Analysis of Models Usability Methods Used on Design Stage to Increase Site Optimization

Iryna Gruzdo[1], Iryna Kyrychenko[1], Glib Tereshchenko[1] and Oleksandr Shanidze[2]

[1] *Kharkiv National University of Radio Electronics, Nauky Ave. 14, Kharkiv, 61166, Ukraine*
[2] *National Technical University "KhPI", Kyrpychova str. 2, Kharkiv, 61002, Ukraine*

Abstract

The analysis of existing usability models and methods used in the design and analysis of software (SP) is carried out, thanks to which you can choose the desired type of methods (quantitative or qualitative). The issues of how best to build a site structure are considered. An experiment was performed on the example of the selected site. During the experiment, its shortcomings and miscalculations were identified that were made in the process of its design and recommendations were provided in accordance with the analyzed models and methods of designing and analyzing interfaces.

Keywords

Search engine optimization, site, user, method, statistical text analysis, usability, design, evaluation, site structure, information, data visualization

1. Introduction

General characteristics of the problem. The main task today, facing developers, designers and designers is the development of high-quality software, which is popular and aesthetically attractive to the user, and this is the main requirement when developing native design according to the principles of Material Design (MD). To build a high-quality interface solution, it is not enough just to operate with knowledge of the development of interfaces or applications, to know and be able to apply about basic principles of design. It is also necessary to understand the psychological, psychophysical, ergonomic needs and motives (theories of motivation of consumer behavior) that are important for different groups of users [1]. Another basic factor is knowledge of the rules and principles of application development for different operating systems and the peculiarities of interfaces for different devices (smartphones, mobiles, OS, web applications, etc.).

Quite full of problems facing designers described by Massimo Vignelli "The life of a designer is a constant struggle. The fight against ugliness. Just like a doctor fights a disease. For us, visual illness is what we have around us and what we are trying to do is, one way or another, treating the environment through design" [2].

Also, when developing a quality design, one should not forget about the requirements for SEO optimization and promotion (if the software is a web), in order to operate with knowledge regarding the needs and problems of different groups of users, and why they are attractive / targeted from a business point of view. It is also necessary to understand which factors influence the expediency and necessity of software development, which further determines all the specifics of the project and determines the correct definition of the target audience, its characteristics and, as a result, affects the popularity and attractiveness of the software for users.

Some specialists forget about existing standards. But they are aimed at increasing usability, therefore, it is also necessary to take into account: the rules for the design of screens (fonts and color

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EMAIL: irina.gruzdo@nure.ua (I. Gruzdo); iryna.kyrychenko@nure.ua (I. Kyrychenko); hlib.tereshchenko@nure.ua (G. Tereshchenko); s.alexandr21@gmail.com (O. Shanidze)
ORCID: 0000-0002-4399-2367 (I. Gruzdo); 0000-0002-7686-6439 (I. Kyrychenko); 0000-0001-8731-2135 (G. Tereshchenko); 0000-0002-0484-6746 (O. Shanidze)

palette), the composition and location of windows and controls; rules for using the keyboard and mouse; rules for the design of the texts of assistance; list of standard messages; rules for processing the user's reaction; etc.

Also, when developing, attention should be paid to various analytical aspects of usability, which help not only to facilitate the development process, but to calculate in advance and take into account the necessary metrics that use the process of designing or analyzing interfaces. It is also necessary to pay attention, not only to qualitative assessments, but also to quantitative ones, because they allow you to define specific variables in more detail, thereby providing more detailed information regarding the designed software. themselves reduce the risks of not completing the project and reduce design errors, as well as, as a result, affect the popularity of the software itself or the resource.

These circumstances make it relevant to conduct research and analyze usability methods at the design stage and, as a result, expand the possibilities of monitoring the interface development process. The effectiveness of monitoring and the quality of the interface development process and the popularity of the project depends mainly on the selected methods that are used in the interface design process or its analysis. Therefore, it is necessary to first analyze the existing mathematical apparatus, to determine which models and methods are used in world practice in the design and analysis of interfaces.

There are four types of user-centered design activities that need to start in the early stages of the project:

- Understand and clarify the context of use.
- Clarify user requirements and organizational.
- Develop a design solution.
- Evaluate design options according to requirements.

