Measuring Logistics Service Quality Using the SERVQUAL Model

Alma Jusufbašić, Željko Stević[*]

Faculty of Transport and Traffic Engineering, University of East Sarajevo, 74000 Doboj, Bosnia and Herzegovina

[*] Correspondence: Željko Stević (zeljko.stevic@sf.ues.rs.ba)

Abstract: Quality is a key success factor in the market. For the successful performance of a company, it is very important to have high quality and a quality system, and strive for its development and improvement. In this paper, it has been measured the quality of logistics service using the SERVQUAL model in the TC company as one of the most well-known and most used models in the field of quality measurement. The users of the transport service, the respondents, provided certain information on their expectations, as well as their perceptions of the quality of the transport service from the aspect of all five dimensions: reliability, assurance, empathy, tangibles and responsiveness. The SERVQUAL model was chosen to obtain the final results of the quality of service provided to users. The FUCOM method was applied to obtain the final weights of dimensions. The main goal of this paper is to assess the quality of the transport service in the TC company, so that the company has an insight into its current state, and based on it, takes further steps to improve its quality. Increasing service quality results in greater satisfaction of service users, greater satisfaction results in increased loyalty, which further guarantees the positive performance of the company itself and its safe existence and work on the market. The results have shown that the company has negative final values from the aspect of all five dimensions, which tells us that users are not satisfied with the service provided, and the greatest dissatisfaction was expressed from the aspect of the dimension of tangibles.

Keywords: Quality of service; SERVQUAL; FUCOM; Quality measurement methods; Quality dimensions

1. Introduction

The quality of a product or service is essential. Customer satisfaction with service quality determines the future of a company and is also able to define customer loyalty to the company and therefore the company will continue to make profits [1]. However, in the study of Munusamy et al. [2], the authors identified that the quality of service can be interpreted from the difference between the expectations of services that their clients experience and the perceptions of services they receive. According to the study from Banomyong and Supatn [3], today it is necessary to make a great effort to continuously improve the quality of service and understand the needs and wishes of different users. The SERVQUAL model (Service Quality) was defined by Parasuraman et al. [4], and later it was refined and modified several times. The service quality measurement model can be used in different service systems, but it is mainly intended for existing or former users, who have certain knowledge and experience related to the service provider [5]. The application of the SERVQUAL model is significant in the field of logistics services [6]. In its initial phase, the SERVQUAL model was created for ten components of service quality: tangibles, reliability, responsiveness, competence, courtesy, credibility, security, access, communication, and understanding the customer. Due to the large number of the dimensions, there were difficulties during real measurement, and these ten components were reduced to five main dimensions, namely: reliability, assurance, tangibles, empathy and responsiveness [7]. To measure the dimensions and their impact on service quality.

Many authors have criticized the use of the SERVQUAL model as a general instrument for measuring service quality. Criticisms came from both a theoretical and an empirical point of view [8]. Quality measurement was improved by introducing a "tolerance zone" in the expectation of services. According to these supplements, the users' expectations move within a zone limited by "desired service" and "adequate service" [9]. The research of

Sotteriou and Chase [10] shows that service quality measured by SERVQUAL instruments depends on the degree of contact with the user. The authors of the study of Oppewal and Vriens [11] provide an alternative approach for measuring service quality, based on integrated experiments that include the five SERVQUAL dimensions. According to the study from Buttle [12], customers will often criticize poor performance rather than praise exceptional performance since failure to meet expectations often appears to be a more significant outcome than success in meeting or exceeding expectations. While according to the study of Grönroos [13], the user may have low expectations based on the previous experience with the service provider even if these expectations are met, there is no gap and the service quality is considered satisfactory, even though this may not be the case. In the research of Maksimović et al. [14], the authors states that the importance of transport can be seen through the simple fact that it is a necessary element in the functioning of all activities in the economy and society. The new lifestyle and communication have contributed to the need to increasingly adopt business rules in transport, where quality becomes the key word, and the perception of the user of transport service becomes a measure of the quality of the transport service offered. In the research of Memic et al. [15], the SERVQUAL model was used to measure logistics service in passenger transport. The questionnaire contained 22 questions for the perception and the same number for the expectation of users in the area of five dimensions, and the questionnaire was filled out by 50 service users of different ages. After the calculation was made, a certain difference was observed between the expectations and observations of the users in all dimensions. The smallest difference between perception and expectation occurred in the dimension of empathy, and the greatest dissatisfaction can be observed in the dimension of tangibles. At the end of the research, after obtaining the results, all the mentioned hypotheses were refuted due to the negative gap, and the SERVQUAL model indicated critical business functions and the possibility of their improvement. In addition, after a detailed review of all issues individually in all dimensions, it was concluded that the reason for the negative SERVQUAL is largely the events that caused the increase in ticket prices for service users by 90%.

