“Analysis of selected technology acceptance model constructs and their impact on user behavior”

AUTHORS	Igor Fedorko Radovan Bačik Beata Gavurova

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Igor Fedorko (Slovakia), **Radovan Bacik** (Slovakia), **Beata Gavurova** (Slovakia)

ANALYSIS OF SELECTED TECHNOLOGY ACCEPTANCE MODEL CONSTRUCTS AND THEIR IMPACT ON USER BEHAVIOR

Abstract

Nowadays, when the Internet is a regular part of people's life in competitive conditions, it is essential to emphasize user feelings about the products, especially in the context of web pages. The study aims to clarify the significance of selected Technology Acceptance Model elements concerning user behavior in the web area. The study applied an exploratory method using an anonymous questionnaire in electronic form (Likert scale). This study's respondents were website users, visitors, or internet users within the EU. Adequacy of the research sample was measured using Cronbach's alpha and Kaiser-Meyer-Olkin (226 respondents). This paper proposed factors that impact user behavior. The quality of the website content factor contains two other variables: the quality of information (QI-Q5) and its availability (AI-A3). The design quality factor is composed of four elements: appearance (AP1-AP5), website findability (F1-F4), website navigation (N1-N3), and website access and usability (AU1-AU4). In addition, the paper selected the perceived usefulness factor (USEF1), the factor of perceived ease of use (EOU1-EOU3), and the attitude to use the website (ATT1). This study calculated the values of the Pearson correlation coefficients and used the lower triangle method to obtain the resulting coefficient values. The analysis results show that the simplicity of use and page orientation does not affect the actual use of the website. The study's outcome is a model that identifies the impact of individual factors on user behavior in the context of user experience.

Keywords HCI, TAM model, usability, usefulness, user experience, website, factor

JEL Classification M15, M31, L86

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Igor Fedorko, Assistant Professor, Faculty of Management and Business, The University of Presov in Presov, Slovakia. (Corresponding author)

Radovan Bacik, Associate Professor, Faculty of Management and Business, University of Presov in Presov, Slovakia.

Beata Gavurova, Professor, Faculty of Mining, Ecology, Process Control and Geotechnologies, Technical University of Košice, Slovakia.

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INTRODUCTION

The Internet has turned human existence upside down. It has revolutionized communications to the extent that it is now a preferred medium of everyday communication. People use the Internet for various purposes (Dentzel, 2014). However, it is worth discussing competition between sites because the more attractive and accessible it is, the more visitors it will have. IT technologies play a decisive role here. When browsing the Internet, a website cluttered, complex, and challenging to navigate, the user will leave immediately. Therefore, it is worth considering various characteristics (factors) even in creating a website or if an existing one is being updated. IT specialists should do everything possible to make the site as intuitive as possible.

Web technologies have led to the use of other online tools in both the private and government spheres (Huculová, 2018; Yuen & Will, 2008; Civelek et al., 2021; Muftiasa et al., 2022; Akhter et al., 2022). As Internet participation grows in various departments, the importance of technology adoption has increased considerably (Fusilier et al., 2008; Ključnikov et al., 2021). Several models have been designed to explain user behavior. However, research on analyzing the main goals of a website in terms of site acceptance and use has been neglect-

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ed (Castaneda et al., 2007). Innovative websites are trying to attract customers, and research in this area suggests that websites with 3D environments are perceived as more challenging to use and as less cognitive absorption than traditional websites (Visinescu et al., 2015). Gavurova et al. (2018) show that customers' motives in online environment behavior are independent of the age of respondents. This study extended the research conducted by Davis (1989) by adding and combining more external variables such as quality of website content, website design, perceived usefulness, perceived simplicity, attitude toward the website use, and actual use of the website to create positive user behavior.

1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Today user behavior is the main component of a successful business, and its understanding is key to finding out how clients interact with a product. User behavior encompasses all the actions visitors take on a website: where and what they click on, how they scroll down a page, where they stumble, and where they eventually drop off the page and leave (Hotjar team, 2021). Analyzing user behavior will answer questions and help continuously refine products. Fard (2022) argues that understanding user behavior is the foundation of building a great product and an indicator of a good company organization. It provides valuable information about a product (service), gives one a competitive edge, increases clients' retention rates, ensures that one meets their needs, and takes the guesswork out of user experience (UX) design.

