# Comparative Analysis of Information Usefulness Evaluation Methods on Business Internet Services*

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 **Abstract:**

**Purpose:** *The article presents the usefulness issues of presented information on information and business internet services. The article presents a comparative analysis and an applicability analysis of information usefulness evaluation methods for textual and graphic forms of content presentation on the example of business internet services.*

**Design/Methodology/Approach:** *The study describes the basic methodological assumptions, the research evaluation procedure of information usefulness and various forms of informational content presentation, and also the results of data analysis from the study conducted on a group of respondents. In order to determine the factors, that have the greatest impact on information usefulness evaluation of various forms of content presentation, the data obtained from the study using various methods such as online questionnaire, usability testing and heuristic analysis were compared and subjected using multi-criteria SAW method.*

**Findings:** *Results of research presented in the article can be useful in creating assumptions for ways of content presentation and visualization on websites and continuous improvement of their functional quality and also consequently on the perception by customers, sellers and owners of these websites.*

**Keywords:** *Information usefulness, textual and graphic forms of content presentation, online questionnaire, usability testing, heuristic analysis, methods triangulation, multi-criteria SAW method.*

**JEL classification:** *D8, L15, L86.*

**Paper Type:** *Research study.*

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## 1. Introduction

The popularity and enormous interest in business websites among Internet users has been never at such a high level as in the 21-st century. This is due to several factors, including continuous development of information and communication technologies, more and more common access to high-speed Internet, development of advanced network products and services or increasing number of companies and institutions available online. A business website is defined as a technologically advanced solution, that integrates distributed applications as well as information and knowledge resources to better conduct business activities (Afuah and Tucci, 2003). Therefore, first such websites should be the most useful, functional, and accessible to their users. Unfortunately, ensuring high-quality of website usability, like any other software product, is not an easy task and usually requires compliance with a specific software development process focused on the user's needs as well as continuous testing and evaluation of its usability (Nielsen and Loranger, 2006).

According to the ISO 9241-11 standard, web usability defines the extent to which the website can be used by specified users to achieve specified goals in a specified context of use (ISO 9241-11 standard). According to Jakob Nielsen, one of the world's most famous experts, the web usability is one of the basic criteria for its technical and functional quality (Nielsen, 1993; Norman and Draper, 1986). The information usefulness collected on the website is several different criteria, that should be characterized by information content to be accessible, up-to-date or understandable for recipients. The evaluation criteria of information usefulness for their suitability for a user, may be features, such as: accuracy, veracity, timeliness, completeness, reliability, adequacy, form, frequency of use, scope, coherence, source, time horizon, etc. (Nowakowski, 2018; 2020; Sarmento, 2004).

On the other hand, the philosophy that considers usability guidelines in the process of creating a website is the user-oriented design concept known as the UCD (*User-Centered Design*). This design philosophy provides guidelines to be incorporated into the software development lifecycle and dictates a constant focus on the desires, needs and limitations of the user in order to provide him the best possible final product (Sharp, Rogers, and Preece, 2005). A software, designed in accordance with the UCD philosophy, should be created according to successive stages, and after each completed cycle, it should be repeated and supplemented with user feedback. The stages of the UCD process are as follows: 1) research, 2) conceptualization, 3) design, 4) development, 5) implementation, and 6) testing (Dix, Finlay, and Abowd, 2004). Two areas of websites design are also strongly associated with the UCD concept, such as the UX (*User Experience*) - that is the whole experience received by the user in communication with the product and the UI (*User Interface*) - that is the visual middleware in communication between user and device (Ritter and Winterbottom, 2017).

The main objective of the article is a comparative analysis and an applicability analysis of selected methods for evaluation of the information usefulness in terms of the overall quality and usability of textual and graphic content for end users on the example of three selected business websites. The main objective of the study was analyzed and evaluated on the basis of: online questionnaire (quantitative analysis), results of the activities and behaviors of respondents carried out using the usability testing (qualitative analysis) and evaluation results by selected experts carried out using the heuristic analysis (expert analysis) within the selected websites.