Also, in the research of Vasiljević and Stević [16], this model was used to measure service quality in the transport of goods, where the purpose of the research was to expand the framework of service quality analysis through empirical verification of the possibility of measuring the technical and functional dimension of quality with the methodologies of the most widely used and well-known SERVQUAL model. The research refers to the measurement of service quality in freight transport, i.e. in an express mail company. The questionnaire was filled out by users online through the Google forms application, and the questionnaire consisted of 25 questions for user perceptions and 25 questions for user expectations for five dimensions. After collecting responses and completing the calculation, it has been obtained a result showing that the users are satisfied with the quality of the company's logistics service. All values of the SERVQUAL model are positive except for the dimension of responsiveness, which had zero as a result, which means that expectations remained equal to perceptions, but the company has the most space for improvement in this aspect. According to the users' assessment, the greatest satisfaction was expressed by the dimension of reliability.

Further, the paper is structured as follows. Section 2 refers to quality measurement models and methods, presenting SERVQUAL as a model, its definition, main characteristics and significant points. This section also provides the steps of the FUCOM method used to obtain the final values of weighting coefficients. The Results section presents the application of the SERVQUAL method on a specific example, on the measurement of the quality of the logistics service of the TC company. In the following sections, it is given the method of obtaining the final values of weighting coefficients, the frequency of transport service users' responses, the results of the dimensions with expectations and perceptions, as well as the final results of the research and calculations.

2. Methodology

Further in the paper, it is presented the SERVQUAL quality assessment method, its main characteristics and equation, and the FUCOM method for obtaining final weight values.

2.1 SERVQUAL Model

The SERVQUAL model was founded in 1985, as an instrument used to assess the quality of service based on user perceptions and expectations along certain dimensions. At the beginning of the establishment of the model itself, there was a large number of dimensions, which caused difficulties during real measurements, so the number was reduced to ten dimensions. The model has changed a lot throughout history, and today the model consists of 22 questions for perception and 22 questions for expectation, which are distributed along five basic dimensions: assurance, responsiveness, empathy, tangibles and reliability. Today, this is the most well-known model in the field of service quality measurement. The model is expressed by the algorithm "perception minus expectation", which can be represented by the following equation:

$$SQi = \sum W_j \left(Perception - Expectation\right) \qquad (1)$$

2.2 FUCOM Method

The FUCOM method was developed by Pamučar et al. [17] for determining the weights of criteria. In the following part of the paper, it is presented the procedure for obtaining weighting coefficients of criteria using FUCOM:

Step 1: The criteria from the predefined set of evaluation criteria $C=\{C_1, C_2, …, C_n\}$ are ranked.

$$C_{j(1)} > C_{j(2)} > \cdots > C_{j(k)} \tag{2}$$

Step 2: The ranked criteria are compared and the comparative priority of the evaluation criteria is determined $\varphi_{k/(k+1)}$, $k=1, 2, …, n$, where "k" represents the ranking of the criteria:

$$\Phi = \varphi_{1/2}, \varphi_{2/3}, …, \varphi_{1/(k+1)} \tag{3}$$

Step 3: The final values of the weighting coefficients of the evaluation criteria $(w_1, w_2, …, w_n)^T$ are calculated. The final values of the weighting coefficients should satisfy the following two conditions:

The ratio of weighting coefficients is equal to the comparative priority between the observed criteria ($\varphi_{k/(k+1)}$) defined in Step (3), i.e. the following condition is met:

$$\frac{w_k}{w_{k+1}} = \varphi_{k/(k+1)} \tag{4}$$

In addition to condition (2), the final values of the weighting coefficients should satisfy the condition of mathematical transitivity, $\varphi_{k/(k+1)*}\varphi_{(k+1)/(k+2)}= \varphi_{k/(k+2)}$.

From: $\varphi_{k/(k+1)} = \frac{w_k}{w_{k+1}}$ and $\varphi_{(k+1)/(k+2)} = \frac{w_{k+1}}{w_{k+2}}$; $\frac{w_k}{w_{k+1}} * \frac{w_{k+1}}{w_{k+2}} = \frac{w_k}{w_{k+2}}$

Thus, there is one more condition to satisfy the final values of criteria weights, namely:

$$\frac{w_k}{w_{k+2}} = \varphi_{k/(k+1)} * \varphi_{(k+1)/(k+2)} \tag{5}$$

According to the previously, the final model can be defined for determining criteria weights:

min X
s.t.

$$
\begin{aligned}
&\left| \frac{w_{j(k)}}{w_{j(k+1)}} - \varphi_{k/(k+1)} \right| = X, \forall j \\
&\left| \frac{w_{j(k)}}{w_{j(k+2)}} - \varphi_{\frac{k}{k+1}} * \varphi_{\frac{k+1}{k+2}} \right| = X, \forall j \\
&\sum_{j=1}^{n} w_j \\
&w_j \geq 0, \forall j
\end{aligned}
\tag{6}
$$

By solving model (6), the final values of the evaluation criteria $(w_1, w_2, …, w_n)^T$ and the degree of consistency (X) of the obtained results are gained.