In accordance with the study of the currently existing methods of usability, which are popular from the point of view of their practical use, it is conditional and advisable to group them into the following classes: quantitative, qualitative, mixed.

The qualitative ones include the following most popular [3–8]: methods for evaluating early concepts, reverse card sorting, expectations tests, evaluation of design perception (brand), hardware methods for assessing usability (corneal reflection and pupil contraction, skin-galvanic reaction, face analysis, facial electromyography, changes in the electrical activity of the brain, etc.), etc.

Currently, very few works are known regarding quantitative methods of usability, and those described in most works [1, 9–14] have only theoretical significance, due to the fact that the possibility of their application in practice in the process of designing or analyzing interfaces is not always clear. In accordance with this, there is a need for their detailed analysis and, as a result, determines the relevance of this article. The analysis is aimed at modern mathematical apparatus on the topic of developing a high-quality interface, considering the norms and rules of *usability* adopted in practice.

The purpose of the article is to critically review existing usability models and methods and, as a result, to expand the monitoring capabilities of the interface development process.

Formulation of the research problem. There are different classes of methods used to evaluate the interface. It is necessary, having formulated a number of characteristic criteria, to determine the effectiveness of the use of each of the known usability methods to identify its need and feasibility of use during the software development life cycle. The solution of this problem involves the implementation of the following sequence of steps:

1. Clarification of the objectives of usability analysis that exist in the practice of software development.
2. Definition of the main stages of user interface design, and in relation to the existing life cycle of software development of the selected type.
3. Consider the main classes of usability methods.
4. Conduct a critical analysis of usability methods used at the design stage.

The result of the task are recommendations in accordance with the use of usability methods considered in the work, regarding their use and application for different classes of models and methods in the design or analysis of interfaces.

2. Interface design steps

Among the large number of different definitions regarding the concept of usability, the article will use the following, namely usability – the usability of the product to achieve certain goals with proper efficiency, performance, and satisfaction [3].

As can be seen from the definition itself due to the orientation, when creating and designing software, on the main criteria and metrics of usability in the future, thanks to this, it is possible to find and eliminate errors in the interface, as well as to affect the popularity and quality of the software being developed. It should also be noted that without considering the basic criteria of usability, it is impossible to develop a native design and one that satisfies the existing principles of Material Design [6].

In order to find and eliminate errors in the interface, it is necessary to understand for what purposes the analysis is carried out and what benefits changes in the software interface can bring to business and investors.

In modern practice of usability analysis, there are the following purposes for which it is carried out:

- fixing interface errors;
- increase in key software metrics;
- determination of the vector of development of specific software.

According to the choice of goals, the usability analysis process for each goal will look like:

1. *Fix interface errors.* Tasks: to identify interface errors and get recommendations for improving the usability of the software.
2. *Increasing key software metrics.* Tasks: to determine growth zones, to formulate hypotheses to improve KPIs and increase income [12].
3. *Determination of the vector of development. Tasks: assess the state of software* usability, point out obvious errors and determine the vector of work with the software.

The choice of the goal to be followed will depend on the depth of the usability analysis performed, its focus and what stages the user interface design process itself will consist of.

At the same time, it is also necessary to determine what criteria from the point of view of usability should satisfy the software. There are a large number of articles devoted to the definition of the most "attractive criteria", among them are the following [1, 9, 15–17].

In accordance with the above information from [3], software with an "ergodesign" interface must meet the advanced requirements, both in form (appearance, interface design that ensures the trust and involvement of the user), and in ergonomic content. To assess the quality of such software, it is necessary to perform an analysis according to four criteria characterizing the external interface of the software and the user's interaction with it: effectiveness (the degree to which the user achieves his goals when using the software); productivity (temporary and mental resources spent by the user when performing tasks); satisfaction (emotional reaction when using software); aesthetic appeal [1].

In the article [4], a detailed analysis was carried out, in accordance with existing standards in usability, various definitions of usability and related criteria, there are much more of them, namely: efficiency, fast learning, flexibility, attitude to the user interface, aesthetics, consistency, documentation, clarity, utility, control, errors, memorability, reliability in use, security, compliance with use, performance, versatility, accessibility, gullibility, and so on.

In accordance with ISO 9241-11 [3], the key usability characteristics of any software are efficiency, performance, and satisfaction. Of course, the choice of the necessary criteria depends on the project, but in any case, these three metrics will always be present in one way or another because they are compiled and supplemented by the criteria given in the article [4].