The comparative analysis of selected usability evaluation methods consisted in comparing the test results for different configurations of methods depending on the approach to their classification. In this way, the following four groups of methods were created: 1) the quantitative group (one method: online questionnaire), 2) the qualitative group (one method: usability testing), 3) the expert group (one method: heuristic analysis) and 4) the triangulation group (combined three methods: online questionnaire, usability testing and heuristic analysis). The purpose of creating the above groups was the applicability analysis of individual usability evaluation methods, depending on whether they are applied in the form of a single method (groups 1, 2, 3) or in the form of several different combined methods (group 4).

All the services were analyzed in terms of selected criteria, which were examples of qualitative heuristics of content usability for internet services in terms of quality, cognition, information usefulness and user experience. The results obtained from the study were analyzed using the multi-criteria SAW method, in order to create a ranking of selected usability evaluation methods and to compare their applicability to information usefulness evaluation on business websites.

## 2. Literature Review

In the literature on the subject, there are several different approaches for classification the websites usability evaluation methods depending on meaning, measurement method and type of collected data.

According to the quantitative approach, the quantitative methods of UX/UI research are experimental methods, which based on precise measurements during data collection and analysis, using various statistical indicators and looking for cause-and-effect relationships. They are used, in most situations, at the final stages of project implementation and operation, because they require a working website or its prototype, that can be tested on users. These methods require the participation of a relatively large number of representative participants (a group of at least about 50 people), who should be randomly selected, so that the results are accurate (Silverman, 2005). Quantitative methods usually allow obtaining large amounts of numerical data, indicating the scale of a phenomenon or the number of individuals, who have contact with it. The purpose of these methods is to verify assumptions,

find universal regularities, generalize results and evaluations, create summaries, and present them in the form of numbers, calculated results, statistics, tables or charts. In these methods, the users are the source of knowledge about the website usability (Norman and Lincoln, 2017; Rubin and Chisnell, 2008).

The quantitative methods of usability analysis and evaluation examples include, among others: traditional and online questionnaires (surveys and interviews), card sorting, sentiment analysis, analysis of traffic statistics on the website, analysis of clicktraking statistics, analysis of server logs, usage data or A/B tests (Budiu, 2017; Ritter and Winterbottom, 2017; Rubin and Chisnell, 2008).

According to the qualitative approach, the qualitative methods of UX/UI research are exploratory methods, which based on descriptive observations during data collection and analysis, using various insights and thoughts and looking for detailed information about regularities, patterns or trends. They are mostly used in the initial stages of a project during research and conceptualization because they generally concern when and how different processes should be carried out. These methods require the participation of a relatively small number of participants compared to quantitative methods (approx. 5-10 people), who should be selected individually and non-randomly depending on the context and research needs to make the conclusions credible (Silverman, 2005). Qualitative methods provide less, but more detailed information, in the form of words, pictures or videos, that show how and why a given phenomenon occurs. The purpose of these methods is a soft and qualitative approach, creating recommendations, understanding detected trends, formulating insights, and presenting them in the form of words, quotes, pictures, videos, stories, or diagrams. In these methods, as in the case of quantitative methods, the users are the source of knowledge about the website usability (Norman and Lincoln, 2017).

The qualitative methods of usability analysis and evaluation examples include, among others: observations of users, ethnographic research, interviews, cognitive walkthrough, analysis of opinions, assessment of preference, focus groups, diary research, tasks analysis, card sorting, usability testing, user feedback or eye-tracking (Budiu, 2017; Ritter and Winterbottom, 2017; Rubin and Chisnell, 2008).

According to the expert approach, the expert methods of UX/UI research are analytical methods, which based on group assessment made by specialists in a selected field, that is the so-called experts. These methods use the opinions and assessments of various people (experts, professionals and non-professionals) involved in solving a given problem, finding facts and relationships between them and formulating their own unfettered judgments and proposals for solutions (Nielsen and Loranger, 2006). Application of expert methods to assess the usability of IT products most often consists in determining the degree of compliance of the product with recognized design principles, guidelines, requirements, or other evaluation criteria. In these methods, as opposed to quantitative and qualitative methods, the

experts are the source of knowledge about the website usability (Allen, Currie, and Bakken, 2006; Nielsen, 1994).

The expert methods of usability analysis and evaluation examples include, among others: heuristic analysis, actions analysis, inspections and reviews, comparative assessment, cognitive walkthrough, or group discussion (Leise, 2007; Ritter and Winterbottom, 2017).

According to the approach taking into account the stage of website development, in which its evaluation is carried out, three groups of usability evaluation methods can be distinguished, such as: summative evaluation, formative evaluation and interpretative evaluation (Stufflebeam and Coryn, 2014). The purpose of the summative evaluation is the possibility of obtaining the quality assessment of the functioning website, qualifying it for collection or rejection and comparing it with competing websites. In turn, the purpose of formative evaluation is to improve the website and to obtain information on the possibility of improving its usability at various stages of its creation. On the other hand, interpretative evaluation consists in drawing conclusions based on selected website assessments, which are to be used to explain the mechanism of a certain phenomenon (Joyce, 2019; Sharp, Rogers, and Preece, 2005).

## 3. Materials and Methods

The research problem of the article is a comparative analysis and an applicability analysis of selected methods for evaluation of the information usefulness based on the example of three selected online business websites with the use of selected research methods. The evaluation of information usefulness was focused mainly on available informational content and various forms of information presentation and visualization, such as: text, graphics, images, charts, and infographics.

The research entity survey conducted in June 2019 was 38-persons group of respondents, which was selected for the study by the targeted selection method and fully represented secondary education. All respondents were students, most of them graduated from high school (76%) and the other from technical high school (24%). The sample size was considered as statistically representative due to the specificity of the study related to the website's usability evaluation. All respondents represented the same age group of young people aged 18-22 years old. Among the respondents, the majority were women (82%), and the remainder of men (18%). From the answers obtained from respondents it can be concluded that exactly everyone (100%) uses the Internet several times a day. The most popular form of communication with the Internet among respondents were mobile devices (97%) and stationary devices like laptops (42%) and to use the desktop computers (13%) and tablets devices (3%) admitted a significant minority of them.

The research object were three different Polish-language internet services with the possibility of content reading and browsing and online shopping. To the study there were selected the services based on the first search results obtained in the Google search engine, where the range of search pages related to one selected topic (Google website). Selected websites were characterized by various forms of information content presentation on a selected topic, such as:

- Site-1: textual content combined with images, icons, charts and infographics;
- Site-2: textual content combined with images, full product specification and possibility of making software online purchases;
- Site-3: textual content combined with images and possibility of comparing several products for popular specifications in the form of a table.

The research thematic scope there was a group of electronic devices such as smartphones, which popularity in society in recent years is much higher than traditional mobile phones and still growing. The smartphone is a portable and multimedia electronic device, that combines the functions of a mobile phone and a laptop computer. The smartphone has a small size, is equipped with a touch screen and internal memory, has built-in cameras and an operating system with extended functionality (Wikipedia website).

Due to the fact, that the research problem of the article was a comparative analysis and an applicability analysis of selected methods for evaluation of the information usefulness, several methods were selected for this purpose, characterized by a different approach to data collection (users versus experts) and giving different forms (numerical versus descriptive) and levels of detail of the output data (quantitative versus qualitative). For the purpose of this publication, to evaluate the information usefulness for the forms of text and graphic content presentation in selected websites, the following methods were used: questionnaire method (Gillham, 2008; Ritter and Winterbottom, 2017), usability testing (Rubin and Chisnell, 2008; Tullis and Albert, 2008), heuristic analysis (Nielsen and Loranger, 2006) and triangulation of these methods (Modell, 2005).

Triangulation is a social science technique for ensuring the validity and quality of research by incorporating different methods into a research plan. Using of various methods reduces the effect of the deficiencies of individual methods and the data collected in this way is more detailed, accurate and reliable (Ittner and Larcker, 2001; Ritter and Winterbottom, 2017). According to Denzin, triangulation is a cross-evaluation tool, where two or more different methods turn out to be compatible, which leads to obtain comparable results for solving a research problem (Denzin, 1978). In addition, triangulation allows for the minimization of imperfections and shortcomings of individual research methods used separately and to maintain the reliability and accuracy of inference, ensuring the credibility of research results (Jick, 1979).

