



## Analysis of the Relationship between Quality of Service, Satisfaction and Loyalty of Patients of a Hospital through the Structural Equation Modelling

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### Abstract

Analyzing the relationship between the perceived quality of service, satisfaction, and loyalty is an important issue for service providers. In this study, we investigate this relationship for the patients of a training and research hospital in Turkey. The used dataset, which gathered with a modified Servqual survey, consisted of 158 respondents who were patients of the hospital. We develop a hypothesis about the relationships between the perceived service quality, satisfaction of patients, and their loyalty. We apply structural equation modeling (SEM) to evaluate the hypothesis. We use AMOS 23 software for this aim. According to obtained results, the quality perception and satisfaction of patient affect positively their loyalty.

**Keywords:** Perceived Quality of Service; Satisfaction; Loyalty; Servqual Survey; Structural Equation Modeling; Hospital Management

### Abbreviations

SEM: Structural Equation Modeling; CFA: Confirmatory Factor Analysis; GFI: Goodness of Fit Index; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation.

### Introduction

Especially in a competitive landscape, customer loyalty is an important factor that affects the growth of business firms. It is generally thought that there is a relationship between quality and satisfaction with loyalty. Therefore, to investigate this relationship hypotheses have developed by many researchers, which have evaluated based on several approaches [1-6,10]. As other sectors, analyzing this relationship in the health sector can be useful for providing better services. In this study, we establish a hypothesis that the perceived quality and their satisfaction have a positive effect on their loyalty. We evaluate the hypothesis with structural equation modeling (SEM), based on data collected in a training and research hospital in Turkey using the Servqual questionnaire. The sample consists of 158 respondents, who had different demographic profiles. The obtained results confirm the impact of perceived quality and satisfaction of patients on their loyalty.

In the next sections, at first, the applied method is explained, then the numerical results are presented.

### Method and Conceptual Model

SERVQUAL is a questionnaire designed to analyze service purchasers' expectations and also their perceptions of service [9]. To collect data, we use a modified version of this survey, in which only the quality perception of patients of a hospital is measured. It has 6 dimensions as summarized in Table 1 [7].

In addition, 3 exogenous variables are defined in the survey, which are summarized in Table 2.

The questionnaire has been filled by 158 patients with different profiles in a training and research hospital in Turkey. The questions of the survey are available in the appendix section. Using this collected data, we evaluate a hypothesis as perceived service quality and satisfaction of patients have a positive effect on their loyalty. We develop a structural equation model in AMOS 23 software as seen in Figure 1. In the model, the variables of Table 1 are latent ones, while the observed variables are M1, M2, and M3.

Dimension	Notation in the model	Number of items (questions) in questionnaire
Responsiveness	A	7
Empathy	E	2
Tangible (physical) facilities	F	9
Reliability	G	5
Assurance	GR	5
Kindness	N	6

Table 1: Dimensions of the modified SERVQUAL survey [7].

Variable	Notation in the model
Loyalty	M1
Satisfaction	M2
Perceived quality	M3

Table 2: Exogenous variables in the modified SERVQUAL survey [7].

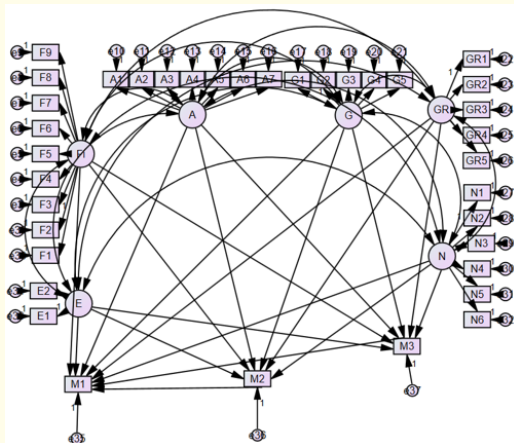


Figure 1: Initially developed structural equation model.

