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Technology acceptance model in e-commerce segment

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Abstract. *Consumer behaviour analysis is a key aspect for the success of e-business. The main objective of the study is to analyse the impact of selected user experience factors on e-commerce web site visiting (technology). The objective of the study is to create a model that will explain the impact of each major factor on the user experience and the re-visit of the e-shop. To explain the use of e-commerce technology, in the second part we have modified the original technology acceptance model (TAM) with other constructs. Specifically, there are modern technologies such as social networks or mobile apps that affect the use of e-shops. The TAM model is one of the most used models of what the system uses to identify the perceived usefulness and perceived simplicity of use from the user' side. For the main advantage of our study, we consider that we have highlighted the importance of the factor of modern technology and therefore of social networks, mobile applications and contextual advertising. This factor, along with the other two factors, has been incorporated into our model and has shown that modern technologies have a direct impact and are therefore directly related to the frequency using the e-commerce websites.*

Keywords: TAM, consumer behavior, e-commerce, user experience.

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Introduction

By 2020, four billion people are expected to be online, suggesting that addressing customers' needs will be more important than ever (IDC, 2015). Marketers needs to continually improve business strategies and models (Ungerman et al., 2018). With the advancement of digital platforms, online shopping environments are evolving as well, and they are able to offer consumers more options in the purchase process, providing them with better services and products (Pappas, 2018). It is important to identify the reasons that customers choose to visit an online store and following their shopping motivations. It ist important to understand how their behavior differs based on their predisposition towards modern online shopping. Many theories and models have been proposed over the years to explain the individuals' usage behavior towards technologies (Momani et al., 2017). This research paper focuses on the technology acceptance model in context of e-commerce

segment. Technology acceptance has become one of the most significant subjects in software engineering field.

Literature review

Lacking the presence of human and social elements is claimed one major weakness that is hindering the growth of e-commerce. Social commerce is a new evolution of e-commerce that combines the commercial and social activities by deploying social technologies into e-commerce sites (Lu et al., 2015). As a relatively new phenomenon, social commerce has evolved quickly in practice (Barnes, 2014; Kim & Park, 2013; Wang & Zhang, 2012). The present study focuses specifically on the verbal format of online product information and examines its impact on selected aspects of the online shopping experiences (Eroglu, Machleit, & Davis, 2003). The central premise is that consumers' perceptual fluency of the verbal information presented online is a key factor that shapes their perceived cognitive effort, positive affect, and, ultimately, their choice outcome judgments in the virtual shopping context (Mosteller, Donthu, & Eroglu, 2014; Reber, Schwarz, & Winkielman, 2004). Online retailers have been implementing various strategies to attract and retain customers. Web personalization has been identified as an important factor in the area of marketing and information systems (Salonen and Karjaluoto, 2016). Consumer behaviour analysis is a key aspect for the success of e-business. However, consumer behaviour towards changes in the Internet market changes as users gain experience (Gefen et al., 2003; Yu et al., 2005; Gavurova et al., 2018). Perceptions that affect their electronic purchase can have different impacts on consumer choice or buyback, because the use of information technology (IT) can change based on perceptions and attitudes (Gefen, 2003). Salovaara (2009) states that when monitoring the UX, we can talk about the perception and responsiveness of the person resulting from the use of the product, system or service. Hassenzahl (2007) describes the user experience as a consequence of the user's internal state (disposition, expectation, motivation, mood), but also the characteristics of the proposed system (complexity, purpose, usability, functionality) and last but not least the context in which the interaction occurs (e. g. social background, organizational background, voluntary use). We can define UX as a user experience that includes all aspects of final-user interaction with the specific e-shop and the services and products it sells (Stefko et al., 2011). Analysing the number of visitors is considered a very important tool in UX measurement. Evaluators can use different metrics that apply to the different areas and features of the software we want to measure. The most commonly measured and tracked are the following: Measure the success of the key tasks – which is the metric that is considered to be the basic usability metric of the software, website or e-capability. If the user is unable to complete the given task, the other application or page properties are irrelevant. This means that the successful completion of a task depends on the type of the task. In primary tasks, their success is expected to be 100%, while in secondary tasks it is a utopia (Sauro, 2011). There are many e-shops on the internet whether in Slovakia or abroad that offer similar and often the same products or services. Therefore, it is also advisable to analyse the competitive environment in order to differ from the competitors and how to engage the customers as much as possible. When analysing the competitors, we focus on the usability, functionality and opportunity analysis (Hawley, 2012). Hawley (2012) also brings out the characteristics of these approaches: usability analysis - its main purpose is to detect the errors made by a competing website. However, here we may

encounter the risk that the errors we find on a competing website will not help solve the problem. Functionality Analysis - This analysis is about features used by competitors on their website, which determine whether these features benefit their website. This is a so-called brainstorming, but we are experiencing the risk that our opinion on the problematic area may be affected and we will accept this solution instead of finding the most effective one. Opportunity analysis - This is a creative approach that looks for a variety of innovations and suggestions for competitors and their e-commerce websites to discover new opportunities for their website.