3. Results

It is known that it is very difficult to measure quality since something that one person considers to be high-quality, another person may consider the opposite, which tells us that the perception of the quality of service is a very subjective category. By applying the SERVQUAL model, the evaluation of service quality in the transport company TC was carried out. The company is located in Bosnia and Herzegovina. The company was registered as a company for the transportation of goods and materials, in international transport for internal and external trade. The company has around 50 employees, most of whom are professional drivers. The fleet includes 20 units of standard tow trucks, mega tow trucks, tandem trucks and two vans. The company currently has three permanent users, and the questionnaire was submitted to 14 users who represent about 30% of the total current users, among whom there are also permanent users of the service. All respondents are legal entities. Before filling out the questionnaire, respondents also provided information on how they found out about the company, how many times

they used the services, in which city they were located.

In Figure 1, it can be seen that 24% of users found out about TC from another company, which represents 4 users, while 76% of users found out about the company through the TIMOCOM platform, which represents 10 respondents.

From Figure 2, it can be seen that 36% of users used the service more than five times, 14% of users used the service once, and 50% of users used the service from two to five times, which is seven out of 14.

From Figure 3, it can be seen that 29% of users use the company's service as their first option, 21% choose TC among the first options, 29% of users use the service if they cannot find another operator, 14% of users use the service only if the price suits them, and the remaining 7% of the service users make arrangements if the company contacts them or vice versa. From Figure 4, it can be seen that the respondents are located both in the cities of Bosnia and Herzegovina and Europe.
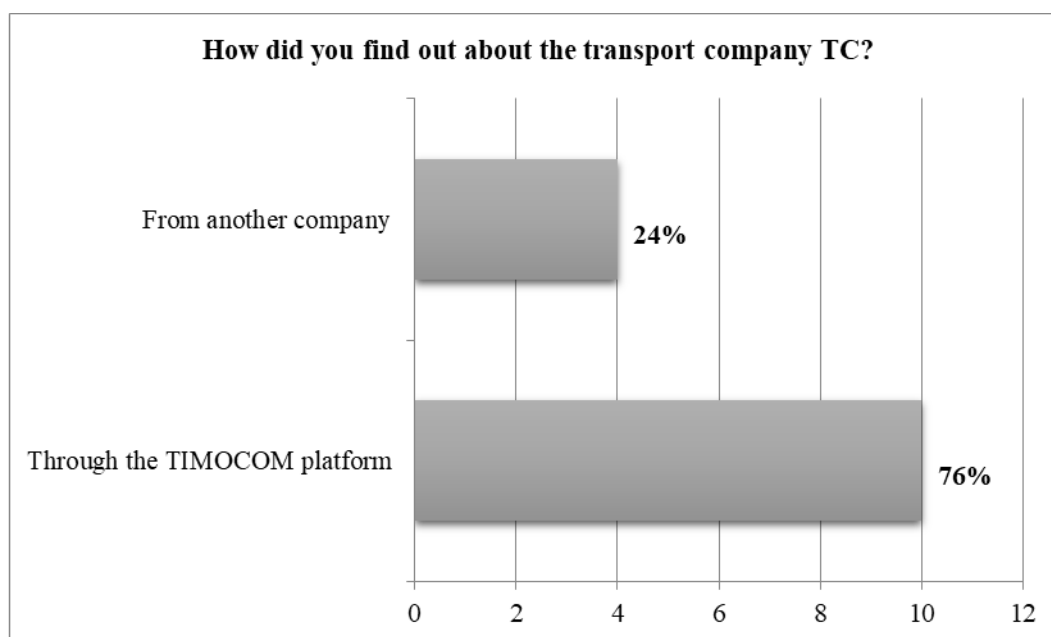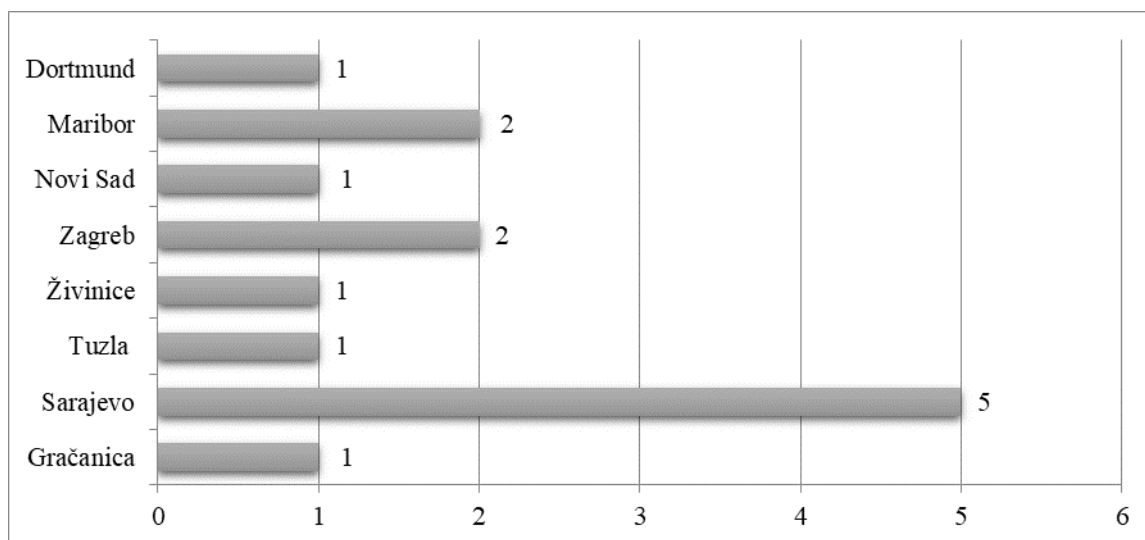

