

# The impact of the level of customer satisfaction on the quality of e-commerce services

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Received 20 February 2019  
Revised 9 May 2019  
5 July 2019  
Accepted 16 July 2019

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## Abstract

**Purpose** – The purpose of this paper is to present the results of surveys conducted in the field of level of e-commerce services quality. The criteria of quality of e-commerce services were identified. On this basis the hierarchy of importance of the adopted criteria for e-commerce service quality were proposed.

**Design/methodology/approach** – The level of customer satisfaction was measured using the Servqual method. In order to compare two groups: the quality of e-commerce services before purchase and the quality of e-commerce services after the purchase, a student's *t*-test was used. To check if the relations between variables are sufficient to carry out the factor analysis (sampling adequacy), the Keizer–Meyer–Olkin test was used. The scope of the research included 23 selected criteria of customers satisfaction.

**Findings** – A comparison of the Servqual weighted and unweighted results shows that customers valued the guarantee/safety dimension the most. It can therefore be expected that customers perceive e-commerce services with increasing trust and consider them increasingly reliable which is also confirmed by the growing tendencies in the forecasts of e-commerce services in Poland.

**Originality/value** – Research allows to know the opinion and expectations related to the quality of services provided in the analysed area and to develop the strategy of company. The most important indicator of the quality of e-commerce services remains reliability (weighting = 0.34). However, the noticeable difference in opinions concerns the tangible elements index compared to the results of the Berry and Parasuraman team and amounted to 0.20.

**Keywords** e-commerce, Service quality, Customer satisfaction, Servqual method

**Paper type** Research paper

## 1. Introduction

The quality of a product or service can be considered as a set of its characteristics, including manufacturing, logistics, marketing and ancillary processes, which results in a satisfaction of customers and takes into account a broad social context. In addition, quality is inextricably linked to the efficiency and effectiveness of the processes implemented in the supply chain, playing a dominant role among the processes associated with the production and the broadly understood customer services (Moschidis *et al.*, 2018).

It is also worth emphasizing that there is a significant difference in the perception of the quality of products and services by the customers, which results from their different character. Services due to their specificity and volatility are considered more difficult to shape and evaluate.



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Companies should undertake the activities aimed at improving the quality of services. The basic activities in this area include:

- identification of the basic determinants of quality;
- supplementing the service delivery process with projects that shape a positive image of the organization;
- educating customers in the range of services offered;
- developing positive features of organizational culture;
- trying to exceed customer requirements; and
- monitoring and measuring the quality of services.

E-commerce is technology characterised by the model of business innovation and quick-scale expansion. It improves the effectiveness of the company's operation and leads to the growth of productivity. However, in practice, it seems that there are some disadvantages concerned with e-commerce technology. Due to the high operations efficiency in e-commerce does not really lead to high profitability. On the other hand, with the large influx of capitals into the e-commerce industry, low returns to inputs in e-commerce have perplexed the investors (Yang *et al.*, 2017).

E-commerce is the future trend of business style. It brings many benefits for both companies and customers (Tseng and You, 2005; Gajewska and Zimon, 2018):

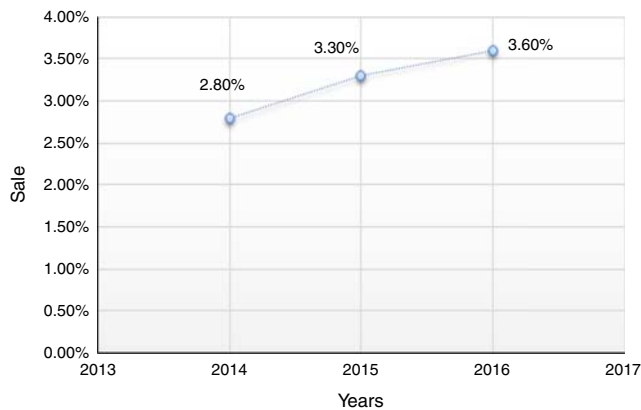
- e-commerce expands the market area from regional to global.
- e-commerce uses electronic techniques instead of traditional paper works, which promotes the industries' efficiency and competitiveness.
- The number of trips is increased. On the other hand, the average load of single trip is reduced, which means it needs higher carriage if using the same means of transportations.
- e-commerce will impact transport system due to the increased trips.
- e-commerce might reduce the number of warehouses and the stock cost. Therefore, the prices could be lowered.

Sector of e-commerce services in Poland is developing more and more dynamically as the result of introduction of multichannel solutions by chain stores and fast development of numerous internet start-ups. However, in terms of the internet sales as a proportion of total retail sales, Poland is still behind the mature European markets. This will change and the differences will gradually decrease. Despite the fact that Poland is a market that remains markedly more attractive in terms of costs will also have an effect on the demand for storage space domestically (Jones Lang LaSall, 2015).

From the viewpoint of companies, the Polish e-commerce market is passing slowly from the incubation phase to the phase of early maturity which is confirmed by both the dynamic growth in sales (Figure 1) and the barriers to entry for new players which are more difficult to overcome (from 2.80 per cent in 2014 of year to 3.60 per cent in 2016 of year). The role of logistics and its great importance in e-commerce can be presented in a number of ways. Any more or less experienced seller would agree that e-commerce is largely about logistics (Kozerska, 2014).

As a result of its development over the past few years, the internet has become a global infrastructure accessible to a huge number of people. The global markets are within the reach of not only strongly prosperous companies but also small businesses and individuals. Furthermore, e-commerce has transformed from a costly and specialized process into an alternative that is easy, realistic and accessible on a mass scale (Morris and Dickinson, 2001).

**Figure 1.**  
Growth in sales  
of e-commerce  
services in general



Source: JLL (2015)

The ease and speed of transactions and, most importantly, reasonable prices, have determined its rapid development. An increase demand for products purchased online involves their delivery within a specified time to the customer (Gajewska, 2009).

Over the last years, the spending on transactions over the Polish internet has been growing at a two-digit pace and, according to the research done by PMR Research, in 2014 it reached 3.9 per cent of the total retail sales domestically. These are largely purchasing of goods most of which pass through modern storage facilities or distribution centres. Even though this is much lower than a result in more developed countries, which is shown in the map (Figure 1), such high dynamics puts e-commerce amongst the fastest growing sectors of Poland's economy.