Methodology and database

The main objective of the study is the realization of a survey that will focus on the specific opinions and preferences of the respondents in relation to the influence of the user experience on e-commerce websites (technology). E-commerce websites want users to achieve their goals after visiting the page and have a positive user experience by using the website. So that they do not feel frustrated when using it during the first time (and later on). These negative feelings can result in a lengthy search for the necessary information or a complicated website orientation. The objective of the study is to create a model that will explain the impact of each major factor on the user experience and the re-visit of the e-shop. To explain the use of e-commerce technology, in the second part we have modified the original TAM model with other constructs. Specifically, modern technologies such as social networks, mobile apps and online advertising have an impact on the use of e-shops. At the same time, we extend the model by factors that significantly affect the perceived usefulness and perceived simplicity of use. Based on the objectives of the analytical part and the definition of the research problems, we formulated six hypotheses. The TAM Model (Figure 1) is one of the most used models of what the system uses to identify the perceived usefulness and perceived simplicity of use. Perceived usefulness expresses the likelihood of a prospective user who assumes that certain applications can increase user performance. The perceived simplicity of use is defined by the degree to which the potential user expects to control the system effortlessly (Davis et al.,1989).

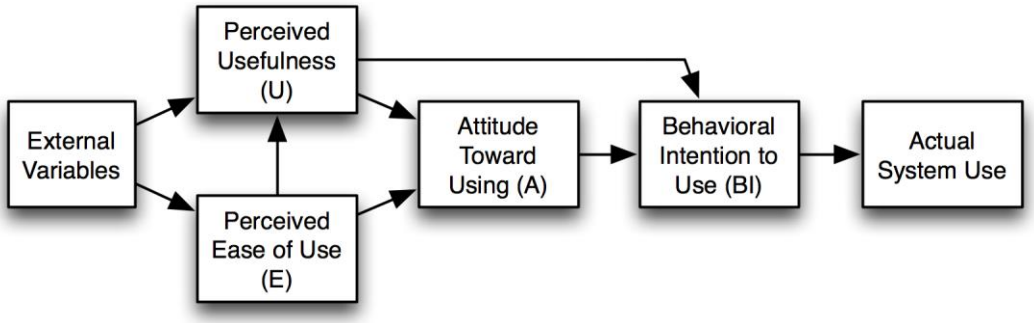

Figure 1. **Technology acceptance model**
Source: Adapted from Davis et al., 1989.

Previous research has mainly focused on understanding the psychological and sociological factors that will shape an individual's behavioral intention toward using technology (Venkatesh et al. 2003). Based upon conceptual and empirical similarities

across prior technology adoption models, Venkatesh et al. (2003) developed the UniJied Theory of Acceptance and Use of Technology (UTAUT).

Geften and Pavlou (2003) in their study claim that the original TAM model does not capture all the factors that affect e-shop purchasing. Therefore, other factors such as Internet experience, normative conviction, and online shopping experience have been added to the model in addition to personal characteristics (age, gender, education). In our survey, we focus on factors that influence the perceived usefulness, simplicity of use and modify the original TAM model by other factors that could influence the usefulness and simplicity of use. Our hypotheses:

- H1: The quality of information significantly influences the perceived usefulness.
- H2: Quality of service has a significant impact on perceived usefulness.
- H3: Modern technologies significantly influence the perceived simplicity of use.
- H4: The quality of the system significantly influences the perceived simplicity of use.
- H5: Perceived usefulness has a significant impact on the use of technology.
- H6: Perceived simplicity of use has a significant impact on the use of technology.

In order to meet the set goal, we used the exploration method to obtain the necessary data. Using online questionnaires, we will source resources based on the subjective responses of Internet users and users of e-commerce websites. The questionnaire, which focused on finding satisfaction and perceived usefulness, had 27 questions. The first part of the questionnaire is based on basic demographic issues, with which we have identified age, gender, education and economic status of users. Subsequently, we found the attitudes and opinions of respondents on the quality of information, service, website system and whether they are happy with the modern technologies that e-commerce websites use to support their marketing communications or not.

The questionnaire included closed questions where respondents could express their degree of agreement or disagreement with the statement in a five-step Likert scale. To obtain the necessary answers, we used a proportional stratified selection. We shared the online questionnaire among respondents, especially through social media, but the most preferred one was the Facebook social network. The questionnaire was anonymous and the respondents filled it voluntarily. We have decided to analyze the reliability of the research file in a number of ways. The first method was test - retest, repeating the administration of the research group. When repeating the administration, we proceeded by submitting the same respondents after a certain period of time to the same questionnaire survey and to monitor the degree of agreement between the observations. The degree of correspondence between the two results was expressed by the correlation coefficient, with all the results we measured high values above 0.80. As our survey does not consist of dichotomous items but has a larger span of scoring, we have tracked the Cronbach alpha coefficient. To evaluate the survey data, we used the R Studio software, which we used to calculate the Pearson correlation coefficients for each variable. We then presented the results using charts and tables. In the summary table, using the lower triangle method, we calculated the values that were confirmed by the dependence of the hypotheses.

