4), indicate

that patients are not particularly demanding, which means that they are easily satisfied even if only a part of their expectations is fulfilled.
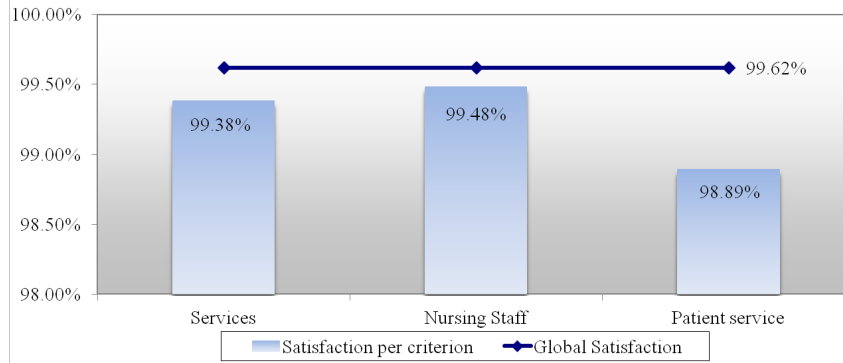

Fig. 2. Global & Partial Satisfaction indices

Regarding the patients' partial satisfaction from the quality of provided services, the highest satisfaction level is assigned to Nursing Staff (99.48%) and the lowest to Patient Service (98,89%). The weight of each criterion shows the degree of importance that given by the total number of tourists in each of the dimensions of satisfaction. Thus, is determined the level of importance of each criterion in the formulation of global satisfaction. Fig. 4 shows that the most important criterion is Services (40%).
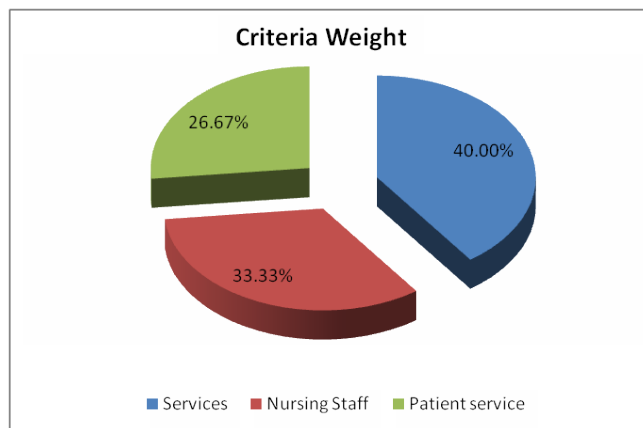

Fig. 3. Criteria Weights

Fig. 4 is coming to confirm the initial results regarding the demanding level of patients on the basis of the form of the global satisfaction function and the degree of the average total demand index. In particular, patients are less demanding regarding the Services, which is the criterion with the highest level of importance.
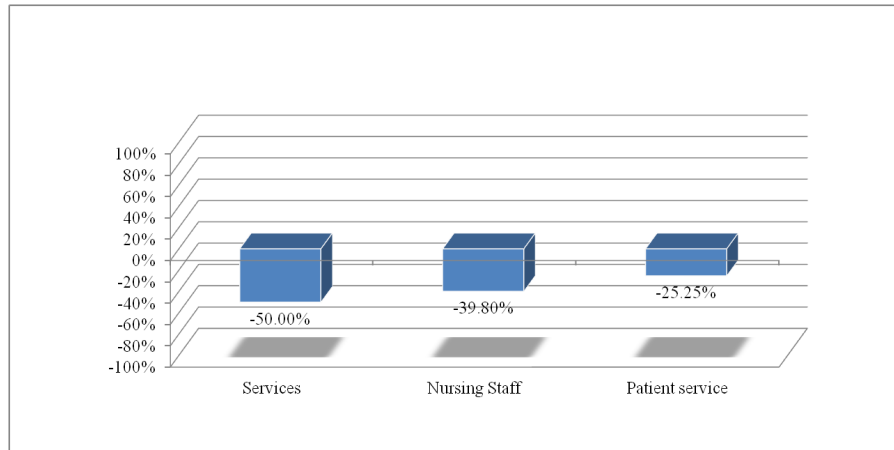
Fig. 4. Average demanding indices

MUSA results regarding the basic criteria can also help in the formulation of an action diagram through the combination of weights of satisfaction criteria with the average satisfaction indicators. Thus, the strengths and the weaknesses of the patients' satisfaction can be determined and also where any improvement efforts should be focused.
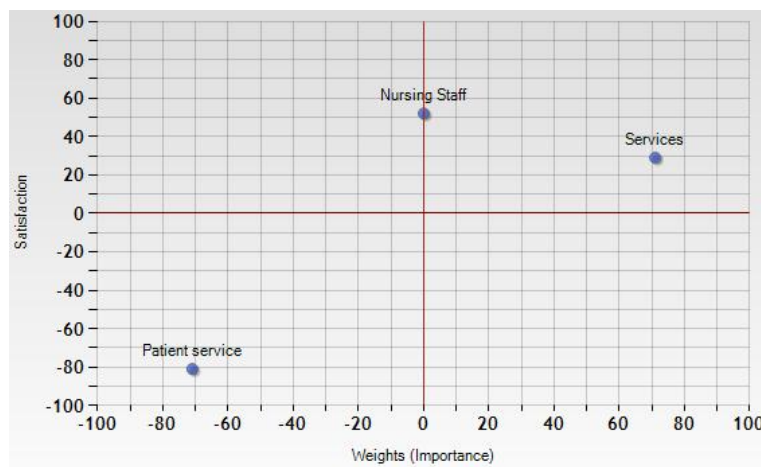
Fig. 5. Action diagram