Many companies IKEA, Lego, Google, Facebook, Microsoft, and Apple have relied on the emotional relationship between the product and the consumer. In their work, they focus on User centered design (Usage Centered Design, not to be confused with User-Centered design) [18] – a design that takes into account needs at each stage of design. This methodology helps not to stray from the "true path" during the development of design. When development is carried out according to the process within the framework of UCD, it is easier to understand what is going on, how to work and what you should pay attention to.

Design development begins with people and ends with answers that reflect their individual and needs. According to this methodology, we get a lot of ideas and create many prototypes.

The user-oriented design process goes through six stages:

- specify usage context and user needs;
- indication of business requirements;
- with the creation of design solutions from rough concepts to ready-made design;
- design evaluation using usability test;
- implementation – product development and release;
- deployment – the final product is evaluated as the needs of the consumer change.

It is characterized by the active involvement of the user in the development process to achieve a transparent understanding of the user's needs and the proper distribution of functions between users and technologies.

As can be seen, all these criteria can be conditionally attributed to such classes as quantitative, qualitative, and mixed, and in the future, it is possible tosify existing models and methods for assessing usability in relation to them. It can be generally concluded that in practice, the most used for evaluating interfaces are such usability criteria as – efficiency, learning ability and productivity and satisfaction [4].

In accordance with the considered criteria, it can be concluded that most of the criteria for determining usability are based on the psychology of human behavior, and conducting such an assessment is quite a difficult task. Because it is necessary to analyze the convenience of navigation and search, the relevance of information, the degree of user satisfaction and other factors. All this is also complicated since in the process of designing or analyzing interfaces, they mostly use qualitative usability methods, which are the most expensive after quantitative methods, and the project budget does not always provide an opportunity for their use. Also, the need to use them is due to the usability verification tools used in the process and is due to the type of software being developed. Therefore, the article will further pay attention to the process of checking usability in accordance with the type of software being developed.

There are the following ways to check usability for the site [18]:

- analysis of statistics (Google Analytics, and others);
- organization of feedback (provide users with the opportunity to give feedback and develop taking into account their comments);
- testing pages (to compare different versions of the site and evaluate innovations);
- monitoring the actions of visitors (it is necessary to form focus groups to perform the prepared tasks, and then all user actions are recorded);
- examination (identification of problems and shortcomings of the interface and design, their ranking by degree of importance).

As you can see, the existing ways to check the usability of the site directly intersect with the objectives of the implementation. Based on this, as well as strategies for developing a user interface, we can distinguish the following stages of work on the design of the site [19]:

- formation of goals and objectives, taking into account all the features of the software.
- analysis of the desired audience on which the software is focused.
- evaluation of options for possible interaction of the audience of users with the software, in accordance with the goals and objectives of the company.
- design of the software structure and appearance.
- search for errors during which specialists study the site interface.
- correction of errors, and improvement of the site design.
- In the process of searching for errors, the greatest attention is paid to the following issues [19]:
- analysis of user journey and development of a map following the interface.
- checking conversion paths (if possible): analysis of all key pages that the user goes through to place an order.
- analysis of all pages or layouts involved in user scenarios.
- analysis of structural elements: whether navigation is clear, whether sections are conveniently built, whether filters and links work correctly, and others.
- evaluation of technical parameters: download speed and display on different devices, functionality of all elements and others.

- analysis of the quality of content: consistency, readability, correct display of images and videos, compliance of the content with the purpose of the pages.

The process of checking usability for a mobile application, in itself, is very complicated, due to the fact that users can interact with the mobile application in a different way than was predicted during development. Either as predicted, but the results obtained are not satisfied, or it is necessary to increase the popularity of the application itself. The most used ways to check the usability of a mobile application [5, 11, 20]:

1. *Expert analysis* – the accumulated knowledge of user experience is used. It allows you to correct the "obvious mistakes" for the expert, but it should be noted the subjectivism of this method since the expert is not always able to identify problems in the design.
2. *Testing using web analytics* – web analytics services allow, according to the reports provided, to determine exactly where the problem is, but it is not always possible to understand exactly what it is. You can also understand the way users follow, but it is not always clear what exactly prevents users from performing targeted actions in the software.
3. *Testing with the participation of live users using special services*. The bottom line is that for the reward of "hired" users will follow the tasks, and as a result, records of their actions on the screen will be formed. This method helps to understand how user-friendly the interface is "in action" but does not always correspond to the reaction to usability from real / target groups of users.
4. *Live testing* consists in attracting users of the relevant target audience, and collecting all the necessary data, on the basis of which the assessment is performed on the selected usability evaluation metrics.

