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Antecedents of Customer Satisfaction – A Study in Health Services

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Abstract Keeping customers satisfied is a big challenge for companies, both in the public and private sectors. The health sector have great importance in this regard, as customers seek an effective service to solve their personal problems. In this sense, a study was carried out to correlate customer satisfaction according to tangibility, reliability, responsivity, safety and empathy quality attributes. A number of 306 customers were interviewed from different Basic Health Units (BHU) in Aparecida de Goiânia city, Goiás state of Brazil, from January to March of 2019. The quantitative data was treated statistically using discriminant function analysis and the software Statistical Package for Social Sciences (SPSS®) to find correlations between customers' satisfaction and their perceptions referent to quality attributes. Of the 21 independent variables considered in the initial model, five of them were admitted by the stepwise estimation as significant for explaining the health service quality perception model from different Basic Health Units (BHU) in Aparecida de Goiânia city, Goiás state of Brazil. The application of the discriminant function analysis allowed the correct classification of 45.9% of the development sample cases, then it is necessary to perform tests to verify if the generated model can generate good responses as to the perception of the perception of the clients from BHU.

Keywords: Health Services, Discriminant Function Analysis, Customer Satisfaction;

1 Introduction

Nowadays health services have been an important subject in the academic discussions, especially referent the quality and customer satisfaction regarding to these services. In other words, the approach about quality management and the performance of the health services has increased in the last times. According to [1] the relevance of the healthcare services is increasing by the day. The aging and growing populations, the drive of innovating technologies, and the focus of care delivery's value and quality are all leading to rising costs and increase of spending for health care provision. On the other hand, second these authors, the healthcare sector is overwhelmed by poor management, inflated prices, outdated information technology systems and infrastructure, poor inventory and distribution management, ad-hoc

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procurement systems, lack of executive involvement, and no process improvement culture. In this sense [2] informs that in the healthcare sector the service quality é considered as user´s fundamental right and responsibility of the providers, so that the organizations' competitively is linked to patients´ satisfaction.

Regarding to quality and customer satisfaction in the health care services context, [3] studied the public healthcare services in a big city of Brazil and concluded that the users are unsatisfied with the public health services (Basic Health Units - BHUs), referent mainly to tangibility and responsivity constructs. In this research the authors identified that the most important attributes are linked to responsivity and reliability constructs. So, the public managers have to priority these aspects in order to promote better services to customers in this context. About customer satisfaction, [4] claim that the path between customer satisfaction and loyalty has been demonstrated numerous times by previous research. [5] added that in the health services context, the companies face the challenge to provide services that satisfy the customers and users and furthermore overcome their expectances.

Referent to satisfaction conceptual aspects several publications approach this subject. According [6] satisfaction is an "overall customer attitude towards a service provider". [7] claim that satisfaction is an emotional reaction to the difference between what customers anticipate and what they receive. [8], [9] and [10] understand that when customers are satisfied, they are more likely to return, while dissatisfied customers are more likely to go elsewhere.

[11] established some correlations among customer satisfaction and possible aspects. The authors identified that customer satisfaction is strongly influenced by the interaction between customers and employees. So examining employee behavior is critical. However, it is important highlight that the employee behavior is strongly influenced by the operating organizational culture, conform several authors ([12]; [13]; [14]; [15]). In this sense, [16] claim that the general satisfaction depends of the performance regarding to several attributes and it is consequence of attend customer's implicit and explicit requirements. [17] add that manage correctly the key attributes tends to increase the customers satisfaction. [2] makes clear that the one of the main challenges of the health services companies is measure continuous the customers satisfaction and affirms that the customers satisfaction is a cumulative construct which join the satisfaction of all organization´s aspects and attributes, as technic, functional, infrastructure, interaction and so on.

[18] correlates perceived quality and customer satisfaction especially in the healthcare services, where the theme has gained importance in the literature as new relations between perceived quality and some users´ characteristics are established. In this sense these authors believe that the perceived quality is very important to customer satisfaction. In this way [19] affirmed that is possible determine two aspects which should be considered in the satisfaction evaluation: one of them refer to satisfaction with health system in general that will motive to search by the service; the second aspect measure the satisfaction with the attending process or only with the result which drive to continuing of the treatment. [18] concluded that the factors which explain the perceived quality by patient are `voluntarism´ and `clinic team´ with 97% and 85% of influence, respectively, in the perception of quality services of the medical ambulatory. The factors `attending´ and `infrastructure´, subsequently, explain 70% and 60% this relation.