Figure 1. Percentage representation of how users found out about the company
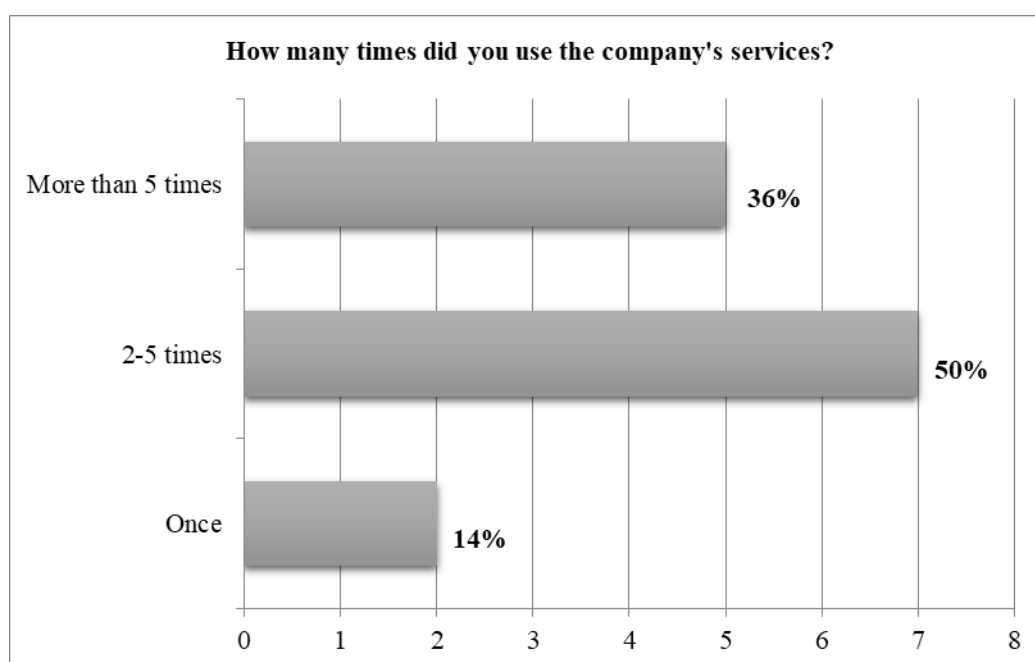
Figure 2. Percentage representation of the frequency of usage of the company's services respondents

4
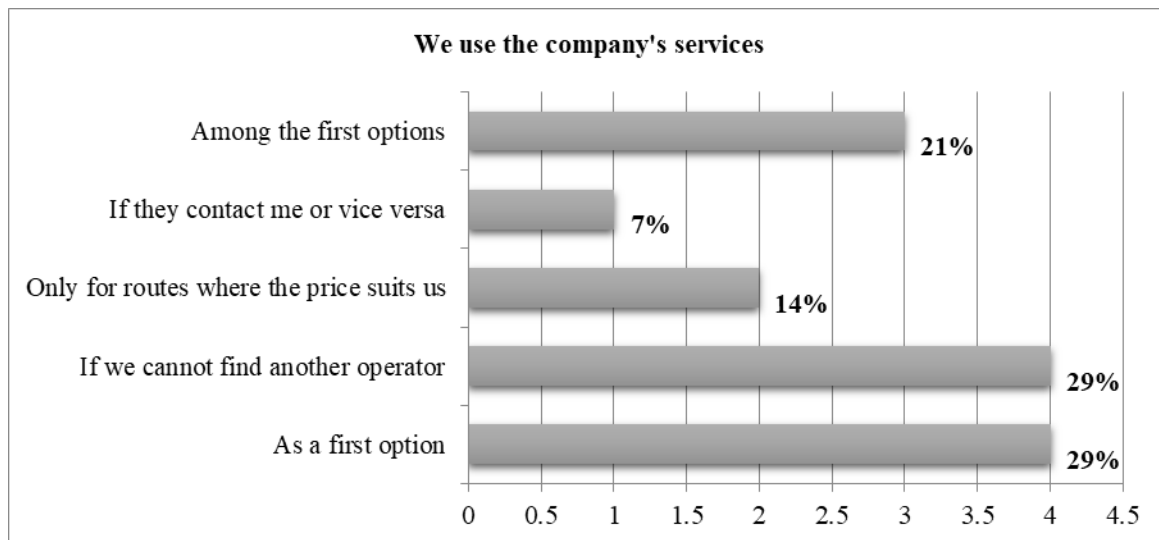
Figure 3. Percentage representation of when respondents use TC company services

Figure 4. Location of service users

The online application "Google forms" was used when surveying the users of TC company's transport services. The questionnaire consists of 17 questions that are arranged along five standard dimensions. So, the questionnaire was filled out by 14 users, representing about 30% of the total number of users. The survey was anonymous in order to obtain data as realistically as possible.