As you can see, the existing ways to check the usability of a mobile application directly intersect with the assessments of user actions and, above all, require an already existing user interface. Based on this, as well as from the strategies for developing the user interface, we can distinguish the following stages of work on the design of a mobile application, they will be somewhat different from the design process for the site:

- preparation of the brief, the goals and objectives of the software and the composition of the necessary work are studied;
- usability audit, during which an existing application or application of competitors is checked in terms of its correct use in accordance with the platform (Android, iOS, Windows) and user friendliness, barriers are identified to improve the performance of targeted actions in the software (technical errors, interface and content flaws and other shortcomings);
- installation of analytics systems and determination of ohvat metrics for further analysis;
- performing tests, and analyzing the results during which options for improving the interface are determined;
- development of a prototype of the interface of the mobile application, which will solve the tasks obtained at the first step in relation to the defined goals, objectives and composition of the necessary work;
- creating a report on the analysis of the usability of the mobile application in accordance with the brief.

As can be seen from the above, in order to effectively check the usability of a mobile application, in most cases, the participation of target groups of users is necessary, since only real people of a particular group can understand the subjective sensations caused by working with the application. Also, most of the usability methods used for evaluation in the process of developing the user interface of a mobile application can be attributed to mixed, because the faults operate with metrics that are related to the psychological characteristics of the user and his interaction with the interface of the mobile application.

When checking the usability of a desktop application (API), methods related to those developed within the framework of the HCI direction (Human-Computer Interaction, human-computer interaction) are used; They are also used to assess usability.

There are the following ways to check the usability of a desktop application [21, 22]:

1. *Analytical assessment methods* are based on the study of software and ways of interacting with it, based on expert knowledge.

- Heuristic evaluation, there is a certain set of criteria ("heuristics") that the software must meet. In the process of evaluating software, you can determine a different set of criteria, in accordance with the direction of the software.
- Cognitive dimensions, a special kind of usability evaluation criteria for a desktop application, is allocated primarily for analyzing the syntax, user interfaces and programming languages, that is, the information part of the software.
- Cognitive walkthrough, the essence is that a usability expert identifies typical scenarios for using a desktop application and tries to pass through them.
- Group peer review of a desktop application (API peer review), several people analyze the application and evaluate it according to selected metrics and criteria.

2. *Empirical methods (or experimental ones)* – emphasis is placed on the study of the actual use of software by real users.

- Monitoring, it consists in collecting statistics on the use of the application.
- Analysis of requests to the support, analysis of appeals and problems related to usability is carried out, as a result of which the most serious problems are identified, and they are corrected when updating the software.
- Surveys and questionnaires, it should be remembered that the list of questions should be individual for each application.
- "Laboratory" usability testing allows you to analyze the application by users who are most suitable for the profile of certain users, give them certain tasks, monitor their implementation, and draw certain conclusions based on the analysis of execution.

In accordance with the life cycle of a desktop application and the process of its development, the following stages of work on the design can be distinguished:

- definition of goals and objectives, software development.
- analysis of the user's work activity, combining business functions in the role;
- building a user data model, linking objects to roles and forming jobs;
- formulation of requirements for user work and selection of indicators for evaluating the user interface;
- development of a generalized scenario of user interaction with the software module (functional model) and its preliminary assessment by users and the customer;
- adjustment and detailing of the interaction scenario, selection, and addition of the standard (manual) for building a prototype.
- development of layouts and prototypes of interfaces, their evaluation and selection of the final version.
- implementation of the interface in the code and creation of a trial version.
- development of user support tools (dictionaries, hints, messages, assistance, etc.) and their embedding in the software.
- usability testing of the test version of the software interface in accordance with a set of previously defined usability quality indicators and correction of possible errors.
- preparation of documentation for users and development of a training program.