The main objective of the following paper is to identify the criteria for the quality assessment of the e-commerce services and to investigate the critical criteria that affects the success of e-commerce services most strongly. For this purpose, the authors presented the results of the surveys concerning the evaluation of the quality of e-commerce services using the Servqual method.

## 2. Literature review

Logistics plays a very important role in ensuring customer loyalty. The factors related to logistics are experienced by customers after making payments and are often grouped as one of the post-purchase factors. Studies have found that customers generally considered physical delivery as a very important factor (Agatz *et al.*, 2008; Gajewska and Grigoroudis, 2015) and that logistics capability is positively associated with firm performance in the computer and consumer electronics retailing industry (Cho *et al.*, 2008) and container shipping services (Yang *et al.*, 2017; Yu *et al.*, 2016).

Much has been written about the "last mile" of internet supply chains (Esper *et al.*, 2003; Kull *et al.*, 2007; Lee and Whang, 2001). Failure of many dot com companies is generally attributed to their inability to fulfil their online promises due to inadequate logistics support (Rutner *et al.*, 2003). Significant sources of customer dissatisfaction arise either due to late arrival (or non-arrival) of the product, accuracy of the order and/or due to damaged products.

The relationship between logistics performance and customer loyalty is much closer in e-commerce business than in any other industries (Ramanathan, 2010). E-commerce orders are always small but the shipment of these orders is rather complex, so the scope of requirements for the role of logistics is much larger, and the logistics service is directly

provided to the final customer who always has high expectation on the logistics service level (Lee and Whang, 2001). Choshin and Ghaffari (2017) in their study proposed model which indicates that the variables of infrastructure, cost, customer satisfaction and individuals' awareness have a direct impact of the success of e-commerce.

The companies have to earn for the group of loyal customers through research, measurement and determination of the optimal state of quality features of the services provided (Singh, 2015; Reicher and Szeghegyi, 2015). However, it should be remembered that the quality assessment in each phase of the service has its own specificity (Sohn *et al.*, 2017). In the process of preparing the service, it should be monitored and implemented by competent staff (Youn *et al.*, 2013). When using the product or when providing the service and using its results, the customer is the assessor. However, they are not professionally prepared for this, they are guided by emotions and their evaluation is largely subjective. It is therefore necessary to use instruments and tools that will enable us to examine and understand the client's needs. The information obtained become the basis for the implementation of an optimal logistic strategy by companies and supply chains (Fernandes *et al.*, 2018).

Another important factor that may affect the success of e-commerce services is the quality. The quality of logistic services is now perceived as one of the most important components of the competitive struggle between companies. It is an indicator of the attractiveness of the proposed offer and a factor that undoubtedly distinguishes the offered products from the competition (Hu and Zhao, 2018). This view is supported by Van Der Vorst *et al.* (2009), who emphasize that the quality of products and logistic services plays a key role in the modern economy and the proper implementation of logistics processes in the supply chain depends largely on the satisfaction of customers (Van Der Vorst *et al.*, 2009; Schniederjans, 2018; Stopka *et al.*, 2016). We should also agree with Anderson *et al.* (1998), who recognize that the quality of logistic service should be constantly monitored, measured and recognized as an important part of the organization's improvement and development cycle (Anderson *et al.*, 1998). Admittedly, the achievement of an optimal level of quality of logistic services is not a clear guarantee that a given company will achieve full customer satisfaction, but it certainly cannot be omitted in the development of an organization's development strategy (Kafel and Sikora, 2014; Fabbe-Costes *et al.*, 2008). Huiskonen and Pirttilä (1998) argue that improving logistic customer service is a prerequisite to win his loyalty. A loyal customer:

- provides a long-lasting revenue stream;
- usually buys more than new customers;
- it allows one to save on the costs of acquiring new customers; and
- more willingly accept price increases.

Satisfaction is the state felt by a person whose requirements have been met (Islam *et al.*, 2011). Despite the differences in the approach to defining customer satisfaction that we can find in the literature, the most popular of them is based on the customer expectations. As mentioned by Gerson (1993), Hill (1996), Oliver (1997) and Vavra (1997), satisfaction is a standard of how the offered "total" product or service fulfils the customer expectations (Gerson, 1993; Hill, 1996; Oliver, 1997; Vavra, 1997). Customer satisfaction can be defined as a state in which his expectations match his perception of the actual service received. (Islam *et al.*, 2011; Radziszewska, 2013). Customer satisfaction measurement is one of the most important issues concerning business organizations, which is justified by the customer-orientation philosophy and the main principles of continuous improvement of modern enterprises (Grigoroudis and Siskos, 2010).

Effectiveness of a company depends largely on the proper identification of the customer as well as his understanding of the expectations and impact on the market.

(Domingues *et al.*, 2015; Zimon, 2017a, b). Consumer behaviour in the market depends on many factors and relatively complicated processes. Effective functioning of companies and whole of the supply chains requires a detailed knowledge about buyers and recipients, gathering information about their behaviour in order to match the right offers to the individual needs (Fynes *et al.*, 2005; Niraj *et al.*, 2001). According to these regularities, customer satisfaction should be measured and translated into a number of measurable parameters. In the recent decades, the importance of customer satisfaction for business organization has been increased (Gerson, 1993). Customer satisfaction is measured by Servqual Model, Expectancy–Disconfirmation Model, Performance Only Model (Servperf), Attribute Importance Model, Attribution Model, Affective Model, Multiple Process Model, Equity Model, European Customer Satisfaction Index and Customer Loyalty Model. Among all these models, the Servqual model is still the most robust one to measure the customer satisfaction in many organizations (Manusamy and OiFong, 2008). The Servqual method is based on measuring the differences between the level of meeting the expectations and the perception of the services by a customer (Wolniak and Skotnicka-Zasadzien, 2012). The starting point for the method development is the assumption that quality assessment of the quality of services performed by customers results from the discrepancy between its expectations and satisfaction with the services provided (Parasuraman *et al.*, 1988). This is due to the fact that the quality experienced during the consumption of the service in a subconscious manner is compared to the expected quality, resulting in a quality conscious (Franceschini and Rafele, 2000). Therefore, the essence of the Servqual method is to minimize the discrepancy between the requirements set by the customer and the actual level of service quality provided by companies (Babakus and Boller, 1992). Thus, the Servqual method can be successfully used to evaluate and analyse the quality of any service, including logistics services (Baki *et al.*, 2009; Chou *et al.*, 2011).