## 4. Results

An online survey was carried out to collect data from respondents, which consisted in evaluating selected criteria by performing simple and successive tasks. All of the tasks were evaluated by respondents on a slightly extended Likert scale for values from 0 (lack or lowest rating) to 5 (highest rating), based on the level of satisfaction and usability fulfillment of specific qualitative and impression criteria for content on selected internet websites (Likert, 1932). Then, data analysis was performed for a specific research problem. For this purpose, the list of 15 examined criteria of information usefulness evaluation was divided into three, equal in quantity, structures depending on the approach to their classification on: quantitative criteria, qualitative criteria, and expert criteria. Each of the created structures contained a list of individual criteria, the significance values obtained for them according to the respondents (weight) and the results of the study. The analysis of data obtained in the study for individual criteria consisted in calculating the arithmetic mean value for these criteria, and then normalizing the data thus obtained. Similar mathematical operations were performed in relation to the weight values for individual criteria, which were obtained from respondents during the initial part of the survey. The operation of analyzed data normalizing is a procedure often used in science to unify various forms of data into a common and comparable form (Nermend, 2013; Piwowarski, Miłaszewicz, and Łatuszyńska, 2018).

The next step was the presentation of the results of the data analysis carried out for a specific research problem. Symbols of the quantitative criteria (*QnC-1, QnC-2,…, QnC-5*), a list of individual quantitative criteria tested using the Internet questionnaire method, obtained weight values within the structure and total for these criteria and values obtained from the survey after data analysis for three analyzed websites (*Site-1, Site-2, Site-3*) are presented in the following Table 1.

**Table 1.** *Structure of individual quantitative criteria of information usefulness evaluation and obtained results from the survey.*

| Symbol | The name of the criterion | Weight of criterion within the structure (*W-S*) | Weight of the criterion as a whole (*W-C*) | Data from survey study Thematic websites | | |
|---|---|---|---|---|---|---|
| | | | | Site-1 | Site-2 | Site-3 |
| QnC-1 | Ease and convenience of reading textual and graphic content of the article | 0.23 | 0.0769 | 0.75 | 1.00 | 0.87 |
| QnC-2 | Level of remembered information from the article | 0.18 | 0.0598 | 0.75 | 0.87 | 0.62 |
| QnC-3 | Level of new information acquired from the article | 0.18 | 0.0598 | 0.50 | 0.75 | 0.62 |
| QnC-4 | Availability and accessibility of all textual and graphic content on the website | 0.21 | 0.0684 | 0.87 | 1.00 | 0.75 |
| QnC-5 | Information completeness of all textual and graphic content on the website | 0.21 | 0.0684 | 0.87 | 0.87 | 0.87 |

*Quantitative criteria of information usefulness evaluation* appears in the Symbol/name header cell.

**Source:** *Author's calculations.*

Symbols of the qualitative criteria (*QlC-1, QlC-2,…, QlC-5*), a list of individual qualitative criteria tested using the usability testing method, obtained weight values within the structure and total for these criteria and values obtained from the survey after data analysis for three analyzed websites (*Site-1, Site-2, Site-3*) are presented in the following Table 2.

**Table 2.** *Structure of individual qualitative criteria of information usefulness evaluation and obtained results from the survey.*

| Symbol | The name of the criterion | Weight of criterion within the structure ($W$-$S$) | Weight of the criterion as a whole ($W$-$C$) | Data from survey study | | |
|---|---|---|---|---|---|---|
| | | | | Thematic websites | | |
| | Qualitative criteria of information usefulness evaluation | | | Site-1 | Site-2 | Site-3 |
| QlC-1 | Types of feelings and emotions accompanying while reading the article | 0.17 | 0.0571 | neutral - 3/5 | neutral - 3/5 | neutral - 3/5 |
| QlC-2 | Adjusting the amount of textual content to the amount of graphic content in the article | 0.17 | 0.0571 | adequate - 3/5 | adequate - 3/5 | adequate - 3/5 |
| QlC-3 | Level of new knowledge by reading the article | 0.23 | 0.0762 | yes and no - 3/5 | yes - 5/5 | yes - 4/5 |
| QlC-4 | The substantive quality for textual and graphic content in the article | 0.20 | 0.0667 | average - 3/5 | high - 4/5 | average - 3/5 |
| QlC-5 | The quality of forms of information presentation for textual and graphic content in the article | 0.23 | 0.0762 | average - 3/5 | high - 4/5 | average - 3/5 |

*Source: Author's calculations.*

Symbols of the expert criteria (*ExC-1, ExC-2,…, ExC-5*), a list of individual expert criteria tested using the heuristic analysis method, obtained weight values within the structure and total for these criteria and values obtained from the survey after data analysis for three analyzed websites (*Site-1, Site-2, Site-3*) are presented in the following Table 3.

**Table 3.** *Structure of individual expert criteria of information usefulness evaluation and obtained results from the survey.*

| Symbol | The name of the criterion | Weight of criterion within the structure ($W$-$S$) | Weight of the criterion as a whole ($W$-$C$) | Data from survey study | | |
|---|---|---|---|---|---|---|
| | | | | Thematic websites | | |
| | Expert criteria of information usefulness evaluation | | | Site-1 | Site-2 | Site-3 |
| ExC-1 | The level of multi-significance knowledge in the content of the article | 0.18 | 0.0614 | 0.75 | 0.87 | 0.75 |
| ExC-2 | Effectiveness of information transfer of the article | 0.21 | 0.0702 | 0.87 | 1.00 | 0.75 |
| ExC-3 | Performance of gaining new information on a selected topic in the article | 0.21 | 0.0702 | 0.75 | 0.87 | 0.75 |
| ExC-4 | The amount of distracting elements on the website that distracts the proper access to the information contained in the article | 0.18 | 0.0614 | 0.71 | 0.71 | 0.83 |
| ExC-5 | Usefulness of the entire content of the article in the future | 0.21 | 0.0702 | 0.62 | 0.75 | 0.75 |

*Source: Author's calculations.*

## 5.  Discussion

The purpose of the data analysis was to verify the thesis, that the combined use of several different methods, in the form of their triangulation, will allow for better results and a higher level of overall applicability, than using only one method. As a result of the data analysis the results were obtained, which the author of the article decided to interpret in four different ways in order to compare them and clearly determine, which of the four groups of information usefulness evaluation methods are the most useful and allow for the most complete usefulness evaluation.

Therefore, in the processes of data analysis and interpretation for the goals set in the study, the multi-criteria SAW method was used, which is based on an additive linear function (Churchman and Ackoff, 1954; Trzaskalik, 2014). According to the procedure of the SAW method in relation to the analyzed source data, the so-called stimulants, that is profit criteria, and the so-called de-stimulants, that is cost criteria, have been additionally applied. Almost all the criteria analyzed in the study played stimulants role, which means, that the higher the values the better. The only criterion of a de-stimulant nature was one of the expert criteria (*ExC-4*), which means, that the lower the values the better (Saaty, 1996).

As it results from the comparative data analysis using the multi-criteria SAW method, for sum values from all three analyzed business websites (*S-123*), all of the analyzed groups of information usefulness evaluation methods were characterized by a slight variability of the obtained results, which still meant their relatively high level of quality. In addition, the obtained results and the order of individual groups of information usefulness evaluation methods in the ranking seem to be quite obvious, except for the triangulation group, which due to the main subject of the study, was just being verified.

The range of obtained values within each of the four groups of methods varied in the range from about 66% (minimum value) to 80% (maximum value) of the ideal rating value. The average value of applicability for all groups of methods was 75%. Such a small range of the obtained results for the studied groups of methods means a moderately different level of the applicability (perfection), achieved by these methods, in the information usefulness evaluation of business websites.

The results obtained from data analysis using the multi-criteria SAW method for individual groups of information usefulness evaluation methods are presented in the following Table 4 and in the Figure 1.

**Table 4.** *The ranking of groups of information usefulness evaluation methods after data analysis using the multi-criteria SAW method.*

| Symbol | Group of information usefulness evaluation method | Information usefulness evaluation methods assigned to the group | Position of the method's group in the ranking | Results from data analysis | | | |
|---|---|---|---|---|---|---|---|
| | | | | Site-1 (*S-1*) | Site-2 (*S-2*) | Site-3 (*S-3*) | The sum of values for the group (*S-123*) |
| Qn-G | The quantitative group | Online questionnaire | 1 | 0.76 | 0.91 | 0.76 | **2.4231** |
| Ex-G | The expert group | Heuristic analysis | 2 | 0.74 | 0.85 | 0.77 | **2.3542** |
| Tr-G | The triangulation group | Online questionnaire, Usability testing, Heuristic analysis | 3 | 0.70 | 0.84 | 0.72 | **2.2667** |
| Ql-G | The qualitative group | Usability testing | 4 | 0.60 | 0.78 | 0.65 | **2.0229** |
| | **The sum of values for each site** | | | **2.7998** | **3.3728** | **2.8942** | |

***Source:*** *Author's calculations.*

**Figure 1.** *The ranking of groups of information usefulness evaluation methods from the lowest to the highest rated after data analysis using the multi-criteria SAW method.*
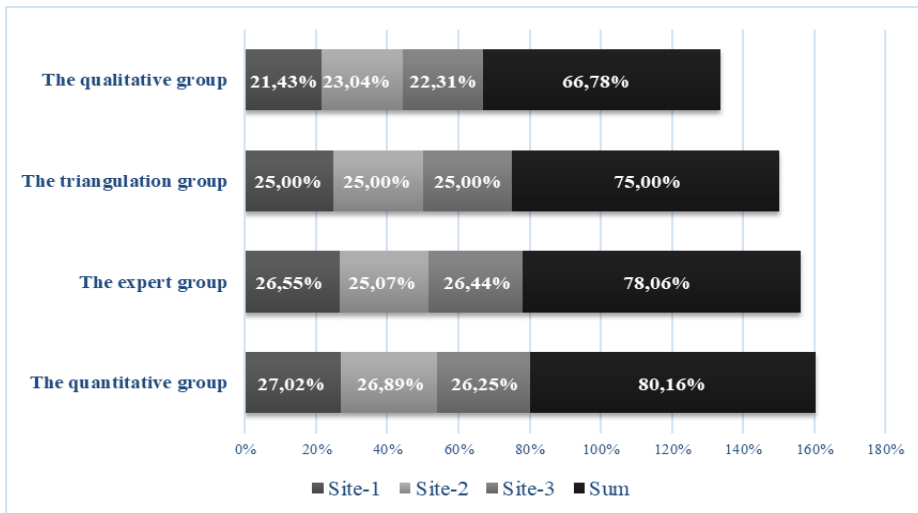


***Source:*** *Author's calculations.*

The highest final grade at the level of 80,16% and simultaneously the highest level of applicability obtained the group of quantitative methods (*Qn-G*) and represented online questionnaire method. This method obtained a result slightly above the average value, and it was less than 20% of points below the ideal value. The final result obtained by this method should rather not be surprising, because quantitative methods in assessing the quality and level of websites usability are used very often and in the first place, due to the ease, speed and low costs of their use, and a relatively wide range of feedback received by them. At the second position, with a

slightly lower value of 78,06%, there was the group of expert methods (*Ex-G*) and represented heuristic analysis method. This method also obtained a result slightly above the average value, and it was less than 22% of points below the ideal value. The final result obtained by this method is completely legitimate, because expert methods, on the one hand, join common features of quantitative and qualitative methods in terms of the characteristics of the analyzed data, and moreover, they have been successfully used for many years to evaluate websites usability by using easily usable heuristics.

The third-ranked group, with a value of 75,00%, turned out to be the group of various methods triangulation (*Tr-G*) and represented the following three combined methods: online questionnaire, usability testing and heuristic analysis. This group was the only one in the study, which included as much as 15 information usefulness criteria and properly normalized weights for them (*W-C*), which had different values, than the weights for the other groups of methods (*W-S*). Together, these methods obtained the result exactly at the level of the average value, and they missed the ideal value by 25% of points. The result of the total applicability level obtained by the group of methods triangulation was one of the main goals and research problems of this work and clearly showed, that simultaneous use of several different usability evaluation methods does not always have to mean the highest level of their total applicability.

Nevertheless, as it results from the obtained results, an encouraging premise to use triangulation of methods may be the fact, that this group obtained higher values than the minimum values and it was significantly close to the maximum values. Of course, this result does not have to mean unequivocally, that triangulation of methods in the usability evaluation will not bring the expected results in other studies, because the effect of combining several methods depends on many factors, such as: a method of data analysis and interpretation, a structure of the criteria in the form of stimulants and de-stimulants or a number of analyzed criteria within individual usability evaluation methods. The last group in the ranking, with a value of 66,78%, turned out to be the group of qualitative methods (*Ql-G*) and represented usability testing method.

This method obtained a result much lower than the average value, and it was less than over 33% of points below the ideal value, which was a significantly weaker result compared to other groups of methods. The final result obtained by this method, as in the case of the quantitative method, should not be too surprising, because the qualitative methods, that are usually used as a supplement to other methods (e.g. quantitative) and their actual significance takes place only during more detailed data analyzes of an exploratory nature. On the other hand, although the application of the qualitative method for the usability evaluation gave a comparatively the lowest level of this method applicability, however the obtained

value at the level of over 60% of the total applicability may still prove its adequate effectiveness.

## 6. Conclusions

The conducted research of a comparative analysis and an applicability analysis of selected usability evaluation methods, for selected qualitative heuristics of information usefulness for business websites, showed the importance to use various types of methods and to combine them with each other in the process of comprehensive evaluation of the quality and usefulness level of textual and graphic content for end users. The comparative data analysis using the multi-criteria SAW method shows, that the highest degree of applicability at the level of about 80% of the ideal grade value, achieved groups of quantitative and expert methods, along with the methods of online questionnaire and heuristic analysis assigned to them.

At a slightly lower level, with the degree of applicability equal to exactly 75% of the ideal grade value, there was the group of methods triangulation, which combined the use of three different types of methods, such as: online questionnaire, usability testing and heuristic analysis. The lowest values, but still at a relatively high level of applicability, equal to about 67% of the ideal grade value, was the group of qualitative methods with assigned to it usability testing method. The results confirm the high level of applicability, used in the study, the popular usability evaluation methods for websites, regardless of the fact whether they are used in a single or combined form (triangulation).

Another conclusion of the study is the fact refuting the thesis put forward in the article, that the combined use of several different methods, in the form of their triangulation, will allow for better results and a higher level of overall applicability, than using only one method. Unfortunately, it was not possible to confirm the thesis about the overwhelming advantage of using several different methods compared to using only one selected method. This situation, according to the author of the article, seems to be a bit unclear, because logically assuming, the assessment of the usability level for selected criteria using several different types of methods should allow for more comprehensive results in the form of both general and detailed information on the overall level of a given website usability.

However, this fact could have been influenced by many different factors and it is not clearly stated, that the same situation would also apply in any other cases. The various factors, that could disprove the thesis put forward, may include: the types of selected methods for usability evaluation, the method of conducting the study and types of collected data, the amount of analyzed criteria within each usability evaluation methods as well as the types and kinds of used methods for data analysis and interpretation. Nevertheless, the use of methods triangulation in one of the cases

gave a positive effect and the obtained level of applicability turned out to be higher, than in the case of using only one of them.

In conclusion, it can be said, that all the compared usability evaluation methods have proved successfully in practice, achieving high levels of applicability for the analyzed data. Business services assessed by the respondents also obtained high quality results in terms of individual information usefulness criteria. Although, used methods triangulation did not meet the expectations, it still achieved a satisfactorily high level of applicability.

Further research on the information usefulness with the use of various types of usability evaluation methods could be carried out towards: a bigger amount of considered information usefulness criteria, a verification of the obtained results for a different amount of criteria assigned to individual methods, an applicability verification of other selected methods for the usefulness evaluation or an applicability verification of other methods for analyzing the final results. The additional idea of the author is to assign additional criteria to the methods of usability evaluation, related to their characteristics, thanks to which the data obtained from respondents could be additionally supplemented with specific features of individual methods. These criteria could create the applicability factor of methods, based on conditions such as, for example: ease of use of the method, costs of using the method, tools and devices needed to apply the method or the minuteness of data obtained thanks to the method.

Making research about a comparative analysis and an applicability analysis of usability evaluation methods for the purpose of business websites evaluation, it is fully justified from the theoretical and practical point of view, because as shown in the article, they have an impact on the continuous improvement of the utility quality level, and consequently also on the perception of them by customers, sellers and owners of websites.

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