When designing any type of software, it should be remembered that there are people who have a clear idea of what a design should look like, and there are those who only have a rough idea of what should be. Therefore, it must be remembered that the phased development of the interface allows you to develop the necessary interface solution more quickly and save time. Also, this method of work significantly reduces the likelihood of errors in work and unexpected edits from customers, reduces software dissatisfaction with end users, and also allows you to increase the popularity of software among users.

As you can see, according to the analysis, the stages of user interface design for different types of software vary significantly. Differently described in existing sources and directly depend on the type of software being developed and the goals set before the software creation. All this, in turn, complicates the process of selecting and selecting technologies, models, methods and metrics for the development and evaluation of interfaces.

Based on the above, we can present an improved generalized process for developing a user-oriented design in an expanded form:

3. Defining the goals and objectives of the software.
3.1 Determination of the direction of customers / investors and their goals.
3.2 Collection of information about the market and competitors.
3.3 Strategy definition and planning.
3.4 Debugging "feedback".
3.5 Analysis of user trends.
3.6 Determining the composition of the necessary work in accordance with the goals of the business and the interests of users.
4. Determination of the composition of the necessary work.
4.1 Work with investors/customers.
4.2 Define working conditions and user roles.
4.3 Definition and selection of models, methods, and metrics by which the interface will be developed and evaluated.
4.4 Choosing an approach, developing, and evaluating the interface.
5. Collection and analysis of information from users, investors, and their coordination with organizational requirements.
5.1 Defining the objectives of the SOFTWARE and how they are consistent with the goals of the business / society and drawing up primary documentation.
5.2 Analysis of users (target audience) and competitors.
5.3 Identification of risks and possible errors based on the analysis of such solutions.
5.4 Determining the use of software.
5.5 Drawing up software requirements (custom, functional, non-functional (which are now very often forgotten), high-quality and others).
5.6 Setting software quality indicators.
5.7 Define and document user tasks.
5.8 Defining and documenting user traits/characteristics.
5.9 Definition and documentation of the organizational environment.
5.10 Definition and documentation of the technical environment (conditions, ergonomics of the workplace).
5.11 Defining and documenting the physical environment.
5.12 Analysis of data from paragraphs 3.1–3.10 and based on the analysis of discussion and adjustment of the goals and objectives of the software, as well as the composition of the necessary work.
6. Development and implementation of the interface.
6.1 Creation of software information architecture.
6.2 Function definition.
6.3 Development of task models.
6.4 System design definition.
6.5 Defining the structure and behavior of interactive systems.
6.6 Development of design solutions.
6.7 Clarification of data on the system and its use.
6.8 Design a navigation map.
6.9 Designing or choosing from existing modular mesh solutions for interface design.
6.10 Study of the purpose of the visit.
6.11 Prototype development.
6.12 Development of user training.
6.13 Development of user support.
7. Conformity assessment of design requirements.
7.1 Clarification and approval of evaluation criteria.
7.2 Evaluation of early prototypes.
7.3 Design improvements.
7.4 Software evaluation to meet organizational requirements and investor requirements.
7.5 Evaluation of the harmonization of existing software requirements.

7.6 Software evaluation on the application of the previously chosen practice.
7.7 Software evaluation to understand whether it meets the needs of users.
7.8 Software evaluation regarding possible errors in the design of the interface.
8. Confirmation of the quality of the created interface.
8.1 Change management.
8.2 Determining the impact on the organization and investors and users.
8.3 Modification according to customer requirements and local design.
8.4 Providing user training.
8.5 Customer support.
8.6 Ensure that workplaces comply with ergonomics legislation.
8.7 Checking real characteristics according to target user groups.
8.8 Study of success and time of completion of tasks.
8.9 Analysis of the frequency of problems.

In general, the process of developing a user interface can be divided into the following main stages:

- study of the goals and objectives of the software and the composition of the necessary work (definition of methods, metrics and criteria for evaluating software);
- collection and analysis of information from/about users and drafting user scenarios;
- development and implementation of the interface;
- confirmation of the quality of the created interface.

This process in general can be used, both in the development of software for scrum-oriented methods, and in the development of complex software systems. The only difference in this case will be the number of steps used, their detailing and the resulting artifacts on the project.