It is worth to mention that the customers are as important for the companies as the quality of their products, which is the key for ensuring the effectiveness of the company (Hsu *et al.*, 2010, Kot, 2018; Forslund, 2007). As Dellana and Kros (2014) rightly noted, the quality of services perceived by clients is shaped during three processes: production, experience and quality assessment. Creating optimal quality services does not stop at the production stage and does not focus only concern on the resources of service provider. It is necessary to interact with customers to develop high-quality services. A similar view is expressed by Sampaio *et al.* (2011) who emphasize that the market is currently transformed under economic, social, political and technological pressure. As a result, there are changes in the value system of customers who focus on personalized service, partnership, speed and reliability of service. The issue of a quality of services is particularly important in logistics, where it deals with the correct and effective implementation of the processes related to delivering products to the customers on the right place at the right time, in optimal condition and at the lowest possible cost of the project (Sroufe and Curkovic, 2008; Dellana and Kros, 2018, Zimon, 2016). Even a product with excellent features and characteristics will not fully satisfy the customer if the logistic processes related to its displacement in the supply chain fail. Due to this fact, companies should carry out a thorough assessment of the quality of logistic processes and implement a number of improvement measures that will enable customer satisfaction and loyalty (Zimon, 2017a, b; Madzik, 2018). This is particularly important for the implementation of the new services sector, which can provide immunity on the market. One of them is the e-commerce sector.

Many studies show that customers consider the logistics performance as an important factor of E-commerce, especially the last mile distribution (Agatz *et al.*, 2008; Esper *et al.*, 2003; Lorenc *et al.*, 2016). Company's logistics capacity has significant and positive effects on logistics performance in E-commerce market (Cho *et al.*, 2008).

The modern logistics become the most important means to improve the efficiency of material flow, reducing distribution costs in various industries; at the same time, the recent development of e-commerce contributes to the expansion of the logistics market, promoting the development of technologies related to logistics. Large numbers of practices are carried out in the e-commerce logistics (Bask *et al.*, 2012; Masmoudi *et al.*, 2014; Ramanathan *et al.*, 2014).

Forecasts done by PMR research anticipated an increase in spending on internet transactions until it reaches 10 per cent of retail sales in 2020. Hence, both logistic operators already functioning in the e-commerce market and the ones who will enter it should take steps to meet the increasing customer demands to provide high-quality services (Jones Lang LaSall, 2015).

### 3. Materials and methodology

#### 3.1 The data

The assumption made in the study claimed that customer satisfaction is a major factor influencing the quality of e-commerce services. The primary purpose of this study is to determine and specify one of the most important factors which significantly influences the success of e-commerce.

In this research, for measuring the factors of e-commerce services development, a questionnaire was used as the main data collection tool. The questionnaire included the questions related to the expectations of the customers and their perception of e-commerce services in the scope of 23 aspects. The questionnaire was based on a five-point Likert-type scale, which allows to assign weights from 1 to 5 to each of the criteria, where 1 = completely disagree, 3 = neither agree nor disagree and 5 = completely agree. The greater the difference between the expectations and the perception of the service, the greater the dissatisfaction of the customer.

The primary data used for the following study have been collected through the survey method by using the structured questionnaire, which contained two sections; Section 1 included the original 23 questions or statements related to the quality dimensions in the sector of the e-commerce services based on similar scientific papers. Section 2 contained the questions related to socio-demographic profiles of respondents.

The evaluation criteria adopted for the analysis were grouped in five dimensions of quality, as follows: reactivity, guarantee/safety, empathy, reliability and tangible elements. It was assumed that the reactivity constituted four criteria, such as:

- information transmission regarding timeliness of the service;
- efficient and fast customer service;
- quick response to customer's question and needs; and
- readability of information.

In turn, the elements of the guarantee/safety dimensions were four criteria, such as:

- competent staff;
- transaction security;
- professional help; and
- trust and credibility of staff.

Quality of the empathy dimension included three criteria, such as:

- individual treatment of customer;
- thoughtful staff; and
- helpful staff.

The quality of reliability constituted the following seven criteria:

- respond time to complaint;
- information about delays;
- appropriate expertise; and
- timeliness of delivery.

The last quality dimension are tangible elements. It included five criteria:

- intelligibility and readability of webpage;
- visual appealing of leaflets and promotional materials;
- responsible company promotion;
- quality/price ratio; and
- responding to the request.

Table AI presents a detailed summary of each criterion and codes assigned to the needs of the analysis.

The research sample was selected from the group of young people who were students or had a university degree and used the internet every day. The questionnaire was carried out electronically. Finally, 100 out of 210 sent questionnaires were accepted for the further research after rejecting those incorrectly completed.

The survey was conducted from January to February 2017, and participation in it was voluntary. The addressees of the questionnaires were customers of e-commerce services in Poland aged between 21 and 25 years. The sample size was 100 including males and females. In terms of gender, the distribution of the sample was 57 per cent for the female and 43 per cent for the male respondents (Gajewska and Zimon, 2018). The demographic characteristics of the survey participants are shown in Table I.

### 3.2 *Theoretical framework*

Along with the above-mentioned purpose, the following are the main objectives of the study:

- proposal for key criteria to evaluate e-commerce service quality;
- assessment of the level of customer satisfaction with the e-commerce; and
- conclusion on the level of quality of e-commerce services.

The level of customer satisfaction with the quality of the service they purchase was measured using the Servqual method which examines the areas of divergence between the actual perception of the quality of the service purchased by the customer (acquired quality) and the customer's expectations (expected service quality) in each of the five service dimensions which are (Gajewska and Grigoroudis, 2015): reactivity, guarantee, empathy, reliability and tangible elements. The characteristics of the quality dimensions are presented in Table II.

