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# A Statistical Approach to Assess Differences in Perception of Online Shopping

Ilona Pawełszek<sup>a</sup>, Paula Bajdor<sup>a\*</sup>

<sup>a</sup>*Czestochowa University of Technology, Armii Krajowej 19b, 42-201 Czestochowa, Poland*

## Abstract

In recent years, online shopping has become a more accessible way of purchasing. In 2019, more than half Poles (53.9%) made this kind of shopping, and it can be assumed that this percentage will steadily be increasing. The speed, ease of making it, and very often lower prices than in stationery stores undoubtedly influenced this type of shopping. However, as in the case of traditional shopping, also in the case of online shopping, there are many factors determining the perception of the online shopping quality level of services. However, the perception of the quality of service may vary depending on the criterion used. Thus, the purpose of the article is to identify significant differences in the perception of online shopping quality level, depending on online shopping frequency. Research conducted among the people who purchase via the Internet showed that there are many significant differences between the outlined groups. However, based on the tests, it is possible to carry out another isolation based on the same criterion.

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\* Corresponding author. Tel.: +0-000-000-0000 ; fax: +0-000-000-0000 .

*E-mail address:* [author@institute.xxx](mailto:author@institute.xxx)

## 1. Introduction

Knowledge of customer behaviour patterns and motives that guide them when making purchases is of great importance for success in the modern market. Researching consumer behaviour can provide managers with the knowledge they need to develop effective communication methods that motivate people to buy goods and services. Knowledge of behavioural patterns is also useful when creating marketing campaigns [1,2,3].

The first research on customer behaviour was conducted over 60 years ago [4,5]. They focused on identifying customers of stationery stores, analyzing their characteristics and patterns of behaviour [6]. Currently, in the era of the digital economy, most companies use the Internet as a well-established channel for conducting business transactions [7,8]. Thanks to the fact that the buying and selling processes have been moved to the virtual space, they can take place in many ways [9,10].

Enterprises can choose from many trading platforms, and the most popular are e-stores, auction portals, classified websites, price comparison websites, and in recent years also social media [11]. A characteristic feature of these solutions is self-service throughout the entire purchase process, from finding the right offer, choosing the payment and delivery method, to completing the transaction [12].

Companies in the e-commerce market are aware that there are many key factors determining success or failure at every stage of sales. A mere online presence or low price is not enough to attract customers. However, providing high-quality e-services at every stage is crucial. Perceived quality influences satisfaction and satisfaction influences consumer loyalty [13].

Given the large number and variety of factors influencing customer decisions [14,15,16,17], the main purpose of the article is to check whether the frequency of online shopping causes differences in the perception of the quality level of services offered as part of online shopping. Thus, the following research question and hypothesis were adopted:

RQ: Are there significant differences between the frequency of online shopping and the perception of the quality of services offered as part of online shopping?

Hypothesis: There are statistically significant differences between the frequency of online shopping and the perception of the quality of services offered as part of online shopping.

In order to examine the relationship between the variables characterizing the perception of the quality of online shopping in the studied group of respondents, statistical U Mann-Whitney significance tests were conducted.

## 2. Literature review

The electronic market is continuously evolving due to the emergence of new technologies that can support commerce, such as mobile devices, Augmented and Virtual Reality, new payment systems, Machine Learning and Artificial Intelligence, chatbots and voice bots, location-based services. Changes in the e-commerce market may also be caused by the emergence of new market participants, in particular companies offering innovative e-services based on modern technologies and new trading platforms [18,19]. The Web services standards and technologies enable individuals and companies to provide multiple functions and e-business services over the Web to be integrated with internal business processes or with trading partners [20]. Examples of such services integrate payment systems, price comparison websites, and shipment tracking services. Due to the Internet, it is possible to add value to the services based on the current needs and desires of customers as they are manifested in diverse browsing situations [21].

In the e-commerce market, finding products, comparing their features and prices from different sellers is very easy, unlike traditional trade. Geographical barriers do not limit customers, so they can easily find the product they are looking for from another supplier. Therefore, the main distinguishing feature of competitiveness and determinants of success is the quality of e-services. Because of dynamic changes and growing competition in e-commerce, the topic of perceiving the quality of e-services is essential and widely discussed in the literature in various approaches [22,23,24].

E-service quality can be defined as the “extent to which a website facilitates efficient and effective shopping, purchasing, and delivery” [25].

E-commerce quality is quite easy to measure in technical terms such as the validity of HTML code, proper functioning of the navigation elements and scripts, the responsiveness of the website. However, website design is just one element of the complex phenomenon of quality perceived by the customer [26,27].

Eduard et al. (2007) defined perceived quality as a multidimensional construct of Website design, customer service, assurance and order management [13].

Perceived quality is defined as a subjective customer's judgment. High perceived quality means attractiveness of the product or service to the customer [28]. However, attractiveness is a relative concept. It is based on our previous experiences and exists only in contrast to what does not attract attention [29].

A broad framework for assessing customer perceptions of e-commerce quality is the WebQual instrument which builds on three dimensions—website usability, information quality, and service interaction quality—to create a comprehensive view of e-commerce quality [30]. WebQual draws on research from three core areas: (1) information quality from mainstream IS research (2) interaction and service quality from marketing, e-commerce and IS service quality research and (3) usability from human-computer interaction. The WebQual concept inspired the study presented in this article. A set of survey questions was developed for each of the three areas mentioned [31].

Customers vary in their tastes, experience and many other characteristics. Therefore instead of trying to serve all customers equally, an organization may focus on targeting different parts of the total marketplace [32]. It is possible to group customers with similar characteristics, which is known as market segmentation [33]. Most often, segmentation concerns the division of e-commerce customers due to their demographic characteristics and shopping preferences.

The presented article attempts to segment customers due to the perception of the quality of e-commerce websites and the frequency of shopping. In particular, the focus was on identifying differences in quality perception by groups distinguished based on shopping frequency and years of experience with e-commerce platforms.

Currently, e-commerce companies have extensive possibilities of acquiring knowledge about customers. For this purpose, they can use online store databases that contain demographic data (customer's gender, home address, age) and transaction data. From these datasets, can gain knowledge about customer behaviour and preferences to create marketing campaigns and recommendations [34].

In the case of surveys of customer opinion and satisfaction, the survey method works best, where the respondent's task is to assess individual quality parameters of the e-commerce platform and determine the degree of perceived quality. It is also essential to determine which of the quality features are the most important in the opinion of customers. An essential condition for a useful survey is its proper construction and selection of appropriate scales. High-quality tests are needed to assess the reliability of data contained in scientific research.

There are many possibilities of grouping clients according to various features as well as establishing cause-effect relationships between these features. Data analysis uses statistical methods and data mining algorithms. The choice of method depends on the research assumptions and objectives, which can be:

- Identifying customer groups with similar characteristics, behaviours, opinions when the group's forwarding and the number is unknown in advance - clustering methods [35]
- Analysis of the relationship between customer satisfaction and service features - Multiple or linear Regression analysis [36]
- having a customer's satisfaction judgments on a set of service characteristics, estimating whether this customer belongs to one of the prescribed satisfaction classes - Discriminant analysis [37]
- estimate a satisfaction probability distribution, i.e. the probability that a customer belongs to a particular "satisfaction class" - Conditional probability models [38]
- measuring relationships among latent variables - Structural Equation Modeling [39, 40]

The next section presents the research methodology and explains the statistical analysis techniques used to establish the relationship between perceived e-commerce quality and shopping frequency.

### 3. Research methodology

#### 3.1. Structure

The conducted research included the following stages:

1. Research questionnaire development - the final form of the questionnaire took the form of a survey consisting of a total of 12 questions. The nature of the answers to individual questions took the form of a single choice, multiple-choice, and a 5-fold answer choice and 5-step Likert's scale was adopted, which is a bipolar interval scale. The scale used in the study consists of 5 categories of answers ("strongly agree", "agree", "hard to say", "disagree", "strongly disagree"), ordered in the correct order.
2. The research procedure involved surveying randomly selected people. When choosing the study using the representative method, efforts were made to minimize the sample size while maintaining the required certainty and accuracy of further inference. The minimum sample size when estimating the probability of success  $p$  in the general population was calculated based on the sample size formula for a very large population:

$$N_{min} = \frac{N_p (\alpha^2 * f(1-f))}{N_p * e^2 + \alpha^2 * f(1-f)} = 384$$

where:

$N_{min}$  = minimum sample size,

$N_p$  = population size,

$\alpha^2$  = level of significance,

$e^2$  = accepted level of the highest error,

$f$  = the structure index

As the calculations show, the minimum sample size, with an acceptable confidence level of  $1-2 = 0.90$  and the maximum estimation error  $e = 5\%$ , should be 384 questionnaires. Because 400 questionnaires were qualified for the research, this condition has been met, and the sample obtained meets one of the assumptions of the representative method. The primary study was conducted in December 2019 – April 2020, using the CAWI method.

3. After qualifying the received questionnaires, an integrated response database was developed containing all the answers to the issues contained in the surveys, and the process of raw coding data was carried out. We used Excel 2019 to develop the database and encode the raw data. Then we used Statistica 13 software to perform statistical analysis.
4. The survey aimed at online shoppers. Therefore, in the first question, they declared that they would make such purchases. If the answer is no, the study has ended. The final structure of respondents was as follows:

Table 1. Descriptive statistical results

	Classification	Frequency	Per cent	Cum. per cent
Gender	Male	134	34%	34%
	Female	266	67%	100%
Age	18-24	194	49%	49%
	25-34	17	4%	53%
	35-44	129	32%	85%
	45-54	53	13%	98%
	Above 54	7	2%	100%
Online shopping duration	less than one month	2	1%	1%
	less than one year	18	5%	5%
	1-2 years	54	14%	19%
	2-5 years	172	43%	62%
	more than five years	154	39%	100%
Online shopping frequency	Few times a week	8	2%	2%
	Few times a month	90	23%	25%
	At least one a month	143	36%	60%

Only for a special occasion	34	9%	69%
Few times a year	125	31%	100%

There were more female participants (67%) than male ones (34%). Almost half of them are young people, between 18 and 24 years old (49%). The next group, in terms of numbers, were people between 35 and 44 years of age. The largest group included people who make online purchases for more than two years but not more than five years (43%), but the second largest group was respondents who made purchases for more than five years (39%). Only 1% of respondents indicated making purchases for less than one month. In the case of frequencies, the largest group of respondents (36%) were people who make online purchases at least once a month.

Nevertheless, also a large group included respondents who make online purchases a few times a year (31%) and a few times a month (23%). The smallest group were people who indicated shopping for a special occasion only (9%) and a few times a week (2%). Based on these results, it can be concluded that online shopping is no longer new and is now one of the forms of shopping. It is worth mentioning that since March 2020, the beginning of the Covid-19 pandemic, in Poland, the e-commerce industry has been growing rapidly. According to the Mobile Institute study, almost 40% of respondents made quarantine purchases online [41]. There is also a definite increase in interest in launching new online stores because due to government restrictions, online shopping is becoming the primary way of shopping [42].

### 3.2. The Reliability analysis

The reliability analysis is most often associated with the construction of multiple scales, in particular summary scales, i.e. consisting of many individual items (questions). Reliability of the scale - understood as its internal coherence, gives us information about the extent to which a given scale measures what it measures; that is, to what extent individual items of the scale measure what the entire scale [43]. The reliability analysis uses the Alpha-Cronbach coefficient, which measures the ratio of the variance of individual items to the variance of the entire scale (the sum of these items) [43]. Its value is between 0 and 1. The closer it is to 1 – higher is the reliability. Table 2 presents the results of the reliability analysis of the 410 questionnaires.

Table 2. The reliability test results of the total 400 questionnaires.

Variable	Mean	Variance	Std dev	Cronbach's alpha
Online shopping is fast	4,330000	0,694573	0,833410	0,936066
Online shopping is transparent	4,050000	0,660804	0,812899	0,936312
Online shopping offers access to new markets/products not available in a traditional way	4,020000	0,954372	0,976920	0,936633
Online shopping offers many discounts or promotions	3,900000	0,904523	0,951064	0,935848
Shopping sites are highly interactive	3,785000	0,832940	0,912655	0,936830
Each stage of online shopping runs smoothly	3,860000	0,683819	0,826934	0,937434
Online shopping uses the newest IT solutions	3,740000	0,796382	0,892402	0,936664
Using the shopping platform interface does not require learning	3,955000	0,706508	0,840540	0,937401
A transparent pricing policy characterizes online shopping	3,785000	0,923392	0,960933	0,937555
The way of shopping online is appropriate for users	4,110000	0,781809	0,884200	0,936254
Online shopping meets the needs above expectations	3,735000	0,869121	0,932266	0,936615
Online shopping has positive opinions	4,020000	0,793568	0,890824	0,935691
Websites offering online shopping are functioning properly	3,990000	0,602915	0,776476	0,936141
Online shopping makes users feel good	3,780000	1,006633	1,003311	0,938740
Online shopping allows improving the image of the company	3,820000	1,022714	1,011293	0,937007
Online shopping provides all the necessary information	3,905000	0,890427	0,943624	0,936288
Online shopping is available 24/7	4,455000	0,711533	0,843524	0,936474
Online shopping offers a variety of payment options	4,330000	0,694573	0,833410	0,936977
Online shopping offers a variety of delivery options	4,255000	0,743693	0,862377	0,936970
When shopping online, contact with customer service is awkward compared to a traditional store	3,495000	1,226106	1,107296	0,941540
Payment transactions are secure	3,855000	0,647211	0,804494	0,937587
An understandable privacy policy accompanies online shopping	3,715000	0,757563	0,870381	0,936663

Online shopping offers more significant control over the purchase process	3,700000	0,834171	0,913330	0,938559
Online shopping is trustworthy	3,815000	0,643995	0,802493	0,936291
Online shopping ensures anonymity to buyers	3,315000	1,171633	1,082420	0,940288
Online shopping responds to the individual needs of users	4,020000	0,512161	0,715654	0,938104
The purpose of online shopping is to meet the needs and expectations of users	4,130000	0,646332	0,803948	0,937177
The online shopping platform displays additional product recommendations in line with users' preferences	3,980000	0,884020	0,940223	0,937474

For all the variables, the Cronbach’s alpha values are higher than 0,90, which means that the reliability of the scale is highly acceptable.

### 3.3. The U Mann-Whitney test

The U-Mann-Whitney test, for unrelated samples, concerns the study of the convergence of two features (or one for two communities) presented on the ordinal scale. It is used when the data do not meet the assumptions for the application of the Student's t-test, and the goal is to compare two groups independent of each other. The measure of central tendency for this test is not average but median. The limitation in terms of numbers only indicates that the most significant sample should have at least ten records [44].

The Mann-Whitney U test uses the following formula:

$$Z = \frac{U - EU}{\sigma} = \frac{\left( R_{\min(k)} - \frac{n_k(n_k + 1)}{2} \right) - \frac{n_1 n_2}{2}}{\sqrt{\frac{n_1 n_2 (n_1 + n_2 + 1)}{12} - \frac{n_1 n_2 \sum_{i=1}^k (t_i^2 - t_i)}{12 (n_1 + n_2) (n_1 + n_2 - 1)}}$$

where:

$R_{\min}$  - the sum of ranks for the group in which the sum is the lowest,

$n_k$  - number of observations in a group with a smaller sum of ranks,

$n_1$  - the size of the first group,

$n_2$  - the size of the second group,

$t$  - number of observations having the same rank.

## 4. Research results

The U Mann-Whitney test determines whether differences in the assessment of the level of quality of online shopping services are statistically significant between the groups of respondents distinguished by the frequency of online shopping. The respondents who took part in the study were divided into the following groups (table 3).

Table 3. Online shopping frequency.

Online shopping frequency	Group no.
Only for special occasions	1
Few times a year	2
At least once in a month	3
Few times a month	4
Few times a week	5

Test results, together with average scores for specific variables in these selected groups, are presented in tabular form. Due to the large number of factors conditioning the perception of the online shopping quality level, tables present only those that showed statistically significant differences.

In the first step, groups of people who make online purchases for holidays and celebrations, and at least once a month, were compared (table 4).

Table 4. U Mann-Whitney test values and averages scores for groups of people doing online shopping only for a special occasion and at least once a month.

Variable	1/3		Average group ratings	
	Z	p	1	3
Online shopping is fast	-3,05090	0,002282	3,5	4,4
Online shopping is transparent	-2,41491	0,015740	3,5	4,0
Online shopping offers access to new markets/products not available in a traditional way	-3,53183	0,000413	3,4	4,3
Each stage of online shopping runs smoothly	-2,41904	0,015562	3,3	3,9
The way of shopping online is appropriate for users	-2,74497	0,006052	3,6	4,2
Online shopping has positive opinions	-2,20423	0,027509	3,8	4,5
Online shopping is available 24/7	-2,85288	0,004333	3,9	4,6
Online shopping offers a variety of payment options	-3,28924	0,001005	3,7	4,5

Interpreting the results presented in the table 4, it can be stated that people making online shopping at least once a month consider significantly more often that online shopping is fast ( $Z = -3,05090$ ;  $p = 0,002282$ ), is transparent ( $Z = -2,41491$ ;  $p = 0,015740$ ), each stage of online shopping runs smoothly ( $Z = -2,41904$ ;  $p = 0,015562$ ) and are available 24/7 ( $Z = -2,85288$ ;  $p = 0,004333$ ). In addition, people making online shopping at least once a month consider significantly more often that online shopping offers a number of payment options ( $Z = -3,28924$ ;  $p = 0,001005$ ) and offers access to new markets / products not available in a traditional way ( $Z = -3,53183$ ;  $p = 0,000413$ ) than people who make online shopping only for a special occasions. Moreover, people making online shopping at least once a significantly more often indicate that the way of shopping online is appropriate for users ( $Z = -2,74497$ ;  $p = 0,006052$ ) and significantly more often have a positive opinions about online shopping ( $Z = -2,20423$ ;  $p = 0,027509$ ).

In the next stage, groups of people who do online shopping only for special occasions and a few times a month were compared (table 5).

Table 5. U Mann-Whitney test values and averages scores for groups of people doing online shopping only for special occasions and a few times a month.

Variable	1/4		Average group ratings	
	Z	p	1	4
Online shopping is fast	-4,82214	0,000001	3,5	4,8
Online shopping is transparent	-3,70978	0,000207	3,5	4,4
Online shopping offers access to new markets/products not available in a traditional way	-2,86318	0,004194	3,4	4,2
Online shopping offers many discounts or promotions	-2,32885	0,019868	3,5	4,2
Shopping sites are highly interactive	-2,24780	0,024590	3,6	4,1
Each stage of online shopping runs smoothly	-3,00283	0,002675	3,3	4,1
Using the shopping platform interface does not require learning	-2,38277	0,017184	3,5	4,2
A transparent pricing policy characterizes online shopping	-2,10606	0,035200	3,4	4,0
The way of shopping online is appropriate for users	-3,84637	0,000120	3,6	4,5
Online shopping meets the needs above expectations	-2,93297	0,003358	3,2	4,1
Online shopping has positive opinions	-3,20543	0,001349	3,5	4,4
Websites offering online shopping are functioning properly	-2,46386	0,013745	3,7	4,3
Online shopping provides all the necessary information	-2,06164	0,039243	3,4	4,2
Online shopping is available 24/7	-3,99078	0,000066	3,9	4,8
Online shopping offers a variety of payment options	-4,05502	0,000050	3,7	4,7
Online shopping offers a variety of delivery options	-2,76872	0,005628	3,8	4,6
Payment transactions are secure	-2,67165	0,007548	3,6	4,2
The purpose of online shopping is to meet the needs and expectations of users	-2,01270	0,044147	3,8	4,3

Interpreting the results presented in the table 5, it can be stated, above all, that there are many more significantly statistical differences in the assessment of the online shopping quality level between people who make purchases only for a special occasions and people who make these purchases few times a month than in the case of previously compared groups. First of all, people who shop online few times a month are significantly more likely to think that: online shopping online is fast ( $Z = -4,82214$ ,  $p = 0,000001$ ); is transparent ( $Z = -3,70978$ ,  $p = 0,000207$ ), and each



stage of online shopping runs smoothly ( $Z = -3,00283, p = 0,002675$ ). In the opinion of these people, online shopping offers access to new markets / products not available in a traditional way ( $Z = -2,86318, p = 0,004194$ ), offers a number of discounts or promotions ( $Z = -2,32885, p = 0,019868$ ), offers a variety of delivery ( $Z = -2,76872, p = 0,005628$ ) and payment options ( $Z = -4,05502, p = 0,000050$ ) and are available 24/7 ( $Z = -3,99078, p = 0,000066$ ). People who shop online few times a month consider significantly more often that shopping sites are characterized by high interactivity ( $Z = -2,24780, p = 0,024590$ ), function properly ( $Z = -2,46386, p = 0,013745$ ), provide all the necessary information ( $Z = -2,06164, p = 0,039243$ ), do not require learning ( $Z = -2,38277, p = 0,017184$ ). In addition, people who shop online few times a month significantly more often express opinions that online shopping meets their needs above expectations ( $Z = -2,93297, p = 0,003358$ ), payment transactions are secure ( $Z = -2,67165, p = 0,007548$ ), online shopping is characterized by a transparent pricing policy ( $Z = -2,10606, p = 0,035200$ ), and its purpose is to meet the needs and expectations of users ( $Z = -2,01270, p = 0,044147$ ). In the case of both groups, there are also significant differences in opinions regarding online shopping, because people who make these purchases few times a month, significantly more often indicated that the way of shopping online is satisfying for them ( $Z = -3,84637, p = 0,000120$ ) and have positive opinions ( $Z = -3,20543, p = 0,001349$ ) than people who make online shopping only for a special occasions.

Next comparison covered groups of people who do online shopping at least once a month and a group of people making these purchases a few times a month (table 6).

Table 6. U Mann-Whitney test values and averages scores for groups of people doing online shopping a few times a year and at least once a month.

Variable	2/3		Average group ratings	
	Z	p	2	3
Online shopping offers access to new markets/products not available in a traditional way	-3,41555	0,000637	4,1	4,2
Online shopping offers many discounts or promotions	-2,32990	0,019812	3,6	4,0
Shopping sites are highly interactive	-2,21151	0,027002	3,6	3,9
The way of shopping online is appropriate for users	-2,44630	0,014434	3,8	4,2
Online shopping has positive opinions	-2,30706	0,021052	3,9	4,1
Online shopping is available 24/7	-2,17551	0,029593	4,3	4,6
Online shopping offers a variety of payment options	-2,10947	0,034905	4,1	4,5
Online shopping offers a variety of delivery options	-2,17852	0,029368	4,0	4,3
Online shopping offers more significant control over the purchase process	-2,13171	0,033032	3,5	3,8

Based on the above results, it can be stated, first of all, that there are much less statistically significant differences in the assessment of the online shopping quality level between people who make purchases at least once a month and people who make these purchases few times a month than in the case of previously compared groups. First of all, people who shop online few times a month, significantly more often believe that: Online shopping offers access to new markets / products not available in a traditional way ( $Z = -3,41555, p = 0,000637$ ), offers a number of discounts or promotions ( $Z = -2,32990, p = 0,019812$ ), variety of delivery ( $Z = -2,17852, p = 0,029368$ ) and payment options ( $Z = -2,10947, p = 0,034905$ ). In addition, people shopping online few times a month significantly more often indicated that shopping websites are characterized by high interactivity ( $Z = -2,21151, p = 0,027002$ ), are available 24/7 ( $Z = -2,17551, p = 0,029593$ ). They significantly more often indicated that during online shopping, they had more control over the purchase process ( $Z = -2,13171, p = 0,033032$ ) than people doing online shopping once a month. In the case of both these groups, there are also significant differences in opinions regarding online shopping. People who make these purchases few times a month, significantly more often indicated that the way of shopping online is satisfying for them ( $Z = -2,44630, p = 0,014434$ ) and more often have positive opinions about online shopping ( $Z = -2,30706, p = 0,021052$ ) than people who shop online only for special occasions.

In the next step, a comparison included groups of people who make online purchases a few times a year and a group that makes online purchases a few times a month (table 7).

Table 7. U Mann-Whitney test values and averages scores for groups of people doing online shopping a few times a year and a few times a month.

Variable	2/4		Average group ratings	
	Z	p	2	4
Online shopping is fast	-4,31380	0,000016	4,2	4,8
Online shopping is transparent	-3,36151	0,000775	3,9	4,4
Online shopping offers access to new markets/products not available in a traditional way	-2,43076	0,015068	3,7	4,2
Online shopping offers many discounts or promotions	-3,06328	0,002189	3,6	4,2
Shopping sites are highly interactive	-3,49220	0,000479	3,6	4,1
Each stage of online shopping runs smoothly	-2,38409	0,017122	3,7	4,1
Using the shopping platform interface does not require learning	-2,63553	0,008401	3,9	4,2
The way of shopping online is appropriate for users	-4,20581	0,000026	3,8	4,5
Online shopping meets the needs above expectations	-2,83717	0,004552	3,6	4,1
Online shopping has positive opinions	-3,91848	0,000089	3,7	4,4
Websites offering online shopping are functioning properly	-2,41057	0,015928	3,9	4,3
Online shopping makes users feel good	-2,04507	0,040849	3,6	4,0
Online shopping allows improving the image of the company	-2,72581	0,006415	3,6	4,1
Online shopping provides all the necessary information	-1,98471	0,047178	3,9	4,2
Online shopping is available 24/7	-3,52974	0,000416	4,3	4,8
Online shopping offers a variety of payment options	-3,27518	0,001056	4,1	4,7
Online shopping offers a variety of delivery options	-3,52977	0,000416	4,0	4,6
Payment transactions are secure	-2,54863	0,010815	3,8	4,2

Based on the above, it can be stated that there are many more significantly significant statistical differences in the assessment of the online shopping quality level between people who make purchases few times a year and people who make these purchases few times a month than in the case of previously compared groups.

First of all, people who shop online few times a month are significantly more likely to think that: shopping online is fast ( $Z = -4,31380, p = 0,000016$ ); is transparent ( $Z = -3,36151, p = 0,000775$ ), makes users feel better ( $Z = -2,04507, p = 0,040849$ ), and each stage of online shopping runs smoothly ( $Z = -2,38409, p = 0,017122$ ). In the opinion of these people, online shopping offers access to new markets / products not available in a traditional way ( $Z = -2,43076, p = 0,015068$ ), offers a number of discounts or promotions ( $Z = -3,06328, p = 0,002189$ ), variety of delivery ( $Z = -3,52977, p = 0,000416$ ) and payment options ( $Z = -3,27518, p = 0,001056$ ) and are available 24/7 ( $Z = -3,52974, p = 0,000416$ ). People who shop at least few times a month consider significantly more often that shopping sites are characterized by high interactivity ( $Z = -3,49220, p = 0,000479$ ), function properly ( $Z = -2,41057, p = 0,015928$ ), provide all the necessary information ( $Z = -1,98471, p = 0,047178$ ) and do not require learning ( $Z = -2,63553, p = 0,008401$ ). Moreover, people who shop online few times a month significantly more often express opinions that online shopping meets their needs above expectations ( $Z = -2,83717, p = 0,004552$ ), payment transactions are secure ( $Z = -2,54863, p = 0,010815$ ). In the case of both these groups, there are also significant differences in opinions regarding online shopping, because people who make these purchases few times a month significantly more often think that the way they make online purchases is satisfying for them ( $Z = -4,20581, p = 0,000026$ ), have positive opinions ( $Z = -3,91848, p = 0,000089$ ) and online shopping allows to improve the image of the company ( $Z = -2,72581, p = 0,006415$ ) than people who shop online few times a year.

The last stage of the study concerned a comparison between people who make online purchases at least once a month, and people who make online purchases a few times a month (table 8).

Table 8. U Mann-Whitney test values and averages scores for groups of people doing online shopping at least once a month and a few times a month.

Variable	3/4		Average group ratings	
	Z	p	3	4
Online shopping is fast	-3,71363	0,000204	4,4	4,8
Online shopping is transparent	-2,70479	0,006835	4,0	4,4
Shopping sites are highly interactive	-1,99910	0,045598	3,9	4,1
Using the shopping platform interface does not require learning	-1,98876	0,046729	3,9	4,2
The way of shopping online is appropriate for users	-2,06591	0,038838	4,2	4,5

Online shopping meets the needs above expectations	-2,86531	0,004166	3,7	4,1
Online shopping has positive opinions	-2,17781	0,029421	4,1	4,4
Websites offering online shopping are functioning properly	-2,81278	0,004912	3,9	4,3
Online shopping provides all the necessary information	-2,55690	0,010561	3,8	4,2
Payment transactions are secure	-2,39783	0,016493	3,8	4,2

Based on the above, it can be stated, that there are much less statistically significant differences in the assessment of the online shopping quality level between people who make purchases at least once a month and people who make these purchases few times a month than in the case of previously compared groups.

First of all, people who shop online few times a month are significantly more likely to think that: shopping online is fast ( $Z = -3,71363, p = 0,000204$ ); is transparent ( $Z = -2,70479, p = 0,006835$ ). People who shop online few times a month consider significantly more often that shopping sites are characterized by high interactivity ( $Z = -1,99910, p = 0,045598$ ), function properly ( $Z = -2,81278, p = 0,004912$ ), provide all the necessary information ( $Z = -2,55690, p = 0,010561$ ), do not require learning ( $Z = -1,98876, p = 0,046729$ ). In addition, people who make online purchases few times a month significantly more often express opinions that online purchases meet their needs above expectations ( $Z = -2,86531, p = 0,004166$ ) and payment transactions are secure ( $Z = -2,39783, p = 0,016493$ ). In the case of both groups, there are also significant differences in opinions regarding online shopping, because people who make these purchases few times a month significantly more often think that the way they make online purchases is satisfying for them ( $Z = -2,06591, p = 0,038838$ ) and have positive opinions ( $Z = -2,17781, p = 0,029421$ ), than people who shop online at least once a month.

The results of the tests performed indicated differences in the perception of the online shopping quality level depending on the frequency of these purchases. On their basis, it can be concluded that the frequency of online shopping by respondents has an impact on how they perceive individual factors affecting the purchasing process. Thus the obtained research results allow for positive verification of the adopted research hypothesis: *There are statistically significant differences between the frequency of online shopping and the perception of the quality of services offered as part of online shopping.*

The research results may have significant application importance because on their basis, enterprises operating on the Polish online sales market recommendations can formulate. Based on these recommendations, they can introduce changes to the online shopping process to retain existing customers as well as increase the number of potential new customers.

## 5. Conclusions

The paper addressed the problem of perception of the online shopping quality level. Online shopping is an increasingly common form of purchasing products covering a wide range of products. Furthermore, as in the case of traditional purchases, they must offer a certain level of quality, not only attracting but also retaining customers. The main purpose of the article was to verify the adopted research hypothesis assuming that *there are statistically significant differences between the frequency of online shopping and the perception of the quality of services offered as part of online shopping.* The obtained results enabled positive verification of the adopted research hypothesis because depending on the frequency of online shopping, there are significant differences in the perception in the perception of the quality level offered as part of this type of shopping. The most significant differences occurred between groups of people who made online purchases a few times a year, and a few times a month or at least once a month, which made it possible to segment customers again, depending on the frequency of such purchases. Research conducted in this article covered five groups of respondents. However, looking at the number of significant differences between them, it can be assumed that the division into three groups will also work: people shopping few times a year, including people shopping only for special occasions; people making purchases at least once a month and people making purchases few times a month. Based on the above division, the purchasing platform can take specific actions, increasing the level of quality of services offered to each of these groups.

However, this study has several limitations, which determine the further directions of research. First of all, the conducted research was limited only to Polish respondents; thus, it limits its generalizability. Moreover, a further direction of consideration may be conducting similar research on a sample of respondents from other countries, which

will allow conducting a comparative analysis on a larger scale. Also, suggested future works may concentrate on services offered via the Internet – like travel, accommodation or rental services in order to identify the quality level of such and recipients' perception.

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