3. Analysis of usability methods

Given in the course of the study, existing models and methods of usability were considered. During the analysis, according to the overall user interface development process, existing usability models and methods were separated, according to three classes (qualitative, quantitative, mixed), and evaluation technologies. The results are shown in Table 1.

As can be seen from the table, all existing means of evaluating interfaces can be divided into those that involve direct user participation and those that imply indirect user participation.

Table 1
Models and methods of usability used in the process of developing and evaluating the software interface

Development process Interface	Classes of models and methods of usability performed in accordance with the work		
	Quality	Quantitative	Mixed
Study of the goals and objectives of the software and the composition of the necessary work	• The method of evaluation of labor activity in the framework of the developed software. • Software evaluation method "Man – machine". • Method for determining the role of the human factor. • Interview method.	• Model B. Boehm. • McCall Model. • Method for estimating the calendar duration of work. • Method for determining the success of the project.	• Kano Model.

	• Method for determining the focus group.		
Collection and analysis of information from users	• Needs model. • Consumer behavior patterns. • Model AIDA. • Method for determining the identity of a person / user. • Method for determining real activity in a real situation (ethnography). • Content inventory method. • Contextual script method. • Content audit method. • Information grouping method. • Method for improving the taxonomy of content. • Expectation testing method. • Method for assessing the perception of design. • Method for determining the user profile. • User selection method. • "Thoughts out loud".	• KLM (Keystroke-Level Model). • Method for assessing the attitude of consumers to competitor's software. • The method of two-dimensional analysis of tasks. • Bagatofactorn methods. • Fitts Law. • Hicke's Law. • HALLWAY TESTING.	• Method of subjective analysis. • SUS (System Usability Scale). • Usability Metric for User Experience (UMUX). • Customer Satisfaction Score (CSAT). • Customer Satisfaction Score (CSAT). • GOMS (The models of Goals, Objects, Methods, and Selection rules).
Development and implementation of the interface	• IA (Information Architecture). • IxD – determining the structure and behavior of interactive systems. • Interaction prototypes. • Navigation maps. • Modular grid. • Experiment with sympathy. • Kano Model. • Study of the purpose of the visit (True-Intent Studies).	• Parametric model for usability assessment. • User productivity. • The speed of learning new users. • Effectively preventing and overcoming user errors. • Subjective user satisfaction. • Consistency of tasks. • Essential efficiency. • Degree of error.	• Method for determining the actions spent by the user on the implementation of the i-th scenario. • The method of neuro-fuzzy assessment of the suitability of using the graphical user interface. • Intercept Surveys. • Method for selecting a critical path. • Methods for evaluating text input.
Confirmation of the quality of the created interface	• Subjective satisfaction. • Heat map. • Map of Scrollingu. • Card sorting.	• FURPS model. • Method for assessing the success of the tasks.	• Usability testing. • Each-galvanic reactions.

• Method for estimating the time of execution of tasks. • Method for estimating the success rate. • Fitts Law. • Frequency of problems. • Hicke's Law. • Webvizor. • Analysis of data collected by feedback services (Google Analytics, Google Tag Manager, etc.). • A/B-testing (A/B testing).	• Analysis of facial expressions. • Facial electromyography. • Electrocardiograms. • Photopletizmograms. • Alterations in the electrical activity of the brain. • Usability Benchmarking. • Single Usability Metric (SUM) • Net Promoter Score (NPS).

According to the analysis, it can be concluded that the models and methods of usability used in the process of developing and evaluating the software interface can be divided into those based on observation, experimentation, survey, analysis, and forecasting based on previous data.

It should also be noted that existing funds can be divided, in accordance with the direction, into three types: theoretical, statistical and combined.

There is no unequivocal answer to the question of what method of usability assessment should be applied in practice because the use of usability verification tools depends on the types of software and the standards and metrics of assessment, budget and business direction adopted at the company. If there are limitations in time and resources, then you should start with the simplest and less expensive techniques, namely high-quality ones.

In accordance with the above, we can conclude that each of the above technologies, as well as the selected models and metrics, in one form or another, affect the assessment of interface quality factors. In this case, the numerical expression of the factor is a linear combination of values affecting it.