Based on the aforementioned context, the difference between what the customers want and what they get plays a key role in understanding their behaviour and identifying quality improvements. This is the basis for the "service gaps" theory, which studies the differences between customer expectations and experience. As noted by Hill (1996), the overall gap that results in a dissatisfied customer is caused by one (or more) of the following gaps (Figure 2):

- (1) promotional gap;
- (2) understanding gap;

Characteristics of e-commerce service customers	Frequency/Percentage
<i>Gender</i>	
Female	57
Male	43
Total	100
<i>Age</i>	
Under 20	9
21–25	62
25–30	4
35–40	8
Over 40	17
Total	100
<i>Place of residence</i>	
City below 50,000 residents	17
City with 50 up to 200,000 residents	10
City with over 200,000 residents	20
Village	53
Total	100
<i>Education</i>	
Vocational	2
Secondary	43
Bachelor's degree/engineering	27
Higher	24
Other	4
Total	100

**Table I.**  
The demographic characteristics of the sample

Quality dimensions	Description
Reactivity	The willingness to help customers and provide prompt service
Guarantee/Safety	The knowledge and courtesy of employees and their ability to convey trust and confidence
Empathy	The caring, individualized attention provided to customers
Reliability	The ability to perform the promised service dependably and accurately
Tangible elements	The appearance of physical facilities, equipment, personnel and communication materials

**Source:** Berry and Parasuraman (1994)

**Table II.**  
Description of quality dimension

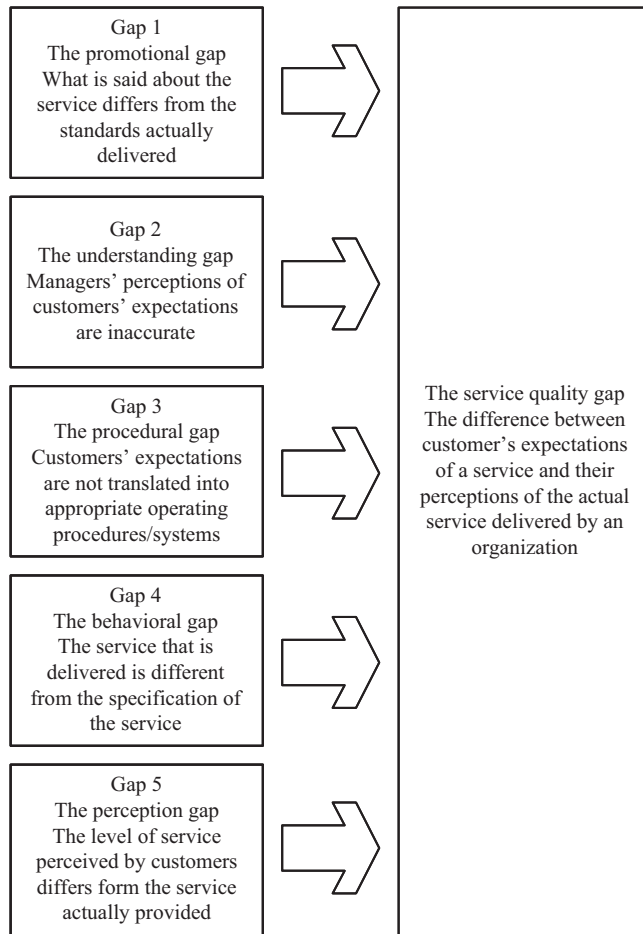
- (3) procedural gap;
- (4) behavioural gap; and
- (5) perception gap.

The “service gaps” theory is the core concept of the SERVQUAL model, applied in this study (see chapter 4).

The questionnaire scenario with the following elements was used as the measurement tool:

- a total of 23 evaluation criteria within the five quality dimensions (Table A1);
- list of 23 evaluation statements through identification of the degree to which the customer senses each of the expectations and the degree to which the customer considers these expectations satisfied; and
- question on the evaluation of the quality dimension weights.





Source: Hill (1996)

Figure 2.  
Service gaps

The respondents were asked to rate all 23 statements each on expectation and as well as evaluation (perception). A brief description of these statements can be seen in Table III.

The obtained results of the survey were subjected to a statistical analysis. In order to compare two groups: the quality of e-commerce services before purchase and the quality of e-commerce services after the purchase, a student's *t*-test was used. In order to determine the relationship between 23 indirect questions contained in the questionnaire, a two-dimensional correlation analysis was applied first, followed by a factor analysis. Factor analysis enabled better identification of interrelations between variables in the analysed case. To check if the relations between variables are sufficient to carry out the factor analysis (sampling adequacy), the Keizer–Meyer–Olkin (KMO) test was used.

#### 4. Assessment of customer satisfaction with the quality of e-commerce – research results and discussion

Customer satisfaction measurement is one of the most important issues concerning business organizations of all types, which is justified by the customer-orientation

Dimensions	Variable No.	Attributes	Mean expectation	Mean evaluation	Gap score
Reactivity	1	Information transmission regarding to timeliness of the service	3.880	3.540	0.340
	2	Efficient and fast customer service			
	3	Quick response to customer's questions and needs			
	4	Readability of information			
Guarantee/ Safety	5	Competent staff	3.860	3.550	0.310
	6	Transaction security			
	7	Professional help			
	8	Trust and credibility of staff			
Empathy	9	Individual treatment of client	3.710	3.320	0.390
	10	Thoughtful staff			
	11	Helpful staff			
Reliability	12	Respond time to complaint	4.110	3.650	0.460
	13	Customer service without reservation			
	14	Information about delays			
	15	Appropriate expertise			
	16	Timeliness of delivery			
	17	Compatibility of services with the offer			
	18	Easy access to the service			
Tangible elements	19	Intelligibility and readability of webpage	3.770	3.470	0.300
	20	Visual appealing of leaflets and promotional material			
	21	Responsible company promotion			
	22	Quality/price ratio			
	23	Respond time to the request			

**Table III.**  
Servqual results

philosophy and the main principles of continuous improvement of modern enterprises (Grigoroudis and Siskos, 2010).

Table III presents the average values of the evaluations of importance made by respondents concerning the analysed criteria, within the five dimensions of e-commerce service quality, before and after the purchase, and so-called quality gap.

The results of the unweighted evaluations take account of the difference between customers' expectations and their evaluations relating to e-commerce service quality which is relatively low. According to the respondents' opinions, reliability is the most important factor in the assessment of the quality of e-commerce services (weighted Servqual results = 0.156). In turn, the perception gap and case confidence equals only 0.460. The key characteristics are the ones with highest scores. It is to be noted that the analysis of the results demonstrated the absence of so-called quality gaps.

An analysis of the unweighted results for each of the quality dimensions demonstrates that e-commerce businesses are working to meet the ever-increasing expectations of customers in each of the five quality dimensions. The analysis demonstrated the greatest difference between the expectations and actual evaluations concerning e-commerce service quality in the case of the reliability of delivery. This finding is possible to see also in Table IV which shows results of paired *t*-test regarding to our before/after point of view.

The *p*-value which is displayed in last column shows that the reliability is the most important dimension to which service providers should attach the greatest importance.