According to the action diagram (Fig. 5) none of the criteria fall in the action area (high importance-low performance). This means that there were no important criteria in which patients are dissatisfied. Furthermore, the criterion of Services falls in the leverage opportunity area, so this criterion may be considered as the competitive advantage of Greek Red Cross which should be further improved and promoted.

6.3 Correlation between Satisfaction, Demographics and Loyalty

Trying to examine the correlation between the satisfaction, demographics and loyalty, we investigated the extent to which the patients' satisfaction level (overall, as well as partial on the criteria) is related to the personal demographic characteristics and/or to the loyalty of the patients as this loyalty is expressed in two questions ([i. willingness to continue the program], [ii. proposing the program to other patients]). For the evaluation of the aforementioned correlation we chose to use two measures depending on the nature of the scale of each variable:

- Chi-square test for nominal demographic variables
- Spearman's correlation coefficient for demographic ordinal and loyalty variables

The demographic variables which were filled in the questionnaire were: gender, age, education level, family status and annual income.

Table 2. Chi-square test – Gender and family Status

	Criteria	X^2	df*	Significance
Gender	Global Satisfaction	0.642	2	0.725
	Services	1.742	2	0.419
	Nursing Staff	0.13	1	0.908
	Patient Service	1.022	2	0.600
Family Status	Global Satisfaction	7.525	6	0.275
	Services	**11.957**	**6**	**0.063**
	Nursing Staff	2.312	3	0.510
	Patient Service	8.384	6	0.211

* degrees of freedom

The chi-square (X^2) test of two independent samples along with the corresponding crosstabulations, which was conducted, showed that there is no association between the Gender or the Family Status and the patients' satisfaction level (see table 2) with only one exception: There is an indication that the satisfaction criterion of Services is related to the Family Status at the level of 6.3% (see table 2). Based on the corresponding crosstabulations one can conclude that the patients who are married and have no children appear less satisfied than the rest of the patients as far as the satisfaction criterion Services is concerned.

From the performed Spearman's rank-order correlation analysis, which was conducted, it was concluded that the Annual Income is negatively correlated with the patients' satisfaction level (see table 3) as far as criterion Patient Service is concerned. Furthermore, a strong positive correlation is observed between the two loyalty questions on one side and Global Satisfaction and satisfaction on criterion Services on the other side. A weaker positive correlation is observed between both question of loyalty and the satisfaction on criterion Nursing Staff.

Table 3. Spearman's rho

	Criteria	Spearman's rho	Significance
Age	Global Satisfaction	-0.097	0.168
	Services	0.065	0.355
	Nursing Staff	0.095	0.178
	Patient Service	0.131	0.062
Education level	Global Satisfaction	0.073	0.301
	Services	0.015	0.834
	Nursing Staff	-0.064	0.362
	Patient Service	-0.091	0.198
Annual income	Global Satisfaction	-0.133	0.059
	Services	0.011	0.877
	Nursing Staff	-0.105	0.137
	Patient Service	**-0.154***	**0.028**
Willingness to continue the program	**Global Satisfaction**	**0.936****	**0.000**
	Services	**0.195****	**0.005**
	Nursing Staff	**0.171***	**0.015**
	Patient Service	0.119	0.092
Proposing the program to other patients	**Global Satisfaction**	**0.979****	**0.000**
	Services	**0.201****	**0.004**
	Nursing Staff	**0.172***	**0.014**
	Patient Service	0.119	0.090

7   Conclusions - Future Research

The presentation of this study is an attempt by researchers to present a measurement of the satisfaction level of patients treated by the Greek Red Cross and more specifically by a service called "Nursing at home". The results reveal a relatively high degree of global satisfaction. More specifically, the average total satisfaction indicator amounts to 99.62%. Regarding the patients' partial satisfaction from the quality of provided services the highest satisfaction level is assigned to Nursing Staff (99.48%) and the lowest to Patient Service (98,89%). Furthermore, a strong positive correlation is observed between the two loyalty questions on one side and Global Satisfaction and satisfaction on criterion Services on the other side.

A weaker positive correlation is observed between both question of loyalty and the satisfaction on criterion Nursing Staff. Future research will examine results of three successive surveys, attempting to evaluate also the relationship between customer (Patients') satisfaction and other organizational results. Future research in the context of the presented study should also focus on satisfaction benchmarking analysis, given the rapid changes of the socioeconomic conditions. Also, additional approaches may be combined for the validation of obtained results (e.g. advanced statistical tools) and the enhancement of the method (e.g. Kano's model).

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