### Experimental Results and Discussion

The model  $\chi^2/df$  is chi-square test outputs are  $=1872.773$ ,  $df=597$  and then  $=3.137$ , is not confirmed by the software. To improve the model, we remove the insignificant paths one by one, according to the regression weights. The removed ones are the paths whose p-value is greater than 0.05. When these steps are done, the resulting model is as in Figure 2, in which standardized estimates of the paths are written above them.

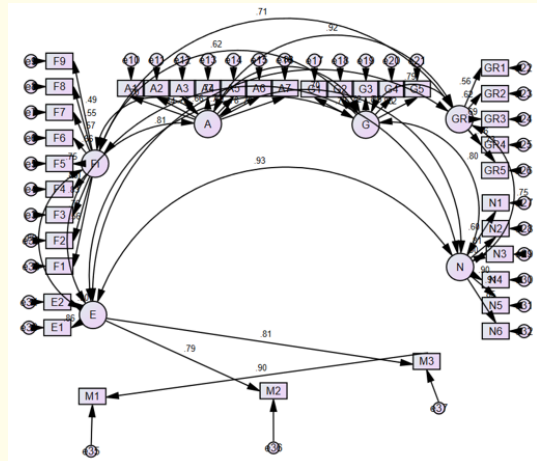


Figure 2: Revised structural equation model.

The results of the goodness of fit for the model shown in Figure 2 and their desire ranges are presented in table 3.

Statistics	Notation	Value	Desired range
Chi-square/degrees of freedom ratio	$\chi^2/df$	3.33	2 to 5
Goodness of fit index	GFI	0.577	> 0.90
Comparative fit index	CFI	0.734	> 0.95
Root mean square error of approximation	RMSEA	0.122	< 0.08

Table 3: Results of the goodness of fit for the model [8,10].

In addition, the regression weights of the paths in the revised model are as in Figure 3, which are all significant.

	Estimate	S.E.	C.R.	P	Label		Estimate	S.E.	C.R.	P	Label
M3 <-- E	.724	.057	12.774	***		A1 <-- A	1.000				
F1 <-- F1	1.000					A2 <-- A	1.137	.142	7.988	***	
F2 <-- F1	1.522	.214	7.113	***		A3 <-- A	1.019	.138	7.386	***	
F3 <-- F1	1.945	.263	7.393	***		A4 <-- A	1.130	.142	7.959	***	
F4 <-- F1	1.981	.263	7.536	***		A5 <-- A	1.330	.154	8.659	***	
F5 <-- F1	1.498	.216	6.949	***		A6 <-- A	1.268	.148	8.524	***	
F6 <-- F1	1.316	.206	6.402	***		A7 <-- A	1.298	.156	8.301	***	
F7 <-- F1	1.257	.216	5.830	***		GR1 <-- GR	1.000				
F8 <-- F1	1.502	.265	5.664	***		GR2 <-- GR	.961	.159	6.042	***	
F9 <-- F1	.929	.180	5.172	***		GR3 <-- GR	1.173	.182	6.440	***	
G1 <-- G	1.000					GR4 <-- GR	1.499	.219	6.854	***	
G2 <-- G	1.063	.111	9.608	***		GR5 <-- GR	1.285	.193	6.660	***	
G3 <-- G	1.208	.109	11.074	***		E1 <-- E	1.000				
G4 <-- G	1.137	.097	11.701	***		E2 <-- E	1.038	.066	15.701	***	
G5 <-- G	.985	.104	9.472	***		M2 <-- E	.764	.062	12.363	***	
N1 <-- N	1.000					M1 <-- M3	.990	.039	25.294	***	
N2 <-- N	1.690	.211	8.004	***							
N3 <-- N	1.881	.219	8.577	***							
N4 <-- N	1.607	.187	8.583	***							
N5 <-- N	1.654	.192	8.622	***							
N6 <-- N	1.750	.212	8.243	***							

Figure 3: Regression weights in the revised model seen in Figure 2.