Therefore, the current study proposes establish correlations between customers´ satisfaction and quality attributes of healthcare services of a brazilian city from the scale developed and validated by [20] and [21].

2 Methodological Procedures

2.1 Data Collect and Analyses

Related to the data collection process we inform that primary data were collected of a quantitative and qualitative nature. These data were obtained from a non-probabilistic sample of 306 customers from different Basic Health Units (BHU) in Aparecida de Goiânia city, Goiás state of Brazil. These data were collected from January to March of 2019. Regarding to scale (research instrument), it was developed and

validated in the papers by [20] and [21]. The scale was developed in four phases until to obtain de final version. In this sense it is important to claim that the scale was created from bibliographic references, especially from the work developed by [22].

The quantitative data was treated statistically, especially regarding to correlations between customers' satisfaction and their perceptions referent to quality attributes. In this sense, we sought to identify possible correlations between customers' satisfaction and the quality attributes from scale developed by [20] and [21] with statistical significance. So, considering the purpose of this study to correlate customers' satisfaction and customers´ perception regarding to quality attributes, it was adopted as dependent variables the customers' satisfaction and as independent variables the customers´ perception of quality attributes.

The Likert scale used in the research instrument has five points, from 1 (Very Dissatisfied) until five (very satisfied). The Figure 1 shows this Likert scale:

1 - Very Dissatisfied	**2 - Dissatisfied**	**3 - Indifferent**	**4 - Satisfied**	**5 - Very Satisfied**

Figure 1. Likert scale used in customer perception questionnaire.

Concerning to the independent variables (explanatory) used in the work, one should mention the 21 quality attributes linked to "Responsivity", "Reliability", "Empathy", "Safety" and "Tangibility" constructs, obtained from the survey instrument developed [20] and [21]. The method used was discriminant function analysis and the software used wad Statistical Package for Social Sciences (SPSS®).

2.2 Estimation and Evaluation of the Discriminant Function Analysis in SPSS®

The set of independent variables is composed of 21 variables related to the patient's perception of the service provided by a health unit. As the categorical dependent variable, LEVEL_SATISFACTION, will be explained by the independents, based on a Likert scale that ranges from 1 (Very Dissatisfied) to five (Very Satisfied). Therefore, we have all the necessary data to start the development of the discriminant model. In this sense, the sample was separated into five groups and these groups were identified using a numeric label (group 1, group 2, group 3, group 4 and group 5).

As we want a function that has simplification in relation to the need for data to be obtained and played on, we choose the Stepwise method, were inserted the variables into the function based on the degree of discrimination that each one has, that is, for its explanatory power.

Finally, we defined the method used for the insertion of the variables in the discriminant function, in this case the Wilk's Lambda method, which is a variation of Test F. Reaching a certain level of significance for Lambda, in which its value was is minimized, the variable respective was selected for the function. This significance level depends on an F value or an F probability. The standard value established is an interval from 5% until 10%. Therefore, in this study we adopted the inclusion of variables that have a level equal to or less than 5%. When the variable reaches a level above 10%, it is excluded. This is equivalent to saying that the desired confidence interval pattern is 95%.

We used the Lachembruch Test, in which each case is tested for a function generated by the other cases. If there is any missing value in the independent variables, it is replaced by the average of the others. This avoids failing to classify a case. After all definitions have been entered or parameterized, the discriminant function and other outputs were analyzed in the Results and Discussion section of this paper.

3 Results and Discussion

The first information refers to the general sample, which identifies the cases that were used to generate the function and those that were separated, or not selected, according to Table 1:

Table 1. Analysis Case Processing Summary.

Unweighted Cases		N	Percent
Valid		306	99,7
Excluded	Missing or out-of-range group codes	0	0,0
	At least one missing discriminant variable	1	0,3
	Both missing or out-of-range group codes and at least one missing discriminating variable	0	0,0
	Total	1	0,3
Total		307	100,0

As we can observe, we have 307 cases or elements available in the sample (100%) and 306 (99.7%) correspond to valid values. So in just one case (0.3%) there is one discriminant variable missing.

Table 2 shows statistic parameters such as means and standard deviations for each variable in the two groups of the sample researched.

Table 2. Test of Equality of Group Means.

	Lambda de Wilks	F	df1	df2	Sig.
3.1 The hospital has preserved and modern equipment	0,810	17,697	4	301	0,000
3.2 The hospital has a quantity of equipment that provides satisfactory care	0,699	32,381	4	301	0,000
3.3 The hospital's physical facilities are pleasant and well signposted	0,837	14,617	4	301	0,000
3.4 The hospital staff has a well-groomed appearance and attire, according to the characteristics of the work environment	0,864	11,808	4	301	0,000
3.5 The reports and other documents delivered to the patient are easy to understand	0,831	15,295	4	301	0,000
3.6 The hospital performs its activities at the appointed time	0,810	17,624	4	301	0,000

3.7 The hospital shows a sincere interest in solving patients' problems	0,761	23,680	4	301	0,000
3.8 The hospital performs the services and procedures correctly, not causing rework	0,786	20,536	4	301	0,000
3.9 The hospital presents reports, documents and information about the patient without errors	0,790	20,018	4	301	0,000
3.10 At the hospital, the team accurately informs patients when services will be performed	0,809	17,711	4	301	0,000
3.11 At the hospital, staff readily assist their patients	0,744	25,894	4	301	0,000
3.12 At the hospital, the staff is polite and courteous to their patients	0,823	16,166	4	301	0,000
3.13 The hospital has a minimum number of qualified and qualified teams to provide satisfactory care	0,754	24,573	4	301	0,000
3.14 The hospital has a minimum number of technicians to operate examination equipment	0,769	22,662	4	301	0,000
3.15 At the hospital, the team's behavior conveys confidence to patients	0,941	4,724	4	301	0,001
3.16 Hospital patients feel safe using their services	0,732	27,556	4	301	0,000
3.17 At the hospital, the team has adequate knowledge to answer patients' questions	0,775	21,835	4	301	0,000
3.18 The hospital has an entrance and exit control for people	0,752	24,791	4	301	0,000
3.19 At the hospital, the team offers individualized care to their patients	0,829	15,486	4	301	0,000
3.20 The hospital operates at times appropriate to its patients	0,810	17,661	4	301	0,000
3.21 The hospital prioritizes the patient's interests	0,736	27,011	4	301	0,000

The first test that the system presents is the equality of means of the groups, a test that seeks to identify which variables are the best discriminators for the groups under study. In this case, it was identified that variable 3.2 (The hospital has a quantity of equipment that provides satisfactory care) is the one with the best power of discrimination between groups, due to the low value of Wilks'Lambda statistics. According

to Wilks' Lambda test, the lower of the statistic variable value, the better the discrimination of the groups studied.

There is also the F-ANOVA test that helps in the interpretation and evaluation of Wilks'Lambda test, presenting the level of significance of each variable, which, being low (less than 0.05), indicates a significant difference between the averages of the group. This test confirms the previous variable and would place the other variables as good candidates for discriminators, if they present Sig. <0.05.

The confirmation that the equality premise between the covariance matrices has broken or not is obtained through the test called Box's M, which is based in F transformation, as shown in Table 3. SPSS® tests the H_0 of equality of covariance matrices through the level of significance obtained.

Table 3. Test Results.

Box´s M		97,057
F	Aprox.	1,554
	df1	60
	df2	116805,870
	Sig.	0,004
Test null hypothesis of equal population covariance matrices.		

In this case, the test indicates a violation of premise of equality between the covariance matrices, conform a significance level of 0.05, because the test result is lower (0.004). The probable cause is referent to the size of the sample or due the difference in size of the groups, but it may also be due to the absence of multivariate normality. After that, Table 4 shows the eigenvalues for each function:

Table 4. Eigenvalues.

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	0,807[a]	83,2	83,2	0,668
2	0,125[a]	12,9	96,2	0,334
3	0,031[a]	3,2	99,4	0,174
4	0,006[a]	0,6	100,0	0,076

a. First 4 canonical discriminant functions were used in the analysis.

The Eigenvalue, which is the column sum of factor loads squared for each factor, represents the amount of variance explained by a factor. In this study, 80.7% of the classification variation is explained by the only factor formed by the explanatory variables in Function 1. By raising the canonical correlation squared (0.668^2), it can be considered that 44.62% of the dependent variable LEVEL_SATISFACTION (Which your level of satisfaction/general perception with the health service?) can be represented by the model identified by the discriminant analysis. The other functions have eigenvalues and lower canonical correlations.

Follow we have the results regarding to the Stepwise process, informing the variables selected or not, at each step, as well as what happened with each one, according to Table 5:

Table 5. Application of the Stepwise method to model variables

Variable Entered/Removed [a,b,c,d]	
	Lambda de Wilks
	Exact F

Step	Entered	Statistic	df1	df2	df3	Statistic	df1	df2	Sig.
1	3.2 The hospital has a quantity of equipment that provides satisfactory care	0,699	1	4	301	32,381	4	301	0
2	3.11 At the hospital, staff readily assist their patients	0,593	2	4	301	22,431	8	600	0
3	3.18 The hospital has an entrance and exit control for people	0,53	3	4	301				
4	3.13 The hospital has a minimum number of qualified and qualified teams to provide satisfactory care	0,497	4	4	301				
5	3.17 At the hospital, the team has adequate knowledge to answer patients' questions	0,474	5	4	301				

At each step, the variable that minimizes the overall Wilks'Lambda is entered.
a. Maximum number of steps is 42.
b. Maximum significance of F to enter is 05.
c. Minimum significance of F to remove is 10
d. F level, tolerance, or VIN insufficient for futher computation.

Table 5 shows the five steps that the system has produced. We can observe that the best variables for the discriminant function were obtained, which were selected considering the levels of significance that they reached within the pre-established confidence interval (95%). They are: 3.2 The hospital has a quantity of equipment that provides a satisfactory service, 3.11 In the hospital, the team promptly assists its patients, 3.13 The hospital has a minimum number of qualified and qualified teams to provide satisfactory services, 3.17 In the hospital, the team has adequate knowledge to answer patients' questions and 3.18 The hospital has a control of entry and exit of people. The other variables were not selected.

As the problem of multicollinearity between these five variables was identified, it was expected that if the function assumed the case, the explanation level conform indicated by the Tolerance coefficient would be reduced for the variables at each step of the Stepwise method. The Stepwise method was chosen because there is the partial correlation of the other variable, the variable '3.17 In the hospital, the team has adequate knowledge to answer the patients'. The questions showed greater predictive power for the discriminant function. The canonical discriminant function obtained is shown in Table 6:

Table 6. Canonical Discriminant Function Coefficients.

	Function			
	1	2	3	4
3.2 The hospital has a quantity of equipment that provides satisfactory care	0,464	-0,081	-0,702	0,064
3.11 At the hospital, staff readily assist their patients	0,267	-0,561	0,272	-0,655
3.13 The hospital has a minimum number of qualified and qualified teams to provide satisfactory care	0,152	0,658	-0,159	-0,271

3.17 At the hospital, the team has adequate knowledge to answer patients' questions	0,236	-0,417	-0,015	0,751
3.18 The hospital has an entrance and exit control for people	0,262	0,361	0,613	0,202
(Constant)	-4,210	0,687	-0,194	-0,412

Unstandardized coefficients.

Then based on the non-standardized coefficients in Table 6 (Canonical Discriminant Function Coefficients) the discriminating functions (Z score) would be:

Z_1 = *-4.210 + 0.464 (3.12) + 0.267 (3.11) + 0.152 (3.13) + 0.236 (3.17) + 0.262(3.18)*

Z_2 = *0.687 - 0.081 (3.12) - 0.561 (3.11) + 0.658 (3.13) - 0.417 (3.17) + 0.361 (3.18)*

Z_3 = *-0.194 - 0.702 (3.12) + 0.272 (3.11) - 0.159 (3.13) - 0.015 (3.17) + 0.613 (3.18)*

Z_4 = *-0.412 + 0.064 (3.12) - 0.655 (3.11) - 0.271 (3.13) + 0.751 (3.17) + 0.202 (3.18)*

The Function 1 has the highest eigenvalue and the highest canonical correlation, so it is considered that Z_1 is more appropriate to express the patients' satisfaction in the analyzed health service.

The cut-off point will be used to classify the cases according to the canonical discriminating function. It was calculated the cutoff considering equal costs of classification errors, weighting the relationship between centroid versus probability. After setting the cutoff point, it was validated the function in relation to the cases of the development samples. The results are showed in Table 7.

Table 7. Validation of Function in relation to Sample Cases.

Classification Results [a,c]							
What is your level of satisfaction/ general perception with the health service?			Predicted Group Membership					Total
			1	2	3	4	5	
Original	Count	1	29	9	5	6	0	49
		2	11	24	8	2	1	46
		3	7	20	29	12	8	76
		4	6	6	15	29	34	90
		5	3	2	5	6	30	46
	%	1	59	18,4	10	12	0	10
		2	,2	52,2	,2	,2	2,	0
		3	23	26,3	17	4,	2	10
		4	,9	6,7	.4	3	10	0
		5	9,	4,3	38	15	,5	10
			2		,2	,8	37	0
			6,		16	32	,8	10
			7		,7	,2	65	0
			6,		10	13	,2	10
			5		,9			0

Cross-validated[b]	Count	1	27	11	5	6	0	49
		2	13	20	10	2	1	46
		3	7	21	27	12	9	76
		4	6	6	15	29	34	90
		5	3	2	5	7	29	46
	%	1	55,1	22,4	10,2	12,2	0	10
		2	28,3	43,5	21,7	4,3	2,2	10
		3	9,2	27,6	35,5	15,8	11,8	10
		4	6,7	6,7	16,7	32,2	37,8	10
		5	6,5	4,3	10,9	15,2	63	10

a. 45,9% of selected original grouped cases correctly classified

b. Cross validation is done only for those cases in the analysis. In cross-validation, each case is classified by the function derived from all cases other than that case

c. 43,0% of selected cross-validated grouped cases correctly classified

Table 7 shows the results of the classifications from the samples. The development ´sample cases were 45.9% correctly classified. There are 29 correct classifications of observations belong to group 1, 24 correct classifications of observations which belong to group 2, 29 correct classifications are referent to group 3, 29 correct classifications are regarding to group 4 and 30 correct classifications of observations belong to group 5. The sample called cross-validated is the Lachembruch test, in which each case of the development sample is removed from the cross-validated sample and a new function is generated and applied on it to verify the classification capacity. This test showed a correctness rate of 43.0% of the classifications. Therefore, we can observe that this model has the capacity to perform, at a moderate level the classification of elements external to itself.

4 Final Considerations

Patient satisfaction is valuable feedback that will contribute to reflect on the continuous improvement of teamwork. Thus, a constant investigation is required in the search to identify components that compromise the performance of the health team and hospital administration. It is for customers that strategies in the pursuit of quality should be directed.

The objective of this study was achieved even with a correct classification of 45.9% of the development sample, a percentage that is not very substantial, but that can be explained because we deal with the perception of customers and we know that there are different views for the same context.

As for the limitation of the study, it is perceived that it would be imprudent to generalize the conclusions of the research. Therefore, it is not advisable to use this model to obtain information even in cases that have certain similarities, because despite some possible coincidences, the realities and contexts are usually different.

Regarding the independent variables, in the Discriminant Analysis they are generally metrics with continuous values, but they can also assume values that represent categories. For future work, the questionnaire used in this study is proposed to also bring questions that refer purely to categories (high and low, for example). Therefore, for a better assessment of these issues, Logistic Regression and/or Neural Networks could be employed.

Finally, one can conclude that although the discriminant analysis shows a result, it is necessary to carry out tests and considerations to verify whether the model can really be used to assess the customer´s

perception of the service offered in different primary health care units in the city of Aparecida de Goiânia. The model is not a “crystal ball”.

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