3.1 The Values of Weighting Coefficients of Dimensions Obtained by the FUCOM Method

Determining the final weights of the dimensions was carried out using the FUCOM method.
Step 1. The criteria were ranked according to Eq. (2).

C2>C1>C3>C4>C5.
C1-reliability; C2-responsiveness; C3-assurance; C4-empathy; C5-tangibles

Step 2. Pair-wise comparison of ranked criteria from Step 1 is made. The comparison is made in relation to the first-ranked criterion. The comparison and significance of the criteria are presented in Table 1.

Table 1. Significance of criteria

Criteria	C2	C1	C3	C4	C5
Comparison	1	1.05	1.15	1.5	1.6

Based on the obtained significance of the criteria, the comparative significance of the criteria is calculated according to Eq. (3).

$$\varphi_{c2/c1} = \frac{1.05}{1} = 1.05; \quad \varphi_{c1/c3} = \frac{1.15}{1.05} = 1.09; \quad \varphi_{c3/c4} = \frac{1.5}{1.15} = 1.304; \quad \varphi_{c4/c5} = 1.07.$$

Step 3. The final values of the weighting coefficients should satisfy two conditions:
- First condition according to Eq. (4):

$$w_2/w_1 = 1.05; \quad w_1/w_3 = 1.09; \quad w_3/w_4 = 1.304; \quad w_4/w_5 = 1.07.$$

- In addition to this condition, it should be satisfied the mathematical transitivity condition represented by Eq. (5):

$$\frac{w_2}{w_3} = 1.05 * 1.09 = 1.15; \quad \frac{w_1}{w_4} = 1.09 * 1.304 = 1.43; \quad \frac{w_3}{w_5} = 1.304 * 1.07 = 1.39.$$

By applying model (6), we can define the final model.

$$min_x$$
$$\left|\frac{w_2}{w_1} - 1.05\right| \le x; \left|\frac{w_1}{w_3} - 1.09\right| \le x; \left|\frac{w_3}{w_4} - 1.304\right| \le x; \left|\frac{w_4}{w_5} - 1.07\right| \le x;$$
$$\left|\frac{w_2}{w_3} - 1.15\right| \le x; \left|\frac{w_1}{w_4} - 1.43\right| \le x; \left|\frac{w_3}{w_5} - 1.39\right| \le x;$$
$$\sum_{j=1}^{5} w_j = 1 \, ; w_j \ge 0 \forall j$$

We obtain the final values of weighting coefficients for the dimensions of reliability, responsiveness, assurance, empathy and tangibles $(0.232; 0.243; 0.211; 0.162; 0.152)^\tau$ and deviation from complete consistency $X=0.000$. Thus, it can be concluded that the most significant is the dimension of responsiveness with 0.243.

3.2 Response Frequencies

Response frequency is the rate at which a response occurs. As part of filling out the questionnaire, a Likert rating scale was used, where respondents were offered ratings from 1-5 when answering the questions.

Figure 5 shows a graph of user responses for the reliability dimension from both the perception and expectation aspects. It can be seen that from the aspect of expectations, users have high expectations from the service and the prevailing rating is 5, which is completely understandable, and from the aspect of perception, the prevailing ratings are 4 and 5, which indicates that the quality of the service is satisfactory for this dimension.

In Figure 6, it can be seen that for the dimension of responsiveness, the greatest change is in question Q7, which had 12 responses with the highest rating/high expectation in terms of expectations, so from the perspective of perception, that number decreased to 7 responses.