When we talk about quantitative assessments, not taking into account the cost of their use in comparison with qualitative ones, they have several advantages:

- simplicity and convenience of calculations;
- forecasting the user's work time with a specific interface option;
- the presence of a visual numerical criterion for checking the results obtained;
- reducing the likelihood that the result may be affected by a subjective assessment of a particular PI developer;
- an increase in the likelihood that the results obtained reflect an objective picture and can be recommended to the user audience;
- the possibility of using statistical methods to confirm the reliability of the assessment result to interested persons who make decisions based on objective data;
- the possibility of applying measurable criteria in subsequent iterations to assess progress towards the goal (for example, reducing the time of placing an order by 20%, identifying 80% of usability problems on the site, etc.);
- the lack of model parameters allows you to evaluate and compare two different interface options;
- creating a working prototype of PI is optional;
- processing of test results can be automated.

Quantitative methods for assessing the design of the interface allow you to reveal and formally fix the most important aspects of human interaction with the machine.

Most often, in the course of quantitative analysis, a number of quantitative indicators are measured, which are indicators of the three components of usability. These data are compared with indicators of competing products, other interface options, a previous version of the system, or with targets adopted at the beginning of system development. This option requires a larger sample size, as well as more careful preparation to avoid the effects of various side factors.

The most common approach to the quantitative analysis of interfaces in practical application is the GOMS method – "rules for goals, objects, methods and selection" (the model of goals, objects, methods, and selection rules). The GOMS method [23] allows for an a priori estimate of the time it will take the user to perform a particular operation when working with this interface model. The absolute error of this method is less than 5%.

The less time and actions a user need to complete in order to achieve his goal, the higher will be the convenience of a user interface using [23].

It is worth noting that the traditional version of the GOMS method is not suitable for the mobile interface, but its modification, developed by Andrew D. Rice and Jonathan W. Lartigue, is designed to evaluate interfaces with touch interaction – GOMS TLM (touch level model) [24].

It is necessary to understand that a specific time of work with the interface in seconds is measured, more like a convention. After all, different users may have different speeds. That is, the real speed of work may or may not coincide with our expectations and may not coincide – everything will depend on the specific user.

There are also modifications to GOMS analysis. For example, "Critical-path method GOMS" (CPM-GOMS) and a version called the natural GOMS language (NGOMSL), which takes into account the behavior of an inexperienced user, such as the time it takes for him to learn.

Also, when using the provided usability methods, one should remember not only the definition of metrics, but also the quality criteria that are aimed at providing an assessment or measurement in numerical form of the levels of factors set during the development of software. Also, you should pay attention to the quality metrics of McCall [9], which from his point of view provide an opportunity to perform a quantitative assessment. Ratings on its scale, take values from 0 to 10, namely [9]:

- convenience of checking for compliance with standards (auditability);
- accuracy of control and calculations (accuracy);
- degree of standardization of interfaces (communication commonality);
- functional completeness;
- uniformity of the used design rules and documentation (consistency);
- degree of standardization of data formats (data commonality);
- error tolerance;
- work efficiency (execution efficiency);
- expandability;
- breadth of the area of potential use (generality);
- independence from the hardware platform (hardware independence);
- completeness of recording of errors and other events;
- independence from the software platform (software system independence);
- modularity;
- convenience of work (operability);
- security;
- self-documentation;
- simplicity;
- ease of training;
- possibility of correlating the project with the requirements (traceability).

It should be noted that one metric of McCall quality can influence the assessment of several quality factors. Coefficients are determined differently for different organizations, development teams, types of software, processes used, etc.

Also, do not forget that many points are variable, and it is in a certain case that they may not be possible to use for one reason or another.

It is also necessary to remember not only about metrics and criteria, but also some rules that are used in the development of software. Among the most popular in use should be noted some rules,

The three-click rule [25] is one of the most well-known rules for usability of the site. It says that the user must find the information he needs in three mouse clicks, but if the web resource has a complex structure, many sub-items or different categories, then you should minimize the number of clicks, for this purpose the heatmap and clicks and transitions are built.

Rule of Seven [26] is another common rule that states that a person's memory is capable of remembering 5-9 objects or entities. In accordance with this, a recommendation was formulated to use no more than 7 items in the navigation menu.

Jakob Nielsen's recommendations [27] are a set of heuristics that should be considered when designing user interfaces. At one time, the author was a usability consultant at IBM and Sun Microsystems. The recommendations provided by him were formulated on the basis of a practical survey and based on the results of a factor analysis of 249 previously identified problems in software usability.