Amongst the statements on this dimension, the lowest notes were scored by the ones concerning the flow of information on delays and changes in delivery; respondents were of a slightly better opinion of the timeliness of delivery, and the most favourable opinions were gained by the correspondence between the service and the offer. The foregoing justifies the unweighted index which was 0.46 in this dimension. The best opinions were scored by the guarantee and safety of the transaction and the tangible elements (service promotion) – 0.31 and 0.30 respectively. In turn, the Servqual weighted index, that is one that takes account of the importance of the particular dimensions of service quality for the respondents, was 0.075.

From the interpretative point of view, it may be interesting to examine the relationship among 23 Servqual questions. At first a bivariate correlation analysis was implemented that has shown a relatively strong interconnection between all questions. Since such an output is relatively difficult to interpret, factor analysis was chosen as the second and (in this case) more appropriate method of interrelationship examination. This is a confirmatory factor analysis, because individual questions were derived from the five Servqual attributes. KMO measurement of sampling adequacy reached 0.784, meaning that linkages between variables are sufficient for factor analysis. The principal component matrix procedure was used and the results are in Table V. Codes of variables (rather than full question quotas) are used in this table – “Rea” = reactivity, “Gua” = Guarantee, “Emp” = Empathy, “Rel” = reliability and “Tan” = tangibility. Explanation of these codes is present in Table AI.

The results show that the linkages between the variables are intense and the five Servqual attributes are mutually interconnected. Although the principal component matrix isolated (relatively successfully) Factor 4 (all empathy variables) and Factor 3 (most tangible variables), other factors are relatively heterogeneous. Factor 1 and also Factor 2 are, for example, tightly linked to the reliability and reactivity. Two groups of variables (reactivity and reliability) have a common element: the time requirements for service. The affinity of the variables is shown in Figure 3.

This chart does not allow to display five dimensions (for five factors), but it is obvious that the relationships between the Servqual elements are relatively strong.

After the weights in the opinions of customer were introduced, the conclusion is that the weighed results were close to 0 thus demonstrating a correspondence between the quality of the service purchased with the customers’ expectations. Such favourable weighed results confirmed the higher evaluations of the quality perceived by respondents in the I, III, IV and V service quality dimensions.

A comparison of the weighted and unweighted Servqual results demonstrated that customers ranked the guarantee/safety dimension the highest. It can therefore be expected that customers have increasing confidence and consider e-commerce services to be

Pair	Mean	SD	CIL <sub>diff</sub>	CIU <sub>diff</sub>	Sig.
Reactivity (before/after)	0.339	0.915	1.111	0.569	0.004
Guarantee (before/after)	0.305	0.866	0.882	0.521	0.007
Empathy (before/after)	0.386	1.125	0.105	0.666	0.008
Reliability (before/after)	0.453	0.783	0.257	0.649	0.000
Tangibility (before/after)	0.297	0.751	0.109	0.484	0.002

**Notes:** CIL<sub>diff</sub>/CIU<sub>diff</sub> = 95% Confidence Interval Lower/Upper of the Difference; Sig. = Statistical significance (or “p-value)

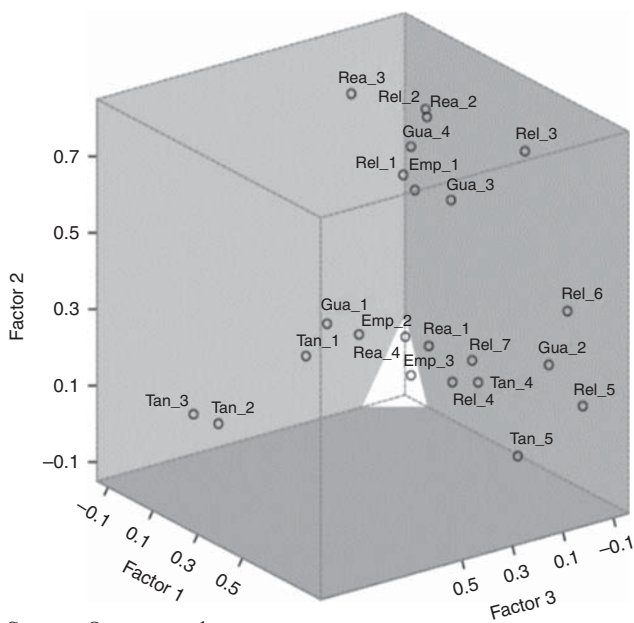
**Table IV.**  
Results of paired t-test

**Source:** Own research

**Table V.**  
Rotated component matrix

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Gua_2	0.761	0.256			
Rel_5	0.747			0.427	
Tan_5	0.712			0.373	
Rel_6	0.677	0.343			0.321
Rel_4	0.614	0.211	0.329		
Rea_4	0.587	0.352	0.493		
Rel_7	0.569	0.232	0.211		
Rea_1	0.566	0.300	0.380		
Rea_3		0.792	0.266		0.203
Rel_2		0.747			0.443
Rea_2	0.235	0.745			
Rel_3	0.442	0.681			0.228
Gua_4		0.655		0.232	
Rel_1	0.216	0.601			0.333
Gua_3	0.296	0.538		0.411	
Tan_3			0.890		
Tan_2			0.821	0.249	
Tan_1	0.294	0.235	0.625	0.283	0.264
Emp_3	0.241			0.752	0.301
Emp_2		0.202	0.321	0.739	
Emp_1		0.482		0.712	
Tan_4	0.235				0.816
Gua_1		0.213	0.372	0.367	0.651

Source: Own research



Source: Own research

**Figure 3.**  
Scatter plot of Servqual variables after factor analysis

increasingly reliable which is also confirmed by the growing tendencies in forecasts of e-commerce services in Poland.

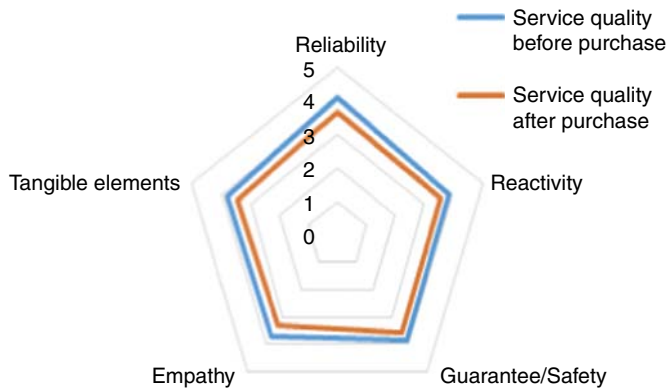
After grouping the detailed quality criteria in the five Servqual quality criteria, the arithmetic average was calculated. It enables a presentation of the profile of expectations of purchasers of e-commerce services and the profile of the quality of service provided by e-commerce businesses (Figure 4).

The profiles of e-commerce service quality indicate a high degree of adaptation of the services which are provided for the ever-increasing expectations of customers. This can be demonstrated by an easy access to the service and correspondence between the service and its offer.

As a next step, the respondents who purchased e-commerce services allocated weights to each of the quality dimensions. A comparison of the weights of service quality dimensions developed by the Berry and Parasuraman (1994) team and the surveyed group of customers using e-commerce services is being presented in Table VI (Berry and Parasuraman, 1994).

The above weight figures confirm the correctness of the tendency to value the research areas in the questionnaire in which customers had lower expectations as regards the less important evaluation criteria. At the same time, a difference is noticeable in the perception of the weights of the particular evaluation areas compared with the standard of weights of the service quality dimensions developed by Berry and Parasuraman (Berry and Parasuraman, 1994). These concern four dimensions such as: reactivity, guarantee/safety, empathy and tangible elements.

Companies and organizations have to attract and retain customers so that they can survive. Electronic commerce (e-commerce) is regarded as an appropriate strategy for



**Figure 4.**  
Quality profiles in  
the e-commerce  
service market

Dimension	Weight of dimension	
	Developed by Berry and Parasuraman	According to the opinions of customers
Reactivity	0.22	0.16
Guarantee/Safety	0.19	0.16
Empathy	0.16	0.14
Reliability	0.32	0.34
Tangible elements	0.11	0.20

**Table VI.**  
A comparison of the  
weights of service  
quality dimensions

marketing, selling and integrating online services which can play a significant role in identifying, obtaining and maintaining customers. However, it should be noted that success in e-commerce depends upon determining effective factors in e-commerce (Choshin and Ghaffari, 2017). In the work, the level of customer satisfaction was analysed as one of the main factors of e-commerce success.

## 5. Conclusions

E-commerce is undoubtedly one of the most important areas of logistics. The high level of its use in recent years and the opportunities to acquire new customers are significant advantages of this service, with relatively small financial outlays. Companies must attract and retain customers so that they can survive. E-commerce is regarded as an appropriate strategy for marketing, selling and integrating online services which can play a significant role in identifying, obtaining and maintaining customers.

The analysis presented in the following paper has demonstrated the greatest difference between the expectations and actual evaluations concerning the quality of e-commerce services taking into account the reliability of delivery. The results confirm the highest expectations and requirements of customers focus on this area. According to the respondents, this is the most important dimension which should be in the light of service providers' attention. After introducing the weights in the customer opinions, the results demonstrated a close relationship between the quality of the service purchased with the customers' expectations. Such favourable weighed results confirmed the higher evaluations of the quality perceived by the respondents in the I (reactivity), III (empathy), IV (reliability) and V (tangible elements) service quality dimensions. A comparison of the Servqual weighted and unweighted results shows that customers valued the guarantee/safety dimension the most. It can therefore be expected that customers perceive e-commerce services with increasing trust and consider them increasingly reliable which is also confirmed by the growing tendencies in the forecasts of e-commerce services in Poland.

The obtained research results can be used by companies to improve their offer, which will allow them to meet the customer requirements in more effective way and optimize costs of services. One of the basic limitations in the work was the age group of respondents taking part in the survey. They were young people between 21 and 25 years old, without higher education. Another limitation was the size of the research sample. The study analysed the results of a group of 100 people. In future, the research sample can be extended to include people of different age groups with different education.

## References

- Agatz, N.A.H., Fleischmann, M. and Van Nunen, J.A.E.E. (2008), "E-fulfillment and multi-channel distribution – a review", *European Journal of Operational Research*, Vol. 187 No. 2, pp. 339-356, doi: 10.1016/j.ejor.2007.04.024.
- Anderson, R.D., Jerman, R.E. and Crum, M.R. (1998), "Quality management influences on logistics performance", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 34 No. 2, pp. 137-148.
- Babakus, E. and Boller, G.W. (1992), "An empirical assessment of the SERVQUAL scale", *Journal of Business Research*, Vol. 24 No. 3, pp. 253-268.
- Baki, B., Sahin Basfirinci, C., Murat, A.R.I. and Cilingir, Z. (2009), "An application of integrating SERVQUAL and Kano's model into QFD for logistics services: a case study from Turkey", *Asia Pacific Journal of Marketing and Logistics*, Vol. 21 No. 1, pp. 106-126.
- Bask, A., Lipponen, M. and Tinnilä, M. (2012), "E-commerce logistics: a literature research review and topics for future research", *International Journal of E-Services and Mobile Applications*, Vol. 4 No. 3, pp. 1-22.

- Berry, L.L. and Parasuraman, A. (1994), "Lessons from a ten year study of service quality in America", *Quality in Service Conference Proceedings*, pp. 153-162.
- Cho, J.J.K., Ozment, J. and Sink, H. (2008), "Logistics capability, logistics outsourcing and firm performance in an e-commerce market", *International Journal of Physical Distribution and Logistics Management*, Vol. 38 No. 5, pp. 336-359, available at: <https://doi.org/10.1108/09600030810882825>
- Choshin, M. and Ghaffari, A. (2017), "An investigation of the impact of effective factors on the success of e-commerce in small- and medium-sized companies", *Computers in Human Behavior*, Vol. 66, pp. 67-74, doi: <https://doi.org/10.1016/j.chb.2016.09.026>.
- Chou, C.C., Liu, L.J., Huang, S.F., Yih, J.M. and Han, T.C. (2011), "An evaluation of airline service quality using the fuzzy weighted SERVQUAL method", *Applied Soft Computing*, Vol. 11 No. 2, pp. 2117-2128.
- Dellana, S. and Kros, J. (2014), "An exploration of quality management practices, perceptions and program maturity in the supply chain", *International Journal of Operations & Production Management*, Vol. 34 No. 6, pp. 786-806.
- Dellana, S. and Kros, J. (2018), "ISO 9001 and supply chain quality in the USA", *International Journal of Productivity and Performance Management*, Vol. 67 No. 2, pp. 297-317, doi: <https://doi.org/10.4018/jesma.2012070101>.
- Domingues, J.P.T., Sampaio, P. and Arezes, P.M. (2015), "Analysis of integrated management systems from various perspectives", *Total Quality Management & Business Excellence*, Vol. 26 Nos 11-12, pp. 1311-1334.
- Esper, T.L., Jensen, T.D., Turnipseed, F.L. and Burton, S. (2003), "The last mile: an examination of effects of online retail delivery strategies on consumers", *Journal of Business Logistics*, Vol. 24 No. 2, pp. 177-203, available at: <https://doi.org/10.1002/j.2158-1592.2003.tb00051.x>
- Fabbe-Costes, N., Jahre, M. and Roussat, C. (2008), "Supply chain integration: the role of logistics service providers", *International Journal of Productivity and Performance Management*, Vol. 58 No. 1, pp. 71-91.
- Fernandes, D.W., Mooiri, R.G. and Filho, V.A.V. (2018), "Logistic service quality as a mediator between logistics capabilities and customer satisfaction", *Revista de Gestão*, Vol. 25 No. 4, pp. 358-372.
- Forslund, H. (2007), "Towards a holistic approach to logistics quality deficiencies", *International Journal of Quality & Reliability Management*, Vol. 24 No. 9, pp. 944-957.
- Franceschini, F. and Rafele, C. (2000), "Quality evaluation in logistic services", *International Journal of Agile Management Systems*, Vol. 2 No. 1, pp. 49-54.
- Fynes, B., Voss, C. and de Búrca, S. (2005), "The impact of supply chain relationship quality on quality performance", *International Journal of Production Economics*, Vol. 96 No. 3, pp. 339-354.
- Gajewska, T. (2009), "Logistics aspects of ecommerce – a theoretical and practical approach", *Log Forum*, Vol. 3 No. 5, pp. 1-7.
- Gajewska, T. and Grigoroudis, E. (2015), "Importance of logistics services attributes influencing customer satisfaction", *Proceedings of 4th IEEE International Conference on Advanced Logistics and Transport*, pp. 53-58, available at: <https://doi.org/10.1109/ICAadLT.2015.7136590>
- Gajewska, T. and Zimon, D. (2018), "Study of the logistics factors that influence the development of e-commerce services in the customer's opinion", *Archives of Transport*, Vol. 45 No. 1, pp. 24-34, available at: <https://doi.org/10.5604/01.3001.0012.0939>
- Gerson, R.F. (1993), *Measuring Customer Satisfaction: A Guide to Managing Quality Service*, Crisp Publications, Menlo Park, CA.
- Grigoroudis, E. and Siskos, Y. (2010), *Customer Satisfaction Evaluation: Methods for Measuring and Implementing Service Quality*, Springer, New York, NY.
- Hill, N. (1996), *Handbook of Customer Satisfaction Measurement*, Gower Publishing, Hampshire.

- Hsu, C.L., Chen, M.C., Chang, K.C. and Chao, C.M. (2010), "Applying loss aversion to investigate service quality in logistics: a moderating effect of service convenience", *International Journal of Operations & Production Management*, Vol. 30 No. 5, pp. 508-525.
- Hu, H. and Zhao, X. (2018), "Building supply chain quality management theory from case study in China", *International Journal of Services Technology and Management*, Vol. 24 Nos 1-3, pp. 4-29.
- Huiskonen, J. and Pirttilä, T. (1998), "Sharpening logistics customer service strategy planning by applying Kano's quality element classification", *International Journal of Production Economics*, Vols 56-57, pp. 253-260.
- Islam, Md. A., Khadem, M.M.R.K. and Alauddin, Md. (2011), "An empirical assessment of the relationship between service quality and customer satisfaction in fashion house", *Proceedings of the 2011 International Conference on Industrial Engineering and Operations Management*, pp. 201-206.
- Jones Lang LaSalle (2015), *Centre for Retail Research*, Blazing a Trail for e-commerce Logistics, PMR.
- Kafel, P. and Sikora, T. (2014), "The level of management maturity in the polish food sector and its relation to financial performance", *Total Quality Management & Business Excellence*, Vol. 25 Nos 5-6, pp. 650-663.
- Kot, S. (2018), "Sustainable supply chain management in small and medium enterprises", *Sustainability*, Vol. 10 No. 4, p. 1143.
- Kozerska, M. (2014), *Obsługa logistyczna obszaru e-commerce. Zeszyty Naukowe. Organizacja i Zarządzanie*, Wydawnictwo Politechniki Śląskiej, Gliwice, pp. 51-60.
- Kull, T.J., Boyer, K. and Calantone, R. (2007), "Last-mile supply chain efficiency: an analysis of learning curves in online ordering", *International Journal of Operations and Production Management*, Vol. 27 No. 4, pp. 409-434, available at: <https://doi.org/10.1108/01443570710736985>
- Lee, H.L. and Whang, S. (2001), "Winning the last mile of e-commerce", *MIT Sloan Management Review*, Vol. 42 No. 4, pp. 54-62.
- Lorenc, A., Michnej, M. and Szkoda, M. (2016), "Information system aiding the logistics processes of loading and securing in railway transport", *International Journal of Shipping and Transport Logistics*, Vol. 8 No. 5, pp. 568-589, available at: <https://doi.org/10.1504/IJSTL.2016.078680>
- Madzik, P. (2018), "Increasing accuracy of the Kano model – a case study", *Total Quality Management & Business Excellence*, Vol. 29 Nos 3-4, pp. 387-409.
- Manusamy, J. and OiFong, V. (2008), "An examination of the relationship between quality characteristics & customer satisfaction in a training organization", *Unitar e-journal*, Vol. 4 No. 2.
- Masmoudi, M., Benaissa, M. and Chabchoub, H. (2014), "Optimization of E-commerce logistics distribution system: problem modelling and exact resolution", *International Journal of Business Performance and Supply Chain Modelling*, No. 6 No. 3, pp. 358-375, available at: <https://doi.org/10.1504/IJBPSM.2014.065275>
- Morris, S. and Dickinson, P. (2001), *Doskonały handel elektroniczny*, Wydawnictwo Rebis, Poznań.
- Moschidis, O., Chatzipetrou, E. and Tsiotras, G. (2018), "Quality costing and quality management maturity in Greece: an exploratory multi-dimensional data analysis", *International Journal of Productivity and Performance Management*, Vol. 67 No. 1, pp. 171-191.
- Niraj, R., Gupta, M. and Narasimhan, C. (2001), "Customer profitability in a supply chain", *Journal of Marketing*, Vol. 65 No. 3, pp. 1-16.
- Oliver, R.L. (1997), *Satisfaction: A Behavioural Perspective on the Customer*, McGraw-Hill, New York, NY.
- Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1988), "Servqual: a multiple-item scale for measuring consumer perc", *Journal of Retailing*, Vol. 64 No. 1, p. 12.
- Radziszewska, A. (2013), "Assessment of customer's satisfaction in e-commerce services", *Polityki Europejskie, Finanse i Marketing*, Vol. 9 No. 58, pp. 383-393.