From Figure 7, it can be seen that question Q14 received a negative rating from the perception aspect, while the expectation for that question was high.
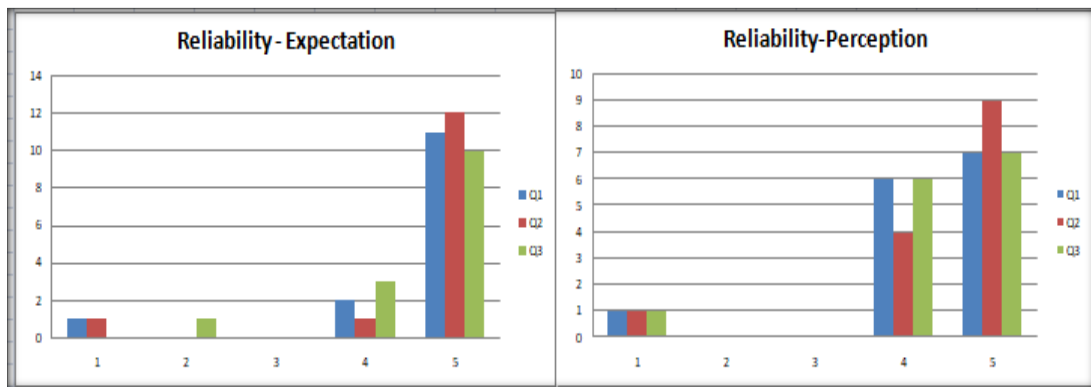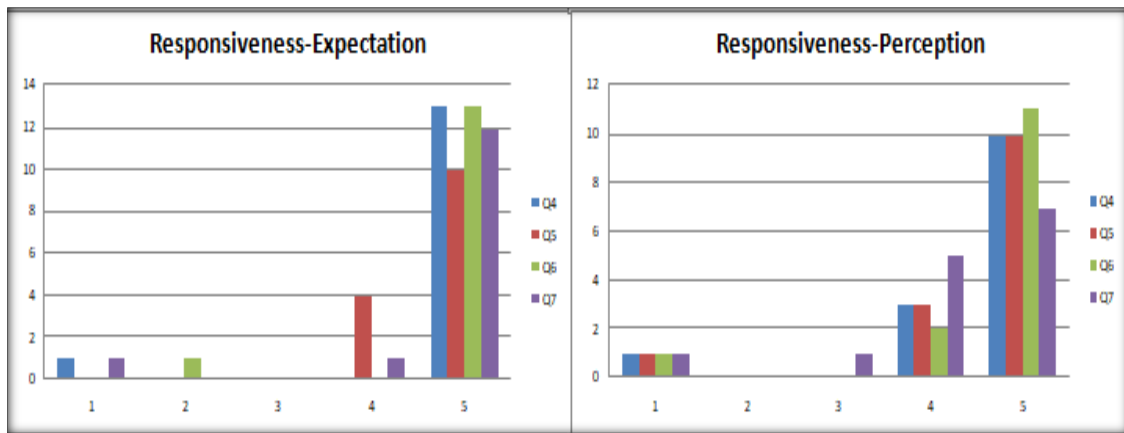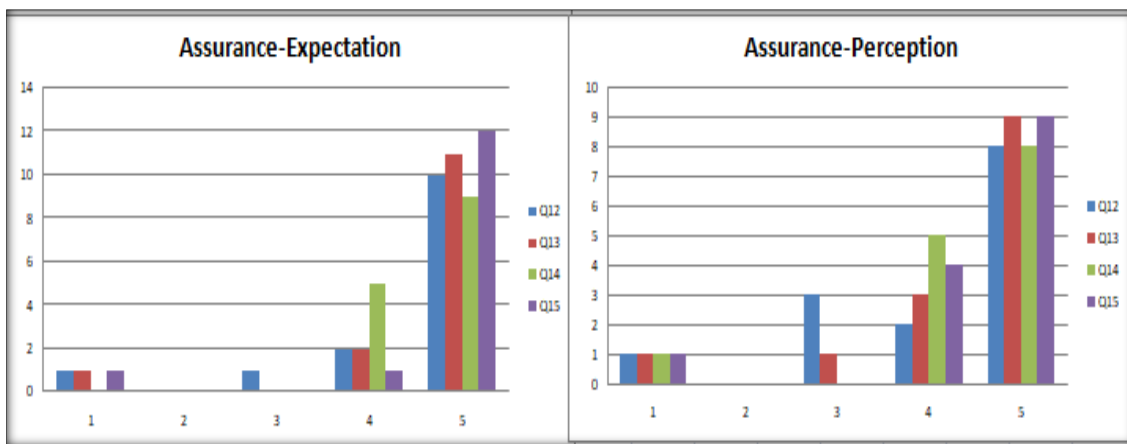

Figure 5. Graphic representation of user responses for the dimension of reliability
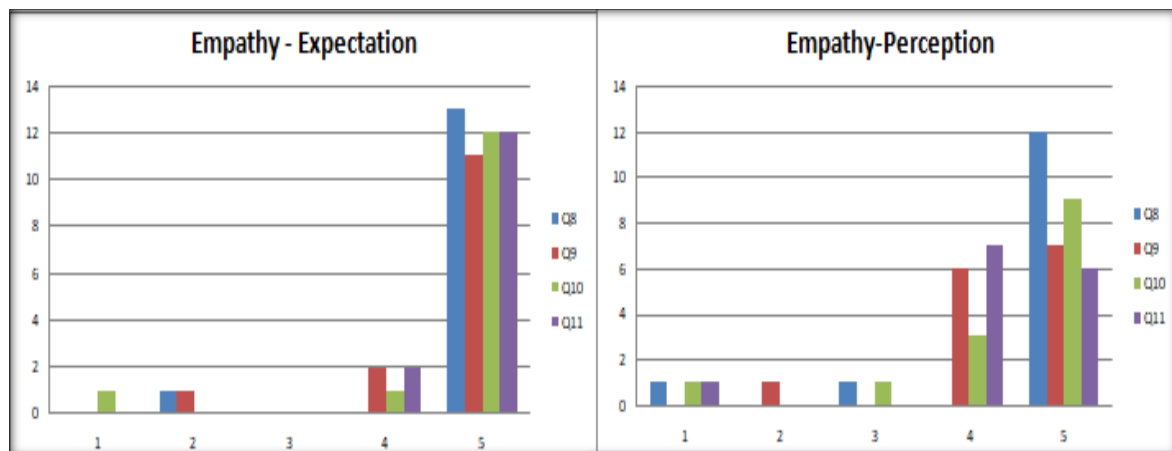
Figure 6. Graphic representation of user responses for the dimension of responsiveness
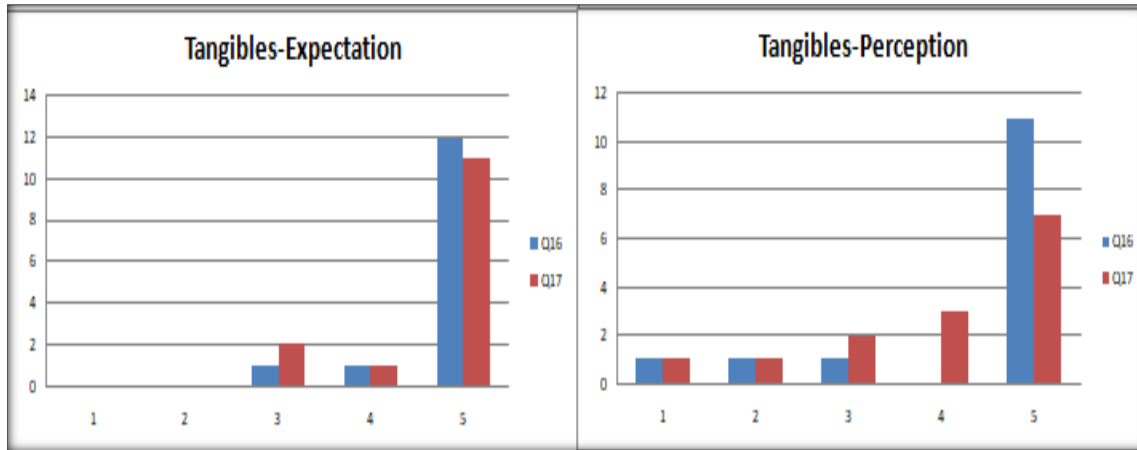

Figure 7. Graphic representation of user responses for the dimension of assurance

Figure 8 shows the responses for the dimension of empathy. It can be seen that question Q11 obtained the greatest difference from the aspect of perception in relation to expectation. We can see that from the aspect of expectations, 12 respondents gave a rating of 5, and from the aspect of perception, 6 respondents gave a rating of 5, 7 respondents gave a rating of 4, while one respondent gave a rating of 1.

In Figure 9, it can be seen that question Q17 caused a certain difference. Thus, we see that there is per one response from the perception aspect rated 1 and 2. So, four users changed their opinion in relation to the high expectations they had.

Figure 8. Graphic representation of user responses for the dimension of empathy

Figure 9. Graphic representation of user responses for the dimension of tangibles

3.3 Results of the Dimensions from the Aspect of User Expectations and Perceptions

Table 2 shows the results of the dimensions with expectations, the calculated average values, standard deviation, values of weighting coefficients and Cronbach's alpha coefficient. In order for the test to be considered reliable, the value of the Cronbach's alpha coefficient should be over 0.7. From the table, it can be seen that based on the average value, users of the service have the highest expectations for the dimension of empathy, where it is 4.732, and the dimension of responsiveness, where it is 4.714. At the same time, the lowest expectations based on the average value of 4.571 belong to the dimension of assurance. The total average standard deviation for all dimensions is approximately 0.843, and the value of the Cronbach's alpha coefficient for all dimensions is 0.875. All values of the Cronbach's alpha coefficient for expectations are extremely high, except for the dimension of tangibles, however, it is also very close to the value of 0.7, which confirms the reliability of the test. The values of the weighting coefficients are the same for user perceptions and expectations, and were obtained using the FUCOM method, for the dimension of reliability is 0.232, responsiveness 0.243, empathy 0.162, assurance 0.211 and tangibles 0.152.

Table 2. Results by dimensions for user expectations

Dimension	AV	ST	Wj	Cronbach's alpha coefficient
Reliability	4.595	0.989	0.232	0.974
Responsiveness	4.714	0.798	0.243	0.914
Empathy	4.732	0.798	0.162	0.919
Assurance	4.571	0.97	0.211	0.897
Tangibles	4.714	0.659	0.152	0.672
SERVQUAL (1)	4.6652	0.8428	1	0.8752

In Table 3, it can be seen that the highest quality perceptions from the service users' perspective are for the dimension of responsiveness4.446, followed by the dimension of empathy 4.375. The dimension of tangibles has the lowest perception and it is 4.179. The total standard deviation for all dimensions is 1.1342. It can be seen that the Cronbach's alpha coefficient is extremely high for perceptions, and its average value is 0.9354.

Table 3. Results by dimensions for user perceptions

Dimension	AV	ST	Wj	Cronbach's alpha coefficient
Reliability	4.333	1.052	0.232	0.945
Responsiveness	4.446	1.077	0.243	0.964
Empathy	4.375	1.037	0.162	0.956
Assurance	4.3214	1.198	0.211	0.873
Tangibles	4.179	1.307	0.152	0.939
SERVQUAL (2)	4.33088	1.1342	1	0.9354

4. Discussion

Table 4 shows the final results obtained by Eq. (1) and expressed by the perception minus expectation algorithm.

Table 4. Final results obtained by applying the SERVQUAL model

	Perception	Expectation	S
Reliability	1.005	1.066	-0.061
Responsiveness	1.08	1.146	-0.065
Empathy	0.709	0.767	-0.058
Assurance	0.91	0.964	-0.053
Tangibles	0.635	0.717	-0.081
Total			-0.064

It is evident from the results that the final values are negative for all dimensions, which ultimately tells us that users are not satisfied with the service provided by TC. Thus, it can be seen that the greatest dissatisfaction was expressed for the dimension of tangibles. Users had the highest expectations for the dimension of responsiveness, and here it can be seen that it is the second by user dissatisfaction, so users experienced a certain disappointment. According to the values, it can also be concluded that the least dissatisfaction is expressed for the dimension of assurance. The total value of the SERVQUAL model is negative and it is -0.0671. Therefore, all dimensions can be improved, especially the dimension of tangibles.

5. Conclusion

It is well-known that quality is the strongest "weapon" in the free and open market. It is pointed out that the market has long been conquered not by low prices but by "high" quality. If the logistics market is conquered by the quality of service, it is an important assumption for the long-term market survival of a company. There is also a well-known statement that says that one can fail in the market even if the quality of the product/service is high enough, but one certainly cannot succeed if the quality is low". Measuring the quality of a logistics service is a very complex process since it is about qualitative quantities whose values cannot be explicitly measured and displayed. Users define and formulate their needs, wishes, demands and expectations in different ways. They are mostly linguistic terms of the type "small", "medium", "large" or "very important", "important", etc. For these reasons, it is very difficult to define a system of criteria for assessing and evaluating absolute values and the relative importance of individual quality attributes. In the literature, there are a large number of models and methods for measuring service quality, however, the best known and most used is the SERVQUAL model, which is defined as a multidimensional research instrument designed to include consumers' expectations and perceptions of service along five dimensions believed to represent service quality.

In the research, the quality of the logistics service was measured in the TC company, which is engaged in international transport. The survey was conducted through an online questionnaire using the Google forms application. About 30% of the users of this company's transport services took part in the survey, i.e. 14 users, including three permanent users. The questionnaire consisted of 17 questions for expectation and 17 questions for perception within the five dimensions: reliability, assurance, empathy, responsiveness and tangibles. At the end of the questionnaire, the users provided the importance of the dimensions expressed in percentage according to their personal opinion, so by them the most important dimension is responsiveness, followed by reliability, assurance, empathy and tangibles. The final weight values of the coefficient were obtained by applying the FUCOM method. Users assessed the responses to the questions using a Likert rating scale, with rates from 1 to 5. For all dimensions, the calculated value of the Cronbach's alpha coefficient is extremely high, which confirms the reliability of the test, i.e. all questions for all five dimensions are justified. After the measurements, it can be concluded that the negative values of the SERVQUAL gaps have been obtained, providing the overall negative value of the SERVQUAL model, which means that the quality of service in the TC company is insufficient, so the users' expectations are not met for all five dimensions. According to the frequencies of responses provided by the respondents who used the company's transport services, it can be seen that only the question for the dimension of empathy, which refers to the company's employees who were ready to provide the user with information how to implement the transport service, question Q9, does not have a negative rating of 1 from the perception aspect, while all other questions, observing all dimensions, have one negative rating each.

Questions Q16 and Q17 have the most negative ratings when observing the response frequencies. The questions refer to the dimension of tangibles. Respondents who use the company's transport services expressed a negative attitude regarding vehicles, the vehicles are equipped for the implementation of transport services and the vehicles are modern, which guarantees the success of the implementation of transport processes. These responses contributed to the final highest dissatisfaction from the aspect of tangibles, which means that the company should work on development and improvement in the future in order to provide satisfaction to users.

Data Availability

The data supporting our research results are included within the article or supplementary material.

Conflicts of Interest

The authors declare no conflict of interest.

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