Material design (MD) rules [16, 28] are aimed at developing a single interface on all devices running android. Currently, this is a rather impressive list, namely: phones, tablets, TVs, cars, wearable electronics. By itself, the MD combines best practices in design, generally accepted standards and the visual appeal of interfaces for various divis, thanks to which it allows you to carefully monitor the needs of the user and, based on them, adjust the design.

To solve business problems, first of all, when developing software, it is necessary to be guided by considerations of the feasibility of using certain techniques, to take into account the specifics of a particular target audience and the peculiarities of human perception as a whole. Failure to fulfill the above basic requirements increases the likelihood that the user will leave the site, because there is always the opportunity to find the best web resource that works without errors and will be more understandable and attractive. You should also at least sometimes answer the following questions: how the user will understand what kind of site it is; why you can use the site in your practice; How exactly the site can be useful and what tasks will allow the user to solve. Therefore, it is necessary to design a site, thinking in advance for which target audience it will be intended, content and a convenient simple structure.

Sometimes there is a need to create a manual of style within a certain solution. The Style Guide is designed to make sure that the design is implemented consistently in branding, visual styles, colors, fonts, and typography. It is also used for design patterns, languages, rules (such as keyboard shortcuts and data display rules) and determining user interface behavior (such as error handling).

Some style guides and specifications are compiled manually, while others are generated automatically. Putting together a manual style guide is a tedious process that can often take up to six months, so any automation tool will help save time.

Thanks to the correct selection of models, methods, metrics, and craters in accordance with the generalized design development process provided, it is possible to: formulate basic usability standards; reduce software development costs and technical support; increase sales and popularity of software; reduce risks.

It should also be remembered that in order to improve the quality of software and maintain the required level of popularity of the developed solution, it is necessary to perform interface analysis in accordance with existing trends. The analysis itself should be performed not only at the stage of design, development, audit, but after release at least 1-2 times a year or six months in order to remain in trend and make the necessary changes in a timely manner.

We should also not forget that in modern marketing, visual interfaces are a tool for creating demand and at the same time a product, which means that marketing through communications, using interfaces, forms potential demand in the market, which the company then turns into a real one. That is, user interfaces are one of the main objects of research within the framework of the new paradigm of spatial economics. [29, 30].

Also, when developing interfaces, it is necessary to stimulate the desires of users returning to a specific solution or site. All this also needs to be laid in the interface and software design. That is, it is necessary to understand the means of so-called "pushing", Society for Human Recourses Management believes that Nudging is the most important trend in the development of business solutions that are based on doing something a person needs certain conditions, a kind of nudge. Richard Thaler created

the theory of Nudging [31]. Nudging is a hint, reminder, incentive that encourages people to take certain actions, but at the same time leaves them with freedom of choice. Examples of Nudging: push notifications in applications. Email newsletters with product user reviews Gamified characters ranking tables of users of the application; progress bar (progress bar) in the user's personal account; challenges between users of the application. Moreover, well-known analyst Josh Bersin believes that Nudging is a new round of development in the measurement of engagement (engagement 3.0 or nudge). An example of this approach is Humu, created by former HRD Google Lascaux Bock. The service allows you to conduct surveys and issue recommendations based on on-time answers. Note that the Nudging approach also laid the foundation for the Cultivate service mentioned by Brian Crop.

That is, when developing software design, you need to see what methods of customer retention exist within the framework of certain solutions and choose the most appropriate ones for the development relationship.

Thus, the above considerations create a methodological basis for testing the use of a combination of tools in the development process, taking into account the type of software in relation to the existing development life cycle and the proposed process of developing a user-oriented design.

4. Experimental verification of the need to use several types of methods in the design, development and execution of site expertise

In accordance with the above and the provided generalized process of developing a user-centric design. Next, the need to use several types of methods in the design, development and examination of the site interface will be checked, and the necessary steps from each item will be selected.

To do this, the tourist site "CHALUPAtur" will be considered (the name is hypothetical, since the real company asked not to disclose the name so that it does not affect its activities), from the position of the company entering the market, and in accordance with the tourist niche that it occupies. It should be remembered that the site primarily forms the expectations of consumers, but this does not mean that the expectation of a tourist service will coincide with the service actually received. Therefore, even small mistakes can distract possