Applicability of the Web Interface of Provided Electronic Services

Dominika Koncova^{*}, Iveta Kremenova, Juraj Fabus, Terezia Galovicova University of Zilina, Faculty of Operation and Economics of Transport and Communications, Department of Communications, Univerzitna 1, 01026 Zilina, Slovakia.

* Corresponding author. Tel.: 041 / 513 31 44; email: dominika.koncova@stud.uniza.sk Manuscript submitted November 10, 2020; accepted May 25, 2021. doi: 10.17706/ijeeee.2021.11.4.142-150

Abstract: The aim of the Paper is to inform about necessity of evaluating usability of websites and the tools that are appropriate to be used for it. Paper defines electronic services from different authors and differences that it creates. Paper states useful methodologies, that could be used for such evaluation and subsequently to parse it by using methodology of 360°. Lastly recommended methodology of 360° is then described in subsequential steps necessary for complex analysis. Conclusion states creation of possible information gap created by using this method, that needs further research.

Key words: Electronic service, methodology 360°, usability.

1. Introduction

In recent decades, communication has been shifted from conventional analog form to its digital version. To a certain extent, we use digital communication tools on a daily basis, for example social networks as well as e-mail addresses are used to mediate standard information sharing. These are used to communicate with individual devices, whether computers, smartphones, or some specific devices. However, to do this, one needs to know the programming language to which, particular device, understands. E.g. to communicate with the internet browser, it is necessary to use elements that the selected browser can understand to.

Technology that allows communication between the device, respectively with a specific page, and the person is conveyed by the interface. We can call this interface the web interface. There is known several types of web interface. Communication can be provided between two websites or in the form of communication between the website and the particular user [1].

Communication can be provided not only in audiovisual form but also visually or in the form of audio. For visual communication, it is necessary to provide input and output. In this case, the input is provided by devices such as a computer mouse, keyboard and monitor, and the output on the websites is secured by the websites themselves. Communication can be also provided audio visually through specific applications that provide communication and are able to convert speech to text. The aim of such devices or applications, resp. programs is to make work easier, as well as access to information and to save time, which can make work much more efficient.

The services were also transferred to a binary code environment shared by a common network - by Internet. Previously, the service was understood only as a product that can be procured by coming to a specific place or ordering it, or that the service is carried out by specific person or technology at a specific time under certain conditions. The book Marketing Services understands a service as a product that is provided in order to meet the needs of customers, as well as the needs of service providers and producers. According to this book, the service does not include satisfying one's own needs [2].

1.1. E-Services

"Electronic service is a service provided in electronic form using information and communication means." The electronic service is specified in this way according to the Ministry of Finance of the Slovak Republic [3]. According to Lidinsky (2008), electronic services are divided into three groups:

- electronic services in paper form (e.g. records / transcripts from specific registers) in which the electronic record, which is the original form, is printed in order to meet the applicant's requirements.
- entirely electronic services with a citizen outcome of this form of service are only electronic data (elements such as e-signature, e-stamp, etc. are required for this type of service).
- • entirely electronic services without a citizen these are services that will operate at the level of G2G (government to government i.e. offices or their departments communicate with each other, without further involvement of the citizen) [1], [4].

Electronic services include several types of services. Some of them are listed as follows:

- e-government these are state services that are provided in electronic form for citizens to communicate with different institutions, for example: statements and transcripts from the criminal record, etc.;
- e-healthcare service meant to serve policyholder e.g. for storing electronic forms of health records of individual policyholders;
- e-banking these are services provided by banks in electronic form, e.g. through electronic accounts, etc.
- e-postal services additional services provided to customers using services of postal providers, e.g. Track & Trace (T&T) service for monitoring the location of a specific postal item, or e-stamp this is a version of a regular stamp for legal purposes in electronic form, this e-service can also in some countries include services like e-postal stamps or e-postcards;
- e-commerce services are services provided for the purpose of buying and selling different specified products (goods and services) through electronic networks, for example via Internet;
- e-learning focused on mediating education using information and communication technology;
- e-books are, in reality, ordinary books in electronic, non-printed forms.

Area of operation	E-services	
E-healthcare	Health information networks, electronic medical records, telemedicine services,	
	etc.	
E-tickets	Purchasing a flight ticket, concert ticket, etc.	
E-reservations	Reservation of accommodation, etc.	
E-banking / financial e-services	Electronic payments, loan applications, etc.	
Postal e-services	T&T, e-stamps, e-postal stamps, e-sheet, e-postcard, etc.	
E-government	Tax returns, e-ID, motor vehicle registration, change of permanent residence,	
	etc.	
E-learning	E-libraries, online courses, lectures / tests for	
	download, online exams, etc.	
E-social networking services	E-social networking services	
E-commerce	E-commerce, marketing	
E-services of the entertainment	Tolovicion radio neuronanore online games music movies etc.	
industry	relevision, radio, newspapers, onnie games, music, movies, etc.	
Communication e-services	E-mail, discussion forums, etc.	
Information e-services	Web search browsers, etc.	

Table 1. The Overview of Different Types of e-Services

In Table 1 can be seen few different types of e-services for better understanding of what each category

consists of [5-adapted].

1.2. User Interface

User Interface (the human-machine interface) is part of the device that processes the interaction (communication) of the machine with a human. The physical part of such interaction is provided by the keyboard, computer mouse, touch screen, or so on. In other types of more complex systems human-computer interaction is used to control software [1].

There are three types of user interfaces:

- graphical user interface, in which the user requires the execution of command by selecting or clicking on the icons displayed on the screen.
- programming language, in which it is necessary to know the programming codes necessary for the programming itself.
- a menu interface in which the user selects an appropriate command from a list displayed on the screen [6].

Based on the received inputs, the web user interface produces outputs by generating web pages. These are transmitted over the Internet and displayed to users using a web browser. Newer implementations, for example JavaScript, Java, .Net framework use those languages for outputs [1].

The output devices are monitors or touch screens. These have different screen resolutions (defined by the number of pixels). It is necessary to eliminate the problem in the quality of displaying websites, and an example of this could be the creation of a responsive website. This saves time as well as investments for creating separate applications for each type of output device [7], [8].

1.3. Usability

Adjustment of the usability is a significant problem, as it is necessary to ensure that the usability is maintained and is available at least partially in the first step of use, as it has effect on safety. In many cases, usability has proven to be a significant factor, for example in many domestic and traffic accidents. From the perspective of usability, it is necessary to center all efforts around the user and, based on his supposed abilities and skills, to design individual processes by designers and software programmers [9].

The International Organization for Standardization according to Jordan (1998) defines applicability from ISO as follows: "...the effectiveness, efficiency and satisfaction with which specified users can achieve specified goals in particular environments". According to ISO 9241-11, as part of ISO 9241, which deals with ergonomic requirements for working with visual terminals, usability is defined as: "the extent to which a product can be used by designated users to achieve specified objectives with efficiency, effectiveness and satisfaction in a given context use", with efficiency, effectiveness and satisfaction being further defined [1], [10], [11]."Usability... is a property of the interaction between a product, a user and the task, or set of tasks, that he or she is trying to complete" [9]. Nielsen emphasizes that usability is just one dimension of the user interface [1], [12].

According to Madlenak, important features of e-shops are ensuring accessibility and usability. According to him, it is necessary to ensure practicality for customers to be able to orientate themselves well on the site and to understand the website quickly, and that they subsequently get a good feeling from using such a website [1], [13].

To determine the level of usability that specific interface has achieved, it is necessary to measure the performance as well as the satisfaction of users who work with thisspecific interface. In different contexts, a different product may have different levels of usability. ISO 9241-11 further defines the benefits of usability measurements, whether in terms of users, performance, or satisfaction. Both are measured by the extent in which they can be achieved, as well as the extent in which the product is still acceptable to the user [1].

2. Methodology

Usability can be measured by several methods or tools. Examples of such tools can be user testing, traffic analysis, temperature maps or expert evaluations.

User testing is a qualitative method of providing specific information about users and how they navigate through each website, how they browse the website, how they perform particular tasks, what caused them problems on the site, what information was or wasn't visible to them. By this type of testing, it is possible to solve, for example, remote testing. About the course and the results informs either the volunteer by filling the questionnaire, or specific digital logging of the screen recording.

Another method for measuring the usability could be eye-tracking. In this case, it is a process of monitoring the movement of the eyes and its respective recording. monitoring where the selected person is looking at [1], [14].

A thermal map is a type of visualization technique that depicts a view of a specific image and subsequently creates color maps, with the most watched places that users have looked at. Most watched places are colored red, yellow areas are positions or places that were viewed shorter and blue areas are places where the user spent the minimum time to look at. If the area is gray, there is no response to it in the form of fixation of the view of user [1], [15].

Analytical tools used in marketing, which includes web analytics (e.g. Google Analytics), can also be used to analyze traffic of website frequency access. The SUS method (system usability scale) is a tool for measuring usability. Benchmarking is *"the process of comparing and measuring one's own process performance with comparable processes in selected lead organizations; the purpose is to obtain information where we have deviations that will help the organization identify and implement improvements - it is a comparison with the best"*[16].

The heuristic method is an expert method in which the expert performs an inspection as part of the evaluation. Experts examine and then assess whether the contemplated interface is in accordance with the principles of usability, as part of the design process. The term persona refers to the creation of a fictitious person as a representative surrogate of users [1].

The main goal of the article is to find out whether the 360° methodology is suitable for evaluating the provided electronic services in terms of the usability of the web interface and whether it is complex.

3. Analysis

As electronic services can be understood as services provided on the Internet in various fields, it is necessary to specify the group to which the article will be further devoted. One of the services that is currently very essential is e-learning. This enables state-of-the-art teaching through ICT (information and communication technologies). ICT technologies are already implemented in the processes of teaching or management of education, namely in development and distribution. In addition to the websites themselves, individual schools and educational institutions are setting up their own intranets and portals for education, i.e. e-learning [1], [17].

Before one can build and later use a web interface to access information, it is imperative to create a website for a particular organization, business, or user. This website must meet specific, interdependent requirements in order to be used and for it to have a good quality. It is suitable to be able to move in it intuitively, i.e. to use intuitive navigation. Furthermore, the very appearance of the page, the selection of suitable images and their placement in suitable places, the use of colors, etc., in short, the design of the site.

Another factor is that the website must be sufficiently visible in search browsers. Search Engine optimization is one of the basic tools designed to increase the visibility of a particular website. Visibility or display is a factor that must comply with W3C.org standards, in which visibility depends on whether the

page can be displayed on any and every type of device, e.g. on a desktop computer, tablet, smartphone, etc. This means providing some form of website responsiveness and functionality in different browsers. In addition to the previous factors, the site must be functional in some way and must have some content. The last factor is the security of the website itself [1].

Analytical tools that can be used to determine e.g. traffic and their subsequent analysis is e.g. Google Analytics. According to Galovicova (2017) eye tracking and EEG are not suitable methods for measuring the usability of web interfaces. And since the assumption that the combination of eye tracking camera and EEG (electroencephalogram) technologies can identify the brain's responses to visual perceptions of web interfaces in the provision of specific services, cannot be unequivocally confirmed or rebutted, it is refuted on the grounds that users browse specific websites without focused active thinking. However, this thinking is increased during activities such as e.g. filling in forms, order confirmations, etc.

Table 2. The Usability of Google Analytics Data by Universities			
Universities	Slovak republic	Czech Republic	
Use Google Analytics data	64,30 %	80,00 %	
Doesn't use Google Analytics data	35,70 %	20,00 %	

Table 2 shows responses from selected universities to the question about using Google Analytics data for detection of usability of their websites.

One of the aims of the work dealing with the issue (Galovicova, 2017) was to find out from specific Slovak and Czech universities whether they use Google Analytics to evaluate data within the usability of their websites.



Fig. 1. SUS evaluation results from students to websites of universities.

As is showed at Fig. 1, average level of usability of universities websites is set at 60.36 points. According to methodology SUS all results under the level of 68 points means level of usability is below the average. Only 6 of 29 websites belonging to Slovak universities shown in research the level of usability above the average of 68 points [1]. The usual evaluation of those websites is framed between 35 to 85 points. 52 to 72 points in the usability rate have reached 20 schools. The SUS (System Usability Scale) method is aimed at finding satisfaction, in this case in high school students with the websites of universities and colleges in Slovakia, which are their potential future place of study[14], [18].

It is suitable to involve, within the 360° methodology, benchmarking, which must be performed on a

specific time basis, e.g. semi-annually, annually. This is a benchmarking that must be compared with the previous evaluation.



Fig. 2. Methodology 360° (Source: [1] adapted).

Fig. 2 shows diagram of particular methodology 360° that was created to fill up the information gap of usability evaluation. Individual steps that are needed to undertake, while using this methodology are integrated, step by step, one after the another in this specific diagram. As the diagram depicts, it is needed to set targeted groups whereas abiding by set goals. After that it is needed to create 'persona' where it is needed to fill up required information. After that it is needed to perform remote user testing, that is highly individualized. After this step satisfaction rating of SUS is needed to incorporate as well as heuristic evaluation. Last step of this methodology holds benchmarking. This step must be performed periodically.

To set a design of a website it is necessary to complement it with an understanding of its purpose. Therefore, it is important to determine the purpose and goals of the selected website. The website is used for: creating an image of the organization, building a brand, providing basic information about the organization, influencing decision-making, communication with the customer and so on. Similarly, are goals and purpose of website used for universities. The goal of such a website can be, e.g. purpose of increasing website traffic by specified amount in the specified timeframe.

Each target group has a specific group of needs and interests that the website must meet according to them. To understand these needs and interests, it is fundamental to personalize the target groups. This can be done by creating "*persona*". It is needed to remark, that it can be relevant to also create persona of future user.

User testing implemented in this methodology shall provide information about the way users work on the site, how they navigate through website, how they perform particular tasks, which of them caused problems to users, what information were visible, or what they couldn't find. To get an overview of user satisfaction or dissatisfaction with the website, it is vital to use the System Usability Scale (SUS) tool.

After that it is necessary to evaluate collected data according to predefined checklist. Here, data from Google Analytics could be very well be implemented for evaluation [1].

Furthermore, it is necessary to compare the collected data with the evaluated area average and also compare the collected data with the interface, with the highest evaluated usability in the given area. However, it is also necessary to accept the revelation of all possible situations that arise due to the uniqueness of the thought processes of individual users [19].

These are directly given by their knowledge, experiences, previous knowledge of the interface environment, the goal of obtaining information from specified website, or the mood of the user. Therefore, it is necessary to include in the 360° methodology evaluations according to the SUS methodology, which evaluates the satisfaction of website visitors [1].

4. Conclusion

The evaluation of the proposed 360° methodology can be characterized as positive. Three of the seven respondents consider the proposed methodology to be comprehensive and beneficial. Based on the above evaluations, it is possible to assume that the proposed methodology will be suitable for determining the usability of the website by individual users.

Before applying the methodology in practice, it is necessary to consider the attitude of a particular institution or organization that the website belongs to. For a particular institution, it is necessary to determine whether users' consideration of the usability of the website is sufficient to further improve the design of the website or to select which information the institution needs and which doesn't. From this point of view, an information gap emerges, which, however, solely depends on the organization that would like to use this methodology in this context. It can be said, this methodology needs ability to be changed dynamically.

Any other pros or cons of methodology can be assumed only after implementing methodology of 360° into practice, that can show not only cons of methodology itself, but also its understanding by individuals commissioned to evaluate data of usability.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

All authors contributed to this Paper. Galovicova Terezia conducted the research, Koncova Dominika wrote the paper, Kremenova Iveta analyzed information and conducted secondary research for writing this Paper and Fabus Juraj processed references into defined form and checked linguistic side of the Paper. All authors had approved the final version of the Paper.

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References

- [1] Galovicova, T. (2017). The proposal of the methodology for usability evaluation of web interface of provided electronic services. Published graduate dissertation, University of Zilina, Zilina.
- [2] Cibakova, V., Cibak, L., & Rosza, Z. (2014). Marketing of services. *Smart Mailbox as a Postal Network Contact Point*. Published graduate diploma thesis. Zilina: EDIS.
- [3] Ministry of Finance of the Slovak Republic. Methodical instructions for the use of technical terms for the field of informatization of society. (2006). The proposal of the methodology for usability evaluation of web interface of provided electronic services. Published graduate dissertation, University of Zilina,

Zilina.

- [4] Lidinsky, V. (2008). Electronical services of e-Government. *Ministry of the Interior of the Czech Republic*.
 Retrieved November 6, 2020, from the website: https://www.mvcr.cz/clanek/elektronicke-sluzby-egovernmentu.aspx
- [5] Taherdoost, H., Sahibuddin, S., & Jalaliyoon, N. (2013). E-services usage evaluation, Applications' level of co-creation and digitalization. *Asian Academic Research Journal of Multidisciplinary*, *2*(*1*), 10-18.
- [6] Business Dictionary. (2015). Retrieved November 6, 2020 from the website: http://www.businessdictionary.com/definition/user-interface.html
- [7] Galovic, M. (2008). The proposal of creating of the user-oriented web applications. Published graduate dissertation, University of Zilina, Zilina.
- [8] (2015). What is a responsive design? *Webygroup*.
- [9] Jordan, P. W. (1998). An Introduction to Usability (1st ed.). London: CRC Press.
- [10] Galovicova, T., & Kremenova, I. (2016). E-learning of the University of Zilina in Zilina by the eyes of users. *UNINFOS 2016*.
- [11] *ISO* 9241-11. Retrieved November 7, 2020 from the website: https://www.iso.org/obp/ui/#iso:std:iso:9241:-11:ed-2:v1:en
- [12] Nielsen, J., & Landauer, T. K. (1993). A mathematical model of the finding of usability problems. *Proceedings ACM/IFIPINTERCHI'93 Conference* (pp. 206-213). Amsterdam, The Netherlands.
- [13] Madlenak, R., & Vaculik, J. (2009). *Electronic Business*. Zilina: Zilinska univerzita.
- [14] Tothova, D., & Galovicova, T. (2018). Websites of Slovak universities. International Scientific Days.
- [15] SMI. (2009). BeGaze 2 Manual, version 2,3. The Proposal of the Methodology for Usability Evaluation of Web Interface of Provided Electronic Services. Published graduate dissertation, University of Zilina, Zilina.
- [16] Benchmarking. (2015). *Euroekonom.sk*. Retrieved November 7,2020, from the website: https://www.euroekonom.sk/manazment/strategicky-manazment/benchmarking/
- [17] Kvasnicova, T. & Kremenova, I. (2015). Comprehensive evaluation of the usability of university websites. *Posta, Telekomunikacie a Elektronicky Obchod*.(II/2015). (pp. 31-40).
- [18] Galovicova, T., Kremenova, I., & Fabus, J. (2016). Usability evaluation of university websites. *EUNIS*.
- [19] Kvasnicova, T., Kremenova, I., Babusiak, B., & Fabus, J. (2016). Ecommerce user experience: Do we feel under pressure during online shopping? *Proceedings of the 20th World Multi-Conference on Systemics, Cybernetics and Informatics (WMSCI 2016)* (pp.41-44). Orlando, USA.

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Dominika Koncova was born in Bojnice, Slovakia in 1994. She studied at University of Zilina in the field of study transport, which was finished by obtaining the degree engineer in 2020 at Faculty of Operation and Economics of Transport and Communications, University of Zilina in Zilina, Slovakia. She is currently studying at University of Zilina as 1st year postgraduate student in the field of study transport.



Iveta Kremenova is a university lecturer at the Department of Communications, Faculty of Operation and Economics of Transport and Communications, University of Zilina, Slovakia. She has been working at the University of Žilina since 1992 as a university lecturer. In the period of 2003 - 2016 she has been the Head of the Department of Communications. Within the study programs Ecommerce and

Management and Postal Engineering she provides lectures in Business Management, Project Management and Management Information Systems. She is a member of EUNIS- European University Information Systems organization. She is the tutor of 2 external PhD. students and one full time PhD. student in the fields of study Branch and Sector Economy and Transport. Her research areas are innovative methods and SMART Learning Technologies as well as substitution services by e-commerce.



Juraj Fabu is a university teacher at University of Zilina in Zilina at Faculty of Operation and Economics of Transport and Communications who specializes in electronic education (e-learning), information and communication technologies, data analysis, social networks and company informatization. In addition, he is also a project manager for multiple intranet / internet applications and central registries. He is actively interested in the startup scene.



Terezia Galovicova is a successful graduate of doctoral studies with doc. Quartz. She began her doctoral studies in 2014 and completed it by passing the state dissertation examination in 2017 in the field of sectoral and cross-sectional economics at the University of Žilina in Zilina. She is currently on maternity leave.