To improve the model fit, we look for paths that can be added by analyzing the results of modification indices. As seen in Figure 4, some paths between the error terms are added to the model. Therefore,  $\chi^2/df = 2.90$ ,  $GFI = 0.622$ ,  $CFI = 0.788$  and  $RMSEA = 0.110$  are obtained, which show an improvement.

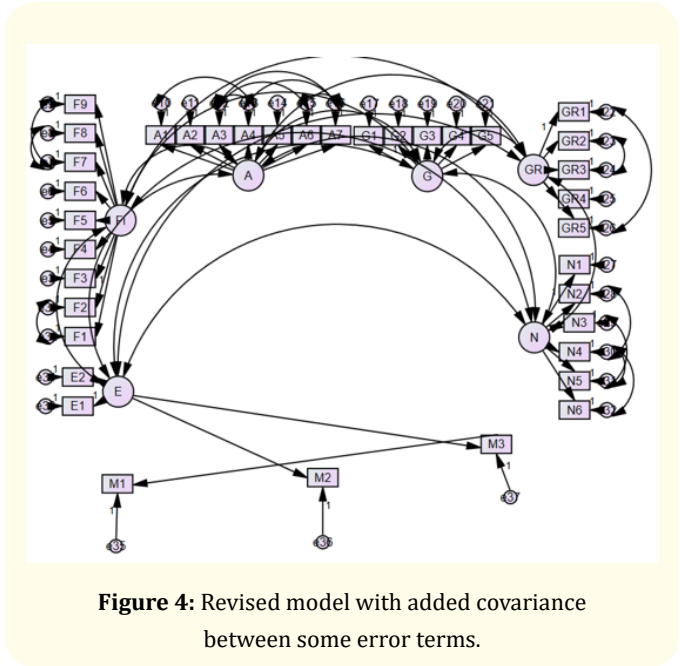


Figure 4: Revised model with added covariance between some error terms.

In addition, 13 respondents are extracted from the dataset by examining the results of the test for normality and outliers, which are titled as the observations farthest from the centroid (Mahalanobis distance). In this case, model fit improves and we obtain  $X^2/df = 2.71$ ,  $GFI = 0.631$ ,  $CFI = 0.800$  and  $RMSEA = 0.109$ . Regression weights in this model are presented in Figure 5.

Although some statistics are not in the desired interval, it can be concluded that the patients' perceived quality and satisfaction affect their loyalty. In addition, one of the highlights is that especially the empathy of the employees affects both the quality perception and satisfaction of patients.

	Estimate	S.E.	C.R.	P	Label	Estimate	S.E.	C.R.	P	Label
M3 <-- E	.549	.049	11.313	***		A1 <-- A	1.000			
F1 <-- Fi	1.000					A2 <-- A	1.257	.136	9.241	***
F2 <-- Fi	1.547	.175	8.854	***		A3 <-- A	1.124	.127	8.845	***
F3 <-- Fi	2.123	.327	6.501	***		A4 <-- A	1.185	.133	8.906	***
F4 <-- Fi	2.256	.338	6.676	***		A5 <-- A	.963	.109	8.836	***
F5 <-- Fi	1.717	.274	6.259	***		A6 <-- A	1.122	.132	8.525	***
F6 <-- Fi	1.511	.256	5.908	***		A7 <-- A	1.346	.151	8.920	***
F7 <-- Fi	1.535	.273	5.632	***		GR1 <-- GR	1.000			
F8 <-- Fi	1.814	.334	5.428	***		GR2 <-- GR	.977	.154	6.336	***
F9 <-- Fi	.964	.216	4.458	***		GR3 <-- GR	1.232	.181	6.794	***
G1 <-- G	1.000					GR4 <-- GR	1.443	.196	7.374	***
G2 <-- G	1.305	.130	10.039	***		GR5 <-- GR	1.370	.202	6.793	***
G3 <-- G	1.239	.118	10.475	***		E1 <-- E	1.000			
G4 <-- G	1.153	.102	11.297	***		E2 <-- E	.826	.039	21.058	***
G5 <-- G	.917	.102	8.975	***		M2 <-- E	.568	.052	11.006	***
N1 <-- N	1.000					M1 <-- M3	.944	.042	22.325	***
N2 <-- N	1.831	.209	8.765	***						
N3 <-- N	1.732	.197	8.778	***						
N4 <-- N	1.487	.173	8.608	***						
N5 <-- N	1.477	.171	8.657	***						
N6 <-- N	1.719	.202	8.512	***						

Figure 5: Regression weights in the revised model seen in Figure 4, when 13 respondents are removed from dataset according to the result of the normality test.

### Conclusion

The aim of this study is to analyze the relationship between the perceived quality by patients of a hospital, their satisfaction and loyalty with SEM. We develop a hypothesis that the perceived quality of patients and their satisfaction have a positive effect on their loyalty. We test this hypothesis using AMOS 23 software for a dataset collected in a training and research hospital in Turkey. The data have been obtained using the Servqual questionnaire, which has been filled by 158 patients of the hospital. At the first run, the model was not confirmed by the software. To improve the goodness of fit some insignificant paths were removed step by step. At the end of each step, the outputs were checked and after a few steps, a pattern is obtained in which all paths are significant. Then, some error terms are added to the path and some data are extracted due to the results of the modification indices and normality and outliers tests. As a result, the goodness of fit statistics improves. Although some of the outputs are not in the desired range, paths are all significant. Therefore, it can be concluded that the perceived quality and satisfaction of patients have a positive effect on their loyalty. In addition, it is observed that the empathy variable, which is one of the dimensions of the applied questionnaire, positively affect the quality perception and satisfaction of the patients.

**Conflict of Interest**

The authors declare that they have no conflict of interest.

**Appendix**

A1	Employees (doctor, nurse, etc.) are easily reached when needed.
A2	Registration is easy and fast.
A3	Employees (doctor, nurse, etc.) are willing to help the patient.
A4	Employees (doctor, nurse, etc.) provide detailed answers to the questions asked by the patient about the discharge procedures.
A5	Employees (doctor, nurse, etc.) answer any questions asked by the patient about any work or procedure.
A6	Detailed information is given to the patient about the examination, treatment, drugs, and disease.
A7	The discharge procedures are explained in detail to the relatives of the patients.
E1	Employees understand the needs of patients.
E2	Nurses behave special care to their patients.
F1	The equipment and technology used are suitable.
F2	Physical appearance is nice.
F3	Toilets are clean.
F4	Rooms are clean.
F5	Quality of foods is good.
F6	The temperature of the meals given to the patient is good.
F7	Rooms are quiet.
F8	Parking space is sufficient.
F9	Meals are on time.
G1	I trust employees (doctor, nurse, etc.).
G2	As a result of the treatment, I believe in my recovery.
G3	I trust on the invoice.
G4	I feel confident in relations with employees (doctor, nurse, etc.).
G5	Employees (doctor, nurse, etc.) are competent.
GR1	Employees (doctor, nurse, etc.) perform their services in a timely manner.
GR2	Patient records are kept correctly.
GR3	The issued invoices are real.
GR4	It is clearly stated when the patients will be given the exact procedure.
GR5	Discharge procedures are easily done.
N1	Employees (doctors, nurses, etc.) respect patients' privacy.
N2	During the registration process, the staff is courteous, polite and friendly.
N3	During my stay, the staff was courteous, polite and friendly.
N4	Employees (doctors, nurses, etc.) are polite to the patient.
N5	Employees (doctor, nurse, etc.) are friendly.
N6	The staff treats the visitors well.
M1	I would prefer this hospital again if I need.
M2	I am satisfied with the services provided.
M3	The general quality of the hospital is good.

**Table 4:** Used questionnaire (translated from Turkish) [7].

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