- Ramanathan, R. (2010), "The moderating roles of risk and efficiency on the relationship between logistics performance and customer loyalty in e-commerce", *Transportation Research Part E*, No. 46 No. 6, pp. 950-962.
- Ramanathan, R., George, J. and Ramanathan, U. (2014), "The role of logistics in E-commerce transactions: an exploratory study of customer feedback and risk", *Supply Chain Strategies, Issues and Models*, Springer, pp. 221-233.
- Reicher, R. and Szeghegyi, Á. (2015), "Factors affecting the selection and implementation of a Customer Relationship Management (CRM) process", *Acta Polytechnica Hungarica*, Vol. 12 No. 4, pp. 183-200.
- Rutner, S.M., Gibson, B.J. and Williams, S.R. (2003), "The impacts of the integrated logistics systems on electronic commerce and enterprise resource planning systems", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 39 No. 2, pp. 83-93.
- Sampaio, P., Saraiva, P. and Guimarães Rodrigues, A. (2011), "The economic impact of quality management systems in Portuguese certified companies: empirical evidence", *International Journal of Quality & Reliability Management*, Vol. 28 No. 9, pp. 929-950.
- Schniederjans, D.G. (2018), "Business process innovation on quality and supply chains", *Business Process Management Journal*, Vol. 24 No. 3, pp. 635-651.
- Singh, H. (2015), "The impact of service satisfaction, relational satisfaction and commitment on customer loyalty in logistics outsourcing relationship", *Journal of Supply Chain Management Systems*, Vol. 4 No. 1, pp. 58-71.
- Sohn, J.I., Woo, S.H. and Kim, T.W. (2017), "Assessment of logistics service quality using the Kano model in a logistics-triadic relationship", *The International Journal of Logistics Management*, Vol. 28 No. 2, pp. 680-698.
- Sroufe, R. and Curkovic, S. (2008), "An examination of ISO 9000: 2000 and supply chain quality assurance", *Journal of Operations Management*, Vol. 26 No. 4, pp. 503-520.
- Stopka, O., Černá, L. and Zitrický, V. (2016), "Methodology for measuring the customer satisfaction with the logistics services", *NAŠE MORE*, Vol. 63 No. 3, pp. 189-194.
- Tseng, Y. and You, W.L. (2005), "The role of transportation in logistics chain", *Proceedings of the Eastern Asia Society for Transportation Studies*, Vol. 5, pp. 1657-1672.
- Van Der Vorst, J.G., Tromp, S.O. and Zee, D.J.V.D. (2009), "Simulation modelling for food supply chain redesign; integrated decision making on product quality, sustainability and logistics", *International Journal of Production Research*, Vol. 47 No. 23, pp. 6611-6631.
- Vavra, T.G. (1997), *Improving Your Measurement of Customer Satisfaction: A Guide to Creating, Conducting, Analysing, and Reporting Customer Satisfaction Measurement Programs*, ASQC Quality Press, Milwaukee, WI.
- Wolniak, R. and Skotnicka-Zasadzien, B. (2012), "The concept study of Servqual method's gap", *Quality & Quantity*, Vol. 46 No. 4, pp. 1239-1247.
- Yang, Z., Shi, Y. and Hong, Y. (2017), "Analysis on pure e-commerce congestion effect, productivity effect and profitability in China", *Socio-Economic Planning Sciences*, Vol. 57, pp. 35-49.
- Youn, S., Yang, M.G.M., Hong, P. and Park, K. (2013), "Strategic supply chain partnership, environmental supply chain management practices, and performance outcomes: an empirical study of Korean firms", *Journal of Cleaner Production*, Vol. 56, pp. 121-130.
- Yu, Y., Wang, X., Zhong, R.Z. and Huang, G.Q. (2016), "E-commerce logistics in supply chain management: practice perspective", *Procedia CIRP*, Vol. 52, pp. 179-185.
- Zimon, D. (2017a), "The impact of TQM philosophy for the improvement of logistics processes in the supply chain", *International Journal for Quality Research*, Vol. 11 No. 1, pp. 3-16.
- Zimon, D. (2017b), "The influence of quality management systems for improvement of logistics supply in Poland", *Oeconomia Copernicana*, Vol. 8 No. 4, pp. 643-655.
- Zimon, G. (2016), "Accounting tools vs. logistics costs control in a trading company", *LogForum*, Vol. 12 No. 2, pp. 155-164.

**Further reading**

Gajewska, T. and Grigoroudis, E. (2018), "Estimating the performance of the logistics services attributes influencing customer satisfaction in the field of refrigeration transport", *International Journal of Shipping and Transport Logistics*, Vol. 9 No. 5, pp. 540-561, available at: <https://doi.org/10.1504/IJSTL.2017.086350>

**Appendix**

Code	Label
Rea_1	Information transmission regarding to timeliness of the service
Rea_2	Efficient and fast customer service
Rea_3	Quick response to customer's questions and needs
Rea_4	Readability of information
Gua_1	Competent staff
Gua_2	Transaction security
Gua_3	Professional help
Gua_4	Trust and credibility of staff
Emp_1	Individual treatment of client
Emp_2	Thoughtful staff
Emp_3	Helpful staff
Rel_1	Respond time to complaint
Rel_2	Customer service without reservation
Rel_3	Information about delays
Rel_4	Appropriate expertise
Rel_5	Timeliness of delivery
Rel_6	Compatibility of services with the offer
Rel_7	Easy access to the service
Tan_1	Intelligibility and readability of webpage
Tan_2	Visual appealing of leaflets and promotional material
Tan_3	Responsible company promotion
Tan_4	Quality/price ratio
Tan_5	Respond time to the request

**Table AI.**  
Codes of Servqual  
variables

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