According to Law et al. (2009), UX includes all aspects of final user interaction with the company. The first condition for user experience is to find a way to meet the customer's needs (Bartok, 2018). Moreover, a customer should feel comfortable. Next comes the simplicity and elegance of the product and, therefore, also the website itself, which should have a good impact on the customer and give a feeling of joy to a user, a joy to own the product, a joy of using the product (Van Schaik & Ling, 2008). Marcus (2014) interprets user experience as a set of distinct quality criteria that includes classical usability criteria, like efficiency, controllability, or learnability, and non-goal directed or hedonic quality criteria, like stimulation, fun-of-use, novelty, emotions, or aesthetics. This has the advantage of splitting the general notion of user experience into a number of simple quality criteria, which describe distinct and relatively well-defined aspects of user experience that can be measured independently.

UX can be defined as user interaction with a business where this interaction is perceived as one segment. UX is a discipline that deals with aspects of the user interface and works to coordinate selected aspects to allow the user to interact best (Wright & Blythe, 2007). Kraft (2012) describes UX as "the feelings the user gets when using a product. Using feelings as a comparison model allows us to understand that user experience can be anything from hate to love. From anger to happiness. From indifference to passion. From expectance to nostalgia. From pride to humiliation. And so forth." UX is about overcoming material possibilities. It is the creation of experience, more precisely, the user experience through devices (Hassenzahl, 2011). As Vila and Kuster (2011) notice, companies spend a substantial part of this effort on improving their websites' visual aspects and the quality of customer interaction experiences. More articles published in this field focus on investigating the relationship between other variables in the web design area (Kwon et al., 2002; Moss et al., 2006). It is in the interest of companies and consumers to monitor the current perception that expresses consumers' willingness to adopt modern web technologies (Lee, 2009; Liao & Cheung, 2002).

Over the last years, the Internet has strengthened and offers many web applications that give organizations an additional chance to reach and not lose customers by providing unique services/products (Bačík et al., 2021; Teo & Tan, 2000; Simionescu, 2021). However, previous website design research does not provide consistent data about attributes influencing user perceptions. Thongpapanl and Ashraf (2011) report conflicting results regarding the content of websites. Gounaris et al. (2010) pay

attention to the importance of the atmosphere in conducting online transactions. Therefore, knowing which factors affect the success of websites is essential. The metrics used to measure the success of websites, such as traffic, average time on the site, and bounce rate, require that users spend as much time as possible inside the site's space (Graham, 2018). Website operators should be able to create such projects that users like to visit, and not all of them may lead to conversions (Vila & Kuster, 2011).

HCI is a field of research into human-centric interactive computer systems and was originally created in the early '80s (Booth, 1989). This study is focused on building specific functions that have long-term effects on people (Dix, 2017). Originally, HCI specialized in computer science, including cognitive science and ergonomics. One important HCI factor is that different users create different concepts, ideas, and mental models about their interactions and have different ways of learning and maintaining knowledge and skills (various "cognitive styles"). Furthermore, cultural and national differences also play a significant role.

Another aspect of HCI study or design is that user interface technology is rapidly changing, constantly offering new interaction possibilities that previous research results do not need to apply. Therefore, it is necessary to continually create new research and gain new insights, especially user preferences (Rouse, 2005). In addition, professionals face interactive system design, which is a difficult task because they have to program the software for millions of users (at the time of design), and they must emphasize that the system works for each user (Fischer, 2001).

Technological acceptance can be interpreted as attention to use technologies to perform tasks. Thakur (2009) argues that technological acceptance is gradual, and its level varies from area to area as well as sector to sector of human activities; generally, its five stages are recognized, viz., elementary, animal traction, initial motorization, motorization, and automation. However, it is known that not all individuals use technology on a daily basis. For this reason, basic factors that lead users to accept technology are explored. In other words, a reason that affects users in the so-called approval process is significant. Therefore, many scientists have developed various studies to maximize the potential for technology adoption (Balcerzak & Pietrzak, 2017; Fusilier et al., 2008).

The dominant model is the Technology Acceptance Model (TAM), a predictive tool for user acceptance testing of new technologies designed by Davis (1989), often used for empirical testing. Compared to competitive models, TAM is economical, predictable, and robust (Venkatesh & Davis, 2000). This model is well suited to examine trends in using selected technologies from an economic perspective.

Many researchers are devoted to the area of acceptance and use of IT systems. Each of the models that have appeared in research in recent years has a similar structure: a dependent variable (intention to use or usage) and various variables that define acceptance (Im et al., 2011).

The most cited theoretical models include the Theory of Reasoned Action – TRA (Fishbein & Ajzen, 1975), Theory of Planned Behavior – TPB (Davis, 1989), or the TAM model (Davis, 1989).

The study outcome is a model that identifies the impact of individual factors on user behavior in the context of user experience. The paper adapts the constructs and definitions of the TAM model in the context of adaptation of website development technology. It extends this model with new constructs related to the UX issue. This study has expanded this model to include factors that address perceived usefulness and perceived ease of use. Perceived usefulness and perceived ease of use variables create a factor that tells whether the user actually uses the website or not. Perceived ease of use has a causal impact on perceived usefulness (Koufaris, 2002).

Based on previous research on technology acceptance models, this study aims to clarify the significance of individual user experience constructs with user behavior in the light of a technology acceptance model.

Based on the goals and the subsequent determination of the research problems, the following research hypotheses were developed (Figure 1):

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Source: Own elaboration according to Davis (1989).

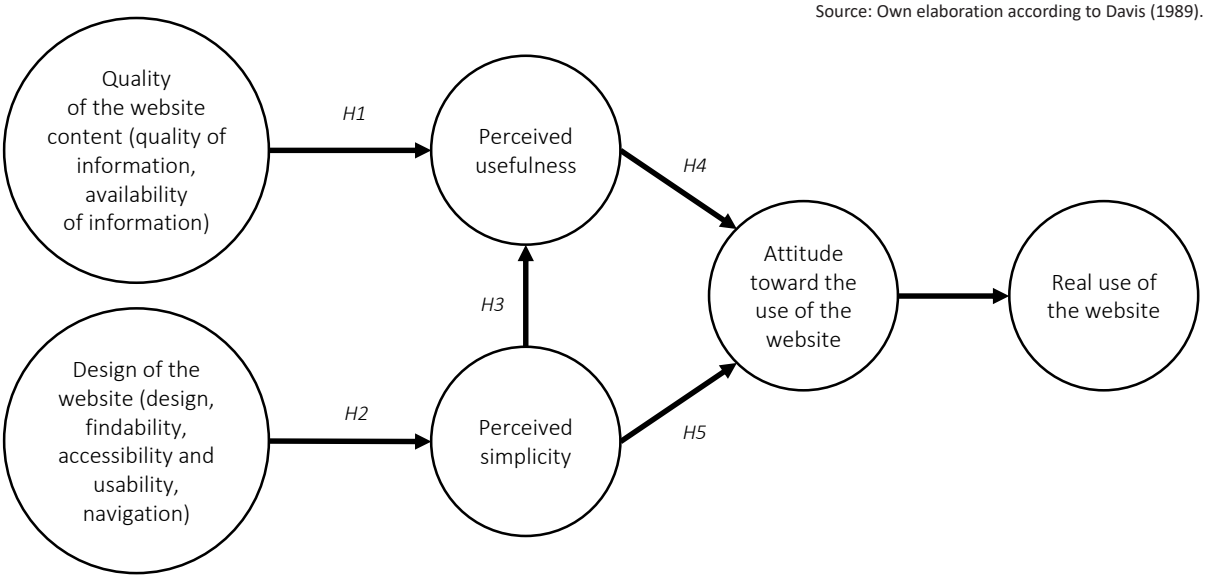

Figure 1. Research model

H1: Content quality positively influences perceived usefulness of the website.

H2: Quality of website design positively affects perceived simplicity of the website.

H3: Perceived simplicity significantly influences perceived usefulness of the website.

H4: Perceived usefulness positively impacts attitude to use the website.

H5: Perceived simplicity positively impacts attitude to use the website.

2. DATA AND METHODS

The study consists of a survey conducted by an exploratory method using an anonymous questionnaire in electronic form. Respondents are website users, visitors, or internet users. The first part of the questionnaire deals with demographic issues, more precisely with the gender and age of the respondents. The next part of the questionnaire focuses on website perception. The study verifies various factors through several statements, which aim to clarify the results while copying the methodology of previous research in this area. Cronbach's alpha and Kaiser-Meyer-Olkin are used to measure the adequacy of the research sample, and statistically test whether partial correlations between variables are low.

The questionnaire contains five statements dealing with the perception of information quality and three with the perceived availability of information on websites that together form the quality of the content. The quality of the website design is monitored on five statements, findability is monitored on four items, three questions are related to navigation on the website, and four items are related to accessibility and usefulness. The study verified the usefulness of the website with one question, the simplicity with three statements, and, last but not least, the actual use of the website with one item. The questionnaire consists of closed questions in the form of a simple selection, where the respondents choose one, and a Likert scale of the offered choices, in which the respondents express the degree of their agreement or disagreement on the five-step scale. This method of questioning was used because of the previous research in this area. 1 means "Definitely disagree," 3 means "Neutral attitude," and 5 means "Definitely agree." The research hypotheses are verified using the mathematical and statistical evaluation in the "R Studio" program, which calculates the values of the Pearson correlation coefficients that consisted of creating a correlation matrix. In addition, the paper used the lower triangle method to obtain the resulting coefficient values. 280 respondents participated in the survey, which, based on proportionally stratified selection, narrowed down to 226 respondents who represented the survey sample. The primary source of data for the survey was personal data collection. The sample corresponds to a sample of Internet users within the EU.

3. RESULTS

The first examined factor is the quality of the website content. The quality of information (QI) was examined with five items and the availability of information (AI) with three items.

The items to examine the quality of information on the website are the following:

- QI 1: I found the expected information on the website.
- QI 2: The website provides relevant business/institution-related information.
- QI 3: The information on the website is regularly updated.
- QI 4: The information on the website is reliable (I believe the information obtained from this source is reliable, and I do not need to verify it on another website or from another person).
- QI 5: I get all the necessary information and documents on the website.

Respondents positively perceive the content quality on the website. It was noticed that most responses on the scale were at option 4, that is, in agreement with statements. Respondents agree that the website provides relevant information; they agree on regular updates and consider them reliable. They have a positive attitude toward the statement that they get all the necessary information and documents on the website. The most positive responses were 66.81% for the QI 2 question.

The answer to the quality of the information factor question is shown in Figure 2.

The items, which are related to the availability of information (AI) on the website, are the following (Figure 3):

- AI 1: I can find exactly what I am looking for on the website (For example, a student can quickly find a study schedule on the website.)
- AI 2: The website has useful links, and links to other useful websites, which provide more useful information.
- AI 3: The website provides quick and easy access to information.

The study found positive responses to statements related to the availability of information; more precisely, the highest response rates were recorded in answers 3 and 4, i.e., the respondents positively perceived the website, which offers them the information quickly and easily. The website contains useful links, and they can quickly navigate the website. The most positive responses were recorded in item AI3, where 55.75% of the respondents expressed a positive attitude to the statement that the website provides quick and easy access to information.

The items to identify perceived appearance of the websites were the following:

- AP 1: The website looks attractive.
- AP 2: Appropriate colors and fonts are used on the website.

Source: Own elaboration.

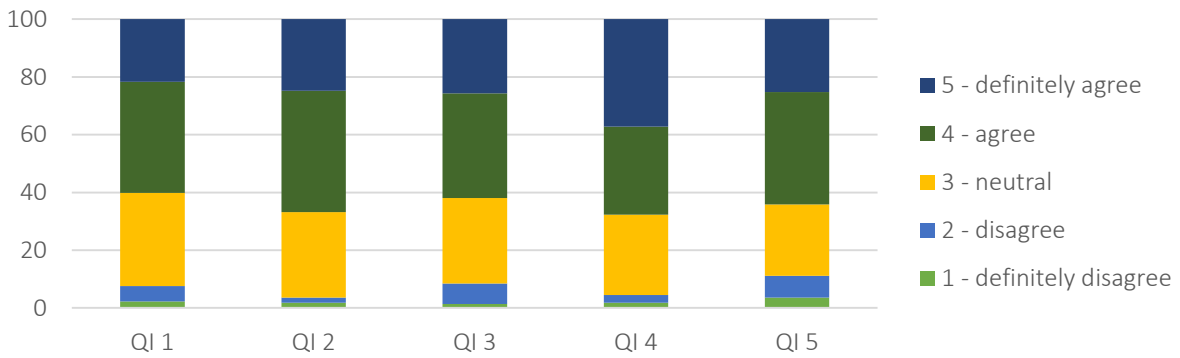

Figure 2. Information quality factor

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Source: Own elaboration.

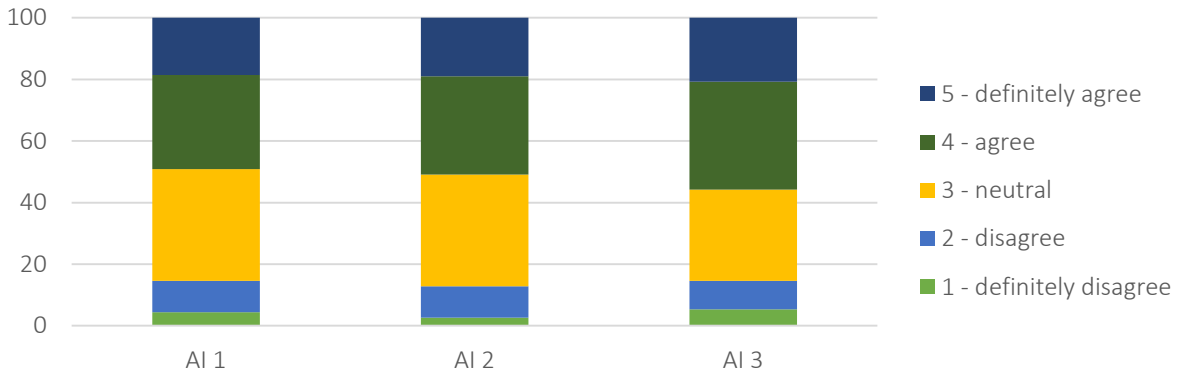

Figure 3. Availability of information factor

- AP 3: The website uses appropriate multimedia elements.
- AP 4: The website looks clear and comprehensible.
- AP 5: The website is well accessible and is visible on mobile devices.

The results of the website design are rather positive. According to the findings, the website is attractive to users; it uses suitably chosen colors, font, and multimedia elements. The most positive responses were recorded for AP2, receiving 65.92% of the positive responses. They said it has an attractive design. The study noticed the most negative responses to AP4 (16.37%), which were related to the transparency and comprehensibility of the website. Many positive responses were also revealed for the F factor – findability (Table 1). In item F1, up to 45.14% of the respondents said they fully agree with the statement that they can easily find the website on the Internet. For website users, therefore, it is simple and quick to find a website, simple and quick to go back to the previous link, they are able to find essential information and positive reviews of the page title organization, which makes it easy to navigate on the page.

The most positive responses to the navigation factor (N navigation) were recorded for N2, 63.71%. The question was whether respondents knew in which section they were currently on the website. For N3, which is related to the location of the search window, the most negative responses were noticed, 23.45% (Table 2).

Respondents more positively perceive the accessibility and usability of the website (AU – Access and Usability). There is the greatest consent on AU4, so there are no unnecessary reports and warnings. For this factor, the largest number of

Table 1. Findability factor of the website

Source: Own elaboration.

Findability of the website	1 Definitely disagree, (%)	2 Rather disagree, (%)	3 Neutral attitude, (%)	4 Rather agree, (%)	5 Definitely agree, (%)
F 1	0.88 (2)	0.88 (2)	22.57 (51)	30.53 (69)	45.14 (102)
F 2	1.33 (3)	3.54 (8)	27.43 (62)	37.61 (85)	30.09 (68)
F 3	3.98 (9)	10.62 (24)	33.63 (76)	32.74 (74)	10.03 (43)
F 4	4.43 (10)	5.75 (13)	32.74 (74)	31.42 (71)	25.66 (58)

Table 2. Navigation factor of the website

Source: Own elaboration.

Navigation of the website	1 Definitely disagree, (%)	2 Rather disagree, (%)	3 Neutral attitude, (%)	4 Rather agree, (%)	5 Definitely agree, (%)
N 1	2.21 (5)	7.96 (18)	28.32 (64)	37.17 (84)	24.34 (55)
N 2	3.54 (8)	8.86 (20)	23.89 (54)	35.39 (80)	28.32 (64)
N 3	13.27 (30)	10.18 (23)	26.11 (59)	26.99 (61)	23.45 (53)

Table 3. Access and usability factor of the website

Source: Own elaboration.

Accessibility and usability of the website	1 Definitely disagree, (%)	2 Rather disagree, (%)	3 Neutral attitude, (%)	4 Rather agree, (%)	5 Definitely agree, (%)
AU 1	14.16 (32)	14.16 (32)	25.22 (57)	28.76 (65)	17.70 (40)
AU 2	11.95 (27)	18.58 (42)	25.22 (57)	24.34 (55)	19.91 (45)
AU 3	10.18 (23)	15.93 (36)	16.37 (37)	19.91 (45)	37.61 (85)
AU 4	1.33 (3)	3.98 (9)	20.35 (46)	36.73 (83)	37.61 (85)

Table 4. Perceived usefulness factor

Source: Own elaboration.

Usefulness of the website	1 Definitely disagree, (%)	2 Rather disagree, (%)	3 Neutral attitude, (%)	4 Rather agree, (%)	5 Definitely agree, (%)
USEF 1	2.21 (5)	16.37 (37)	18.59 (42)	29.20 (66)	33.63 (76)

negative responses was noticed for AU2 (30.53%, results 1 and 2 of Table 2) to determine whether the page contains unnecessary and non-functioning links (Table 3).

The perceived usefulness factor (USEF) examined how the users view the selected website from the usefulness point of view. According to the survey results, users positively perceive the website. Most of the responses were recorded in the option "Definitely agree," more precisely 76 respondents representing 33.63 %. 66 respondents chose option 4, which is also considered to be positive, more precisely, 29.20 % of the survey sample. 18.59%, 42 respondents had a neutral attitude. More than 37 respondents had negative answers, representing 16.37%. Five respondents (2.21%) did not agree with the statement that the website is useful to them (Table 4).

The factor of perceived ease of use (EOU) was followed by three items. After processing the survey results, one can say that this factor is also perceived positively. Therefore, the website is easy to use and orientate on, easy to learn how to use it, and they feel self-confident and comfortable on the website. The most positive responses were recorded in the EOU2 statement, where 61.07% of the respondents had positive responses (Figure 4).

The last factor in the survey is the attitude to use the website (ATT – attitude to use), which leads to the actual use of the website. The survey looked at the following question: ATT1: How often do you visit the website? On this issue, the number of visitors and the frequency of the website were examined. 66 (29.21%) respondents represent option 3. 58 respondents visit the website very often, representing 25.66% of the survey sample. 45 respondents (19.91%) chose option 2, meaning they rarely visit the website. 15 respondents (6.64%) almost never visit the website (Table 5).

Furthermore, the paper used a mathematical-statistical evaluation of the established hypotheses. Firstly, the reliability of the sample using

Source: Own elaboration.

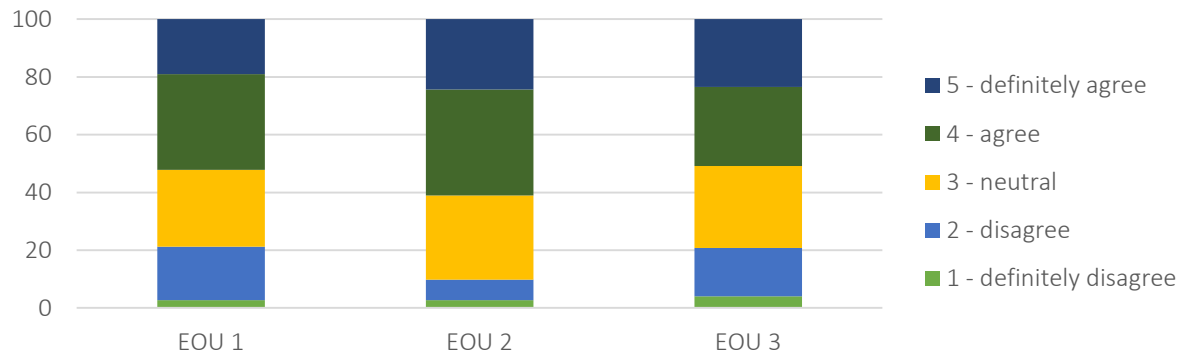

Figure 4. Perceived simplicity factor

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Table 5. Attitude factor to use the selected website

Source: Own elaboration.

Attitude to use the website	1 Almost never, (%)	2 Rarely, (%)	3 Neutral attitude, (%)	4 Often, (%)	5 Very often, (%)
ATT 1	6.64 (15)	19.91 (45)	29.21 (66)	18.58 (42)	25.66 (58)

Table 6. Website content quality factor

Source: Own elaboration.

	QI 1	QI 2	QI 3	QI 4	QI 5	AI 1	AI 2	AI 3
QI 1	1.0000	0.4211	0.3342	0.3985	0.4456	0.4097	0.4334	0.4147
QI 2	0.4211	1.0000	0.3285	0.4258	0.3442	0.3275	0.2731	0.3692
QI 3	0.3342	0.3285	1.0000	0.3962	0.3700	0.3903	0.3915	0.3839
QI 4	0.3985	0.4258	0.3962	1.0000	0.3227	0.2911	0.2756	0.2564
QI 5	0.4456	0.3442	0.3700	0.3227	1.0000	0.4989	0.3744	0.4287
AI 1	0.4097	0.3275	0.3903	0.2911	0.4989	1.0000	0.4814	0.5757
AI 2	0.4334	0.2731	0.3915	0.2756	0.3744	0.4814	1.0000	0.5488
AI 3	0.4147	0.3692	0.3839	0.2564	0.4287	0.5757	0.5488	1.0000

Cronbach's alpha was monitored. This coefficient should be used when evaluating questionnaires that contain intervals; in this case, it is a 1 to 5 interval. Cronbach's alpha measures the dependence between the items. Taking values of 0-1, with a value of 0.7 or more, means high consistency and reliability. Subsequently, the study performed a Pearson correlation analysis in a coefficient r, which takes values from -1 to 1. To obtain the resulting correlation coefficient, the lower triangle method was used.

The quality of the website content is understood as the quality and availability of the information. In the first step, the study verified the reliability of the content quality factor using Cronbach's alpha, which had the value of 0.8370035. Since the value is greater than 0.7, one may consider the responses recorded for this factor to be highly reliable, and dependent. Table 6 shows the content quality factor correlation, which has been examined for QI 1 to 5 questions and the availability of AI 1-5 information.

4. DISCUSSION

H1 has verified the quality of the content of the website and perceived usefulness of the website. In the case of AI2, however, there is only very little dependence between whether the page provides useful information and the perceived usefulness of the website. The study found the highest value for the QI2 item: to determine if the website provides relevant information. This question has a strong relationship with the perceived usefulness of the website. The design of the website means appearance, findability, navigation, accessibility, and usability of the website. The design quality factor is composed of four factors, more precisely, the website layout (AP1-AP5), website findability (F1-F2), website navigation (N1-N3), and website access and usability (AU1-AU4). The correlation coefficients found, except for two cases, range from 0.1 to 0.4, so one can say there is a dependence between the variables examined, even if only a little. Based on the correlation values found and presented, little and middle dependence between perceived simplicity and perceived usefulness factor was found. The highest value was noticed for a question that ascertained how easy and fast it was for users to orientate on the website and how easy it was to use the website; on the contrary, the smallest value was noticed in a question about website orientation. In verifying H5, the factors of perceived simplicity and attitude to use were compared by measuring the website's frequency of use. Based on the values found, one can say that there is no dependence between the EOU1 and EOU2 variables and between the attitude to use the website. Thus, the simplicity of use and page orientation does not affect the actual use of the website (Table 7).

The study addresses the importance of factors influencing user experience with websites. Individual factors originate from a modified

Source: Own elaboration.

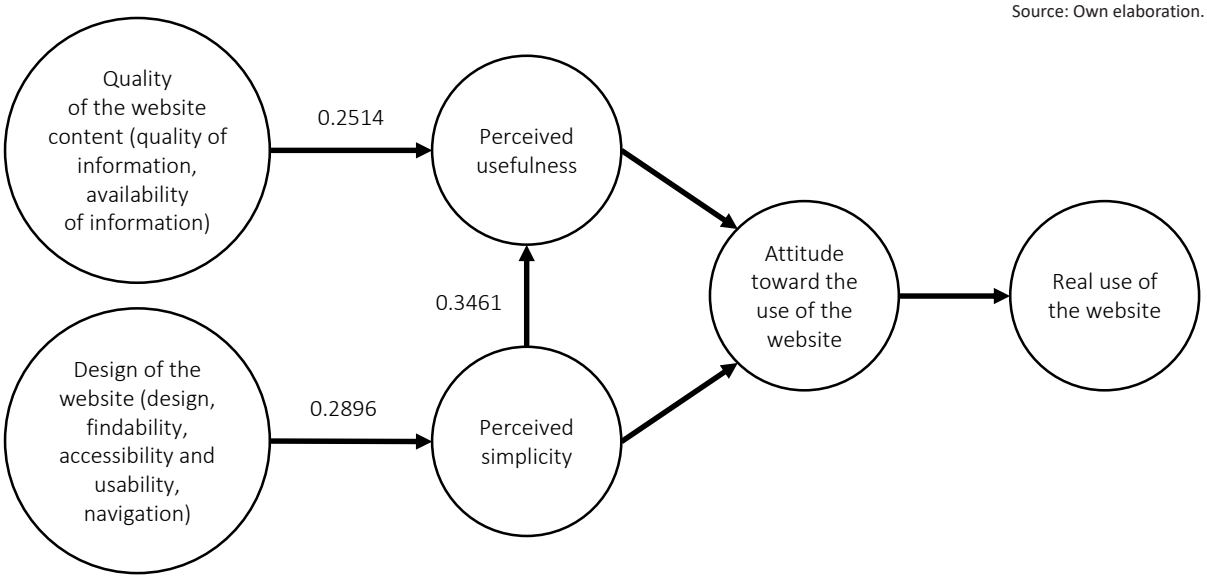

Figure 5. Final model of user experience

Table 7. Statistical evaluation

Source: Own elaboration.

Hypothesis	Examined factors	Final coefficient value	Result
H1	QI, AI > USEF	0.2514	Accepting H1
H2	AP, F, N, AU > EOU	0.2896	Accepting H2
H3	USEF > EOU	0.3461	Accepting H3
H4	USEF > ATT	Not significant	Rejecting H4
H5	EOU > ATT	0.1031	Accepting H5

user experience model based on the original Davis' TAM model. The factors proposed are the page content quality that contains two other variables, such as the quality of information and the availability of information on this website. Another factor is the website design, which is divided into the following variables: appearance, findability, accessibility and usability, and last but not least, navigation on the website.

Based on research results and hypothesis values, the paper approaches the proposed user experience model based on the technology acceptance model by Davis (1989) (Figure 5).

CONCLUSION

The study focused on the phenomenon of user experience in the web area and the impact of selected factors on it. Competitive products are distinguished by the minor details based on which the user is offered to interact with the product. Based on previous research on TAM models, which describe the factors involved in the use of the website, the study has verified the impact of perceived usefulness and the perceived simplicity of the page on its use. The study has consistently confirmed the impact of perceived simplicity of use, so paying attention to variables such as website appearance, navigation, accessibility, and usability is recommended. 66.81% of positive responses were to the statement: "The website provides relevant business/institution-related information." 55.75% of the respondents expressed a positive attitude to the statement that the website provides quick and easy access to information.

65.92% of positive responses were recorded for the statement: "Appropriate colors and fonts are used on the website." Up to 45.14% of the respondents said they fully agree with the statement that they can easily find the website on the Internet. Therefore, the suggestions will help increase the number of visitors. In the case of perceived usefulness, despite the non-confirmation of the impact of the variable and the

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quality of the content, it is recommended to pay close attention to websites, as it is the core of the search. However, there is room for new research on the subject. Tackling usability of websites is designed to increase user comfort during their interaction with web browsing, and one of the effects of quality UX may be increasing the frequency of the use of information technology.

The research results are subject to limitations similar to other cross-sectional studies based on questionnaire surveys. Therefore, the results cannot prove a causal link. Next, the study was done on the selected website; therefore, the results are limited. Although such a specific field of research has apparent advantages, it is essential to be more attentive in generalizing the results for other industries, other forms of technology, or other countries.

AUTHOR CONTRIBUTIONS

Conceptualization: Igor Fedorko, Beata Gavurova.
Data curation: Igor Fedorko.
Formal analysis: Beata Gavurova.
Funding acquisition: Radovan Bacik.
Investigation: Igor Fedorko, Beata Gavurova.
Methodology: Igor Fedorko, Radovan Bacik.
Resources: Radovan Bacik, Beata Gavurova.
Software: Igor Fedorko.
Visualization: Beata Gavurova.
Writing – original draft: Igor Fedorko, Radovan Bacik, Beata Gavurova.
Writing – review & editing: Igor Fedorko, Beata Gavurova.

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