Nowadays, purchasing goods and services on the Internet is a very common practice of people around the world. Some prefer purchasing on the internet due to the comfort of home, others due to the competitive price that e-commerce offers compared to physical

stores. The number of online shoppers is increasing every year. For example, last year, about 1.6 billion people worldwide used the internet for shopping. This number is predicted to increase further in the coming years and to exceed 2 billion users in 2019. The subject of this research are users and therefore online shoppers as well as visitors of e-commerce websites (potential customers). We received survey data from the respondents in November and December 2017. The distribution of the questionnaires took place by collecting the information personally. The respondents were visitors of the e-commerce segment. 252 respondents were involved in the survey, but after having eliminated the invalid questionnaires, we only worked with 230 responses. The survey sample consisted of 123 responses from women (53.47%) and 107 from men (46.53%) who completed the submitted questionnaire.

Analysis of variables

The first issue of QUALITY INFORMATION (QI-Quality Information) was used to find out by the respondents how satisfied they are with the quality, accuracy and up-to-dateness of the information provided by the analysed segment of websites. The quality of information factor tells if users are satisfied with the provided information. We mainly see positive responses as it can be seen from the following chart (Figure 2).

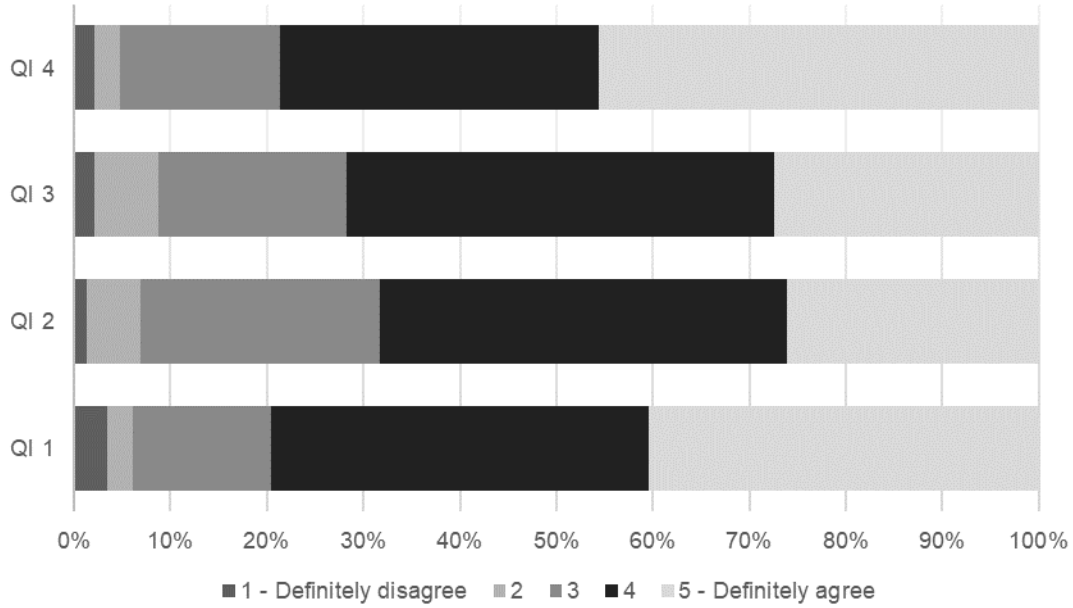

Figure 2. **Overview of results for the quality of information factor**

Source: Authors' own processing.

Table 1. *Overview of results for the quality of information factor*

Factor quality of information	1 Definitely disagree (%)	2 Rather disagree (%)	3 Neutral attitude (%)	4 Rather agree (%)	5 Definitely agree (%)
QI 1	3.48 (8)	2.61 (6)	14.35 (33)	39.13 (90)	40.43 (93)
QI 2	1.30 (3)	5.65 (13)	24.78 (57)	42.17 (97)	26.10 (60)
QI 3	2.17 (5)	6.52 (15)	19.57 (45)	44.35 (102)	27.39 (63)
QI 4	2.17 (5)	2.61 (6)	16.52 (38)	33.04 (76)	45.66 (105)

Source: Authors' own processing.

The second set of questions monitored the QUALITY OF SERVICE factor (abbreviation QS). As part of this factor, we investigated whether the users are satisfied with the e-shop, with the quality of service provided, or the service and the services provided are working properly or not. The questions we asked the respondents were (QS1-QS4). The quality of service factor has shown us that most respondents have a positive opinion on quality that is associated with the service. Most respondents (47.30%) were satisfied with the e-shop because it offered feedback to its users, mainly thanks to Facebook social network. 45.22% of the respondents agree that the analysed segment of websites and they liked that it can easily respond to their requirements (Figure 3).

The following question was about the system quality factor (abbreviation QSY - Quality of system). Using the above-mentioned QSY1-QSY4, we surveyed how they perceive the quality of the service provided by the e-commerce segment. In the attached chart, we can see the respondents' answers to individual questions. In questions QSY1, QSY2, QSY3, we have seen positive responses that are less explicit and more neutral. In the last QSY4 question, which was used to find out how users are satisfied with the format of the information provided, the respondents responded positively and absolute approval was expressed at 60.87% (Figure 4).

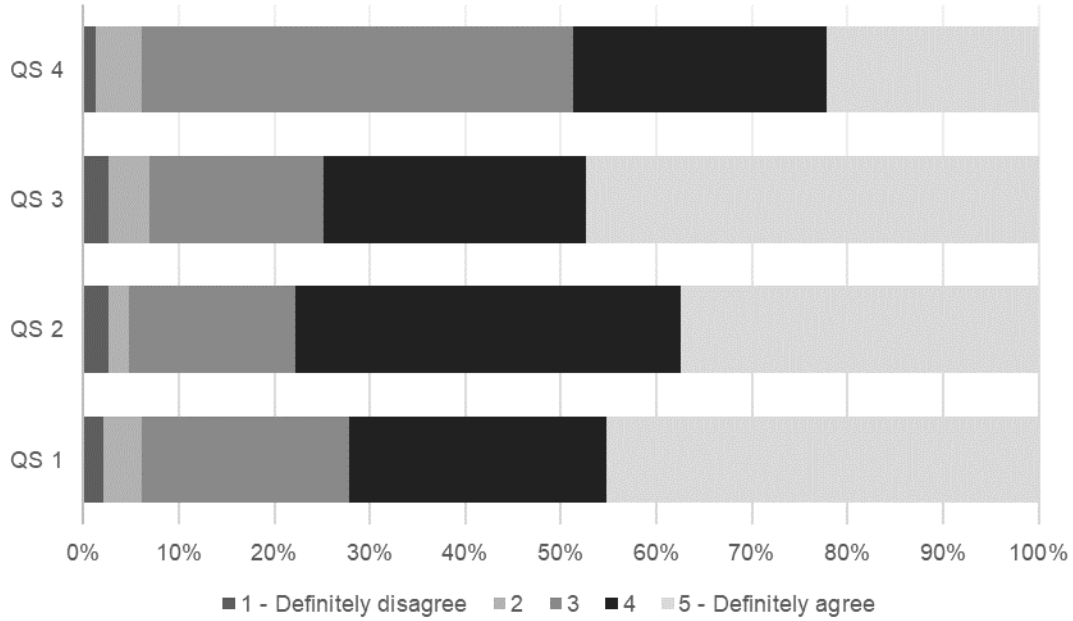

Figure 3. **Overview of result for the quality of service factor**

Source: Authors' own processing.

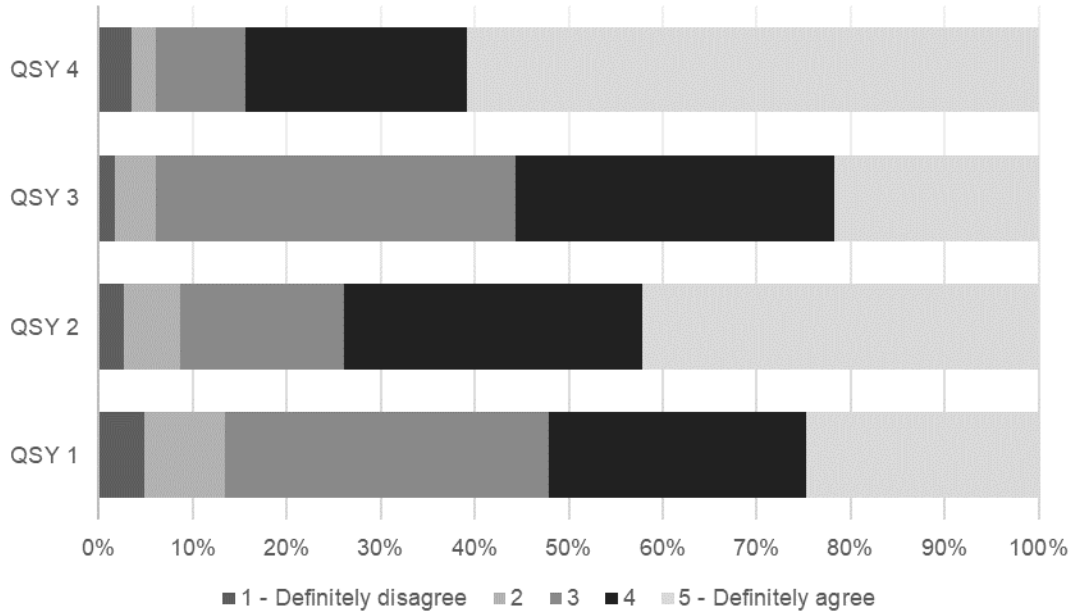

Figure 4. **Overview of result for the quality of system factor**
Source: Authors' own processing.

MODERN TECHNOLOGIES are another factor we have analysed for the implementation of the survey. We have divided this factor into three groups, but they will express one single factor. We monitored social networks as well as contextual advertising besides mobile apps. Mobile Apps - (MA-Mobile applications) focused mainly on the mobile display of the e-shop and we were looking at whether the use of the mobile phone can influence customers in the purchasing process and that, ultimately, it is simply because of this factor that the purchasing is easier. Based on the survey results, we can see that the new factor that we have incorporated into our model affects e-shop users positively. Although the highest number of percentages for all three questions were answered by a neutral attitude (3), the positive "Definitely agree" and "Rather agree" were just a few percent lower. According to 63 respondents (27.87%) the mobile app makes it easier to purchase and according to 67 respondents (29.13%) makes it faster. Social Network - (SM - Social Media) is the second modern factor that has been incorporated into the original model. As can be seen from the survey results, respondents are positively influenced by social media (Figure 5).

Contextual Advertising (CA) is the last, third group of modern technology that has been incorporated into our model. This ad provides the fastest and most effective way to get the necessary information for a targeted user group. The respondents were asked, whether the advertising on the internet, namely the contextual advertising affects their purchase or not. The respondents answered largely positively.

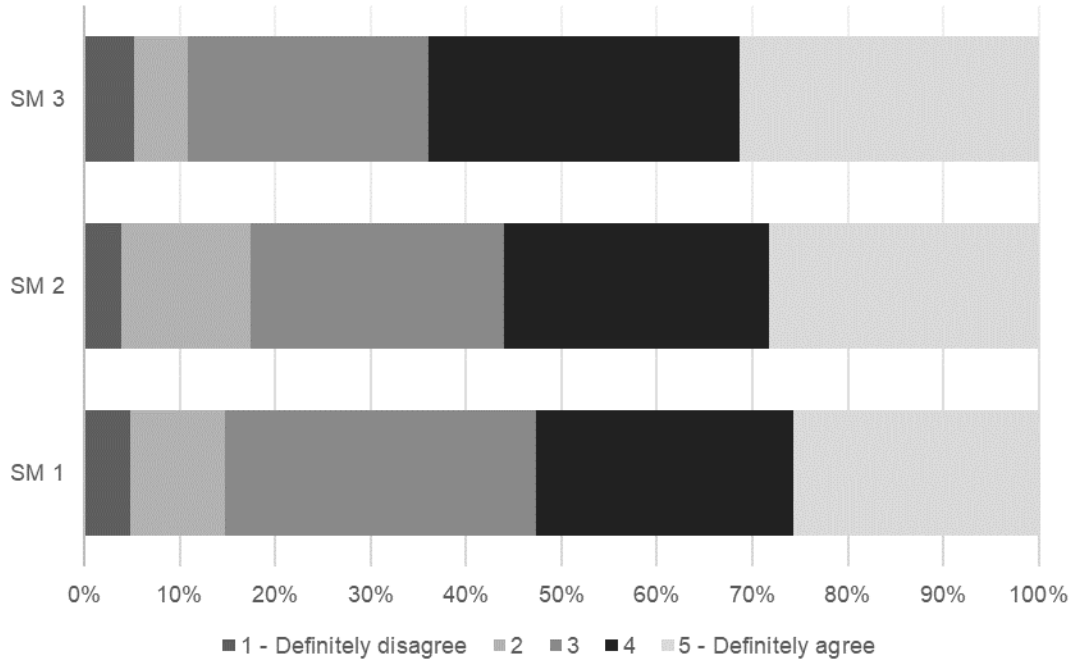

Figure 5. **Overview of result for the social media factor**
Source: Authors' own processing.

The next question in the survey was about the USE-Usefulness factor. Using this factor, we are responding to the question of how electronic purchasing is useful to customers. Their replies were largely positive. Up to 34.35% of the respondents answered, "I rather agree" to the question whether shopping on this e-shop is useful or not. The biggest group of 30.88% on the question of performance improvement were the respondents who answered, "Definitely agree". 30.43% of the respondents answered on "purchasing online is an efficient use of leisure time" rather positively, choosing the "Definitely agree" (Figure 6). The last factor in the analysed model is the PERCEIVED SIMPLICITY OF USE (abbreviation – Simplicity). We asked the respondents how difficult it is for them to buy on e-shops and whether they control the different steps during the purchasing process. The factor "perceived simplicity of use" with the help of the chart below shows that control the site is simple for more than half of the respondents (56.52%). 41.30% of the total number of 95 respondents are able to control it without any difficulties (Figure 7).

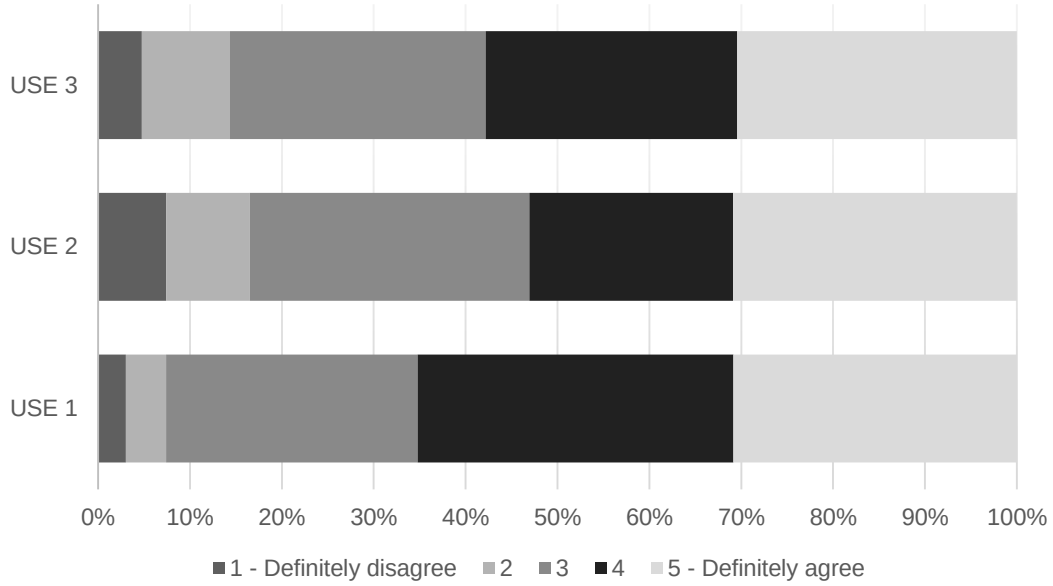

Figure 6. **Overview of result for the perceived usefulness factor**
Source: Authors' own processing.

The last question in finding simplicity in use shows us that up to 119 respondents (51.74%) are considered to be skilled in the control or use of navigation.

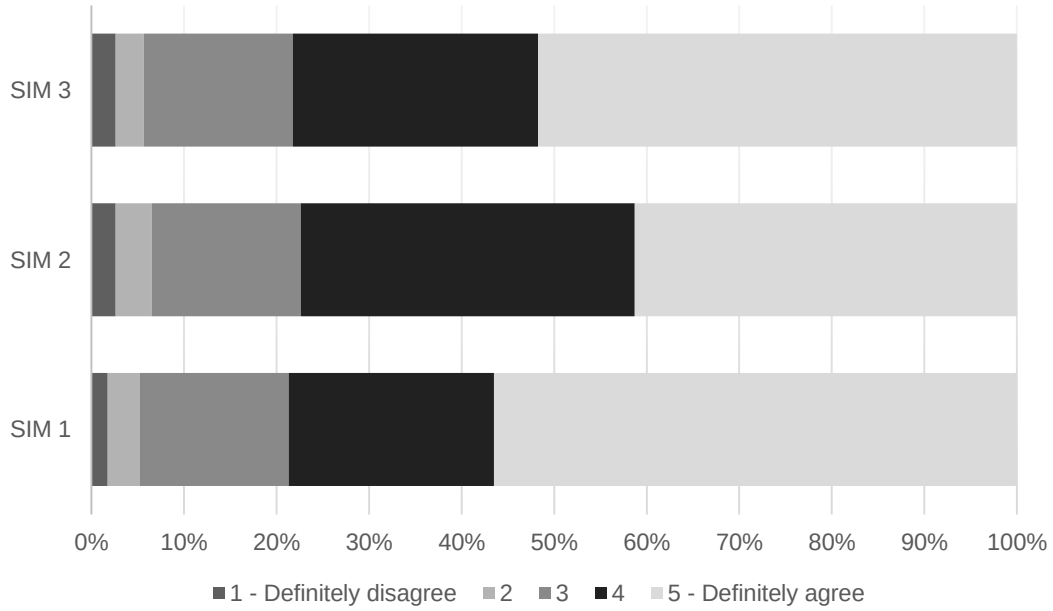

Figure 7. **Overview of result for the perceived simplicity of use factor**
Source: Authors' own processing.

In the survey, we used a questionnaire where we asked the respondents how often they visit the e-commerce site. We examined the results and we figured out the number of visitors. Based on the results, it is possible to assess that respondents are active users of e-commerce web sites. 63 respondents (27.39%) are purchasing on e-shops very often.

25.65% of the respondents purchase frequently. The most numerous group (30.43%) are respondents who purchase online only sometimes. 12.17% (28 respondents) rarely visit the notino.sk e-shop. Despite the fact that the questionnaire was designed for the users of our analysed segment, we found 10 respondents (4.36%) who very rarely visited the e-shop.

Results and discussion

In verifying the hypotheses, the first one was to compile and calculate the correlation matrices by which we calculated the final coefficient values using the lower triangular matrix method. A diagonal matrix is a square matrix with zero entries except possibly on the main diagonal (extends from the upper left corner to the lower right corner). A lower triangular matrix is a square matrix in which all entries above the main diagonal are zero (only nonzero entries are found below the main diagonal - in the lower triangle).

H1: The quality of information significantly influences the perceived usefulness.

The first hypothesis examined the significant influence of the information quality factor on the perceived usefulness factor. Based on our survey, we found that the final coefficient is positive and statistically significant, so we support this hypothesis.

H2: The quality of service has a significant impact on perceived usefulness.

The second hypothesis focused on examining the impact of the service quality on the perceived usefulness factor. The survey results showed that there is a linear relationship between the coefficients and therefore it is possible to assess that the achieved result is statistically significant and we accept the H2 hypothesis.

H3: Modern technologies significantly influence the perceived simplicity of use.

Our third hypothesis examines the significant impact of modern technology (social networks, mobile apps and contextual advertising), the perceived simplicity of use of the e-shop notino.sk. According to our findings, coefficients gain positive values; the result of the survey is therefore statistically significant. We accept the H2 hypothesis.

H4: The quality of the system significantly influences the perceived use.

In the H4 hypothesis, we focused on the quality system factor, on research and its impact on the simplicity of use of the analysed e-shop. As in the previous two hypotheses, we have recorded significant value statistics, thus we also accept this hypothesis.

H5: The perceived usefulness has a significant impact on the use of technology.

The effect of perceived usefulness on the actual use of the observed technology was verified in the H4 hypothesis. The results of the survey point to the existing linear relationship between the variables. We accept the H4 hypothesis.

H6: The perceived simplicity of use has a significant impact on the use of technology.

The latter hypothesis solved the influence of the perceived simplicity factor on the factor of using technology (frequency). The result we observe is as statistically significant as in the previous cases and therefore we accept this hypothesis.

Table 2. *Overview of results for the quality of information factor*

Hypothesis	Proceeding	Final coefficient	Dependence	Result
H1	QI > USE	0.265	*	Supported
H2	QS > USE	0.232	*	Supported
H3	MA > SIM	0.249	*	Supported
H4	QSY > SIM	0.473	**	Supported
H5	USE > A	0.273	*	Supported
H6	SIM > A	0.192	*	Supported

Source: Authors' own processing.

In the modified TAM model, to which we have incorporated the factors proposed (quality of information and service, modern technologies, quality of system), we present the results we have obtained through the survey.

With the help of the selected factors that we have put into the original TAM model and what we have modified, we have found out that the users are happy with this e-shop. We also found out how they perceive its usefulness, its simplicity of use and their actual attitude to the purchasing in the e-commerce segment. Based on the results we have found and interpreted, we have created a set of suggestions and measures for each factor that affects user experience with purchasing.

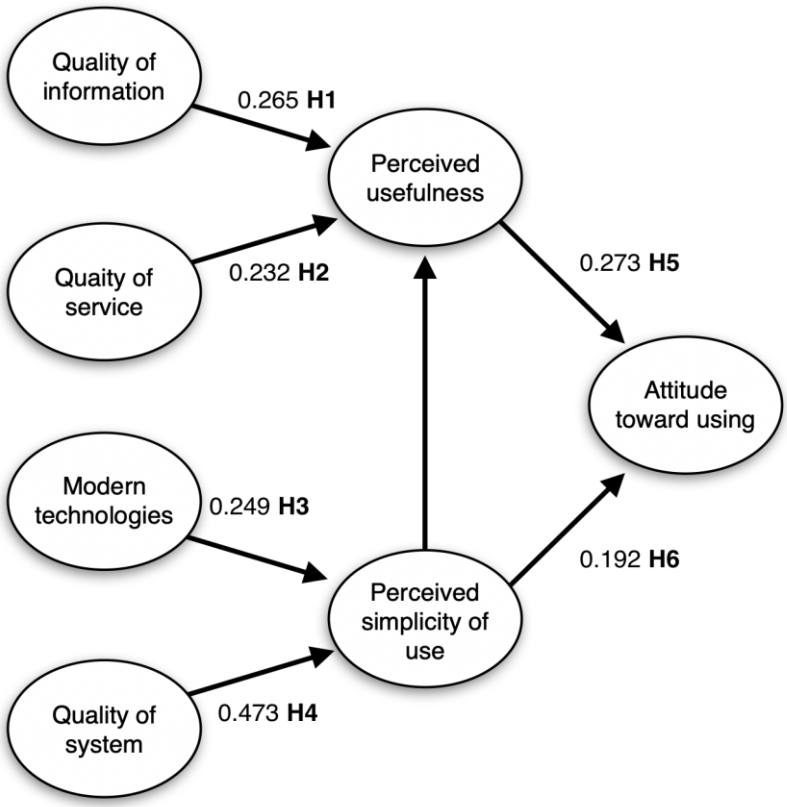

Figure 8. **Model of modified TAM in UX context and its resulting coefficients**

Source: Authors' own processing.

Suggestions for quality information factor

The results we obtained by analyzing the impact of this factor - the quality of information on perceived usefulness showed us that respondents are satisfied with the technology provided information. Satisfaction and positive attitude were expressed by the respondents, whether about the provided information, the completeness, the truthfulness, but also about the format in which the information is provided and presented to the user.

Suggestions for the quality of service factor

When testing the quality of service factor, we confirmed its significant impact on the usefulness of e-commerce. Users perceive this quality positively. They were satisfied with the speed of responses and feedback. However, we see a small deficiency in the customization of e-shop services to special user requirements. Therefore, we want e-commerce technology to focus on these requirements and respond to them. These include, for example, gift-wrapping of the ordered goods, delivery to a different address or the possibility to cancel the order more easily.

Proposals for a modern technology factor

In the survey, we also addressed the influence of modern technology factor on perceiving the simplicity of the use of e-commerce technology. We have put this factor together with three technologies that are used nowadays in the modern, internet world. Social networks, mobile apps and contextual advertising in particular. Social networks – the survey results have shown us that social networking, the comments and reviews that appear there affect the purchasing process and make it easier for the customers. The case study where we have analyzed the number of visitors has shown us that Facebook and YouTube are the most commonly used social media to search for this segment. Therefore, we suggest that e-shops should continue their active two-way communication on both social networks. In order to use Facebook for communicating with the customer and to recommend the product, to give feedback. With the help of the YouTube social network, they reach out to both their long-standing and future customers, either with the help of paid promotion or with the collaboration with today's favourite youtubers. Mobile apps - we have found that nowadays more and more people are buying a mobile device. If the user wants to buy something on the e-shop, his/her mobile will speed up and make the purchase easier. At the same time, the probability of the purchase is increasing because the mobile is constantly connected to the Internet. However, when implementing the case study, we found that many e-shops have mobile versions that users use but have no developed mobile app that users can download directly to their mobile. That is why our suggestion is to create a mobile app for Android and iOS so that people can install it on their mobile phone or tablet, and there would be an automatic newsletter about products or current information. Contextual advertising - the fastest online advertising that “jumps out” thanks to key words also has an impact on the usage and makes it easier. The results have shown us that advertising appearing on the Internet (social networks not included) does not interfere with users and even to a large extent in a positive way affects the purchase. On the other hand, contextual advertising, which is presented on social networks is rather disturbing.

Suggestions for system quality factor

Regarding the quality of the system, respondents expressed a positive attitude towards the availability of the e-shop on the Internet, whether on the computer or on a mobile phone. It

is important for e-commerce websites to be attractive for users and have navigation that suits them and is easy for them to control. Neutral attitudes have taken interest in the audio presentation of the products. Therefore, it is recommended not only to improve audio presentations, but also to present products either directly on e-shops or on social networks. Study results are subject to limitations, similar to other cross-sectional studies based on surveys. The results cannot prove causality and therefore a causal link, so further research in this area should be dealt with by longitudinal research. Further, our research has been conducted in a single industry and therefore results are limited to a specific area of e-commerce. Even though the specific area of research has obvious advantages, caution should be exercised in generalizing results for other sectors, other forms of technology, or other countries.

Conclusion

We have expanded the original TAM Model by introducing new factors to the final model. The technology adoption model has expanded specifically on the quality of information, system quality, the quality of service and modern technology that are related to online marketing. The main theoretical contribution of our scientific work is the importance of the factor of modern technology and of social networks, mobile applications and contextual advertising. This factor, with the other two factors has been incorporated into our proposed model and has shown us that modern technologies have a direct impact and are directly related to the use of e-commerce in case of notino.sk. It has been shown that communication with modern technology increases the likelihood of purchasing and therefore the number of visitors is higher. E-commerce is a phrase what we are going to hear in the future even more often than today. Therefore, it is important for every customer and hence for the e-commerce user to know which online store suits them and which meets their requirements. This study focused on creating user-friendly e-commerce websites. In addition to defining the concepts and technologies, which were needed to create such an e-commerce website, we also focused on the UX issue. The creation of e-commerce web sites with the help of UX also brings a competitive advantage, thanks to which users feel comfortable on a particular website. In the present study, using the Technology Acceptance Model (TAM), which we expanded on information and service quality factors, advanced technologies and the quality of the system, we tried to explain the impact of these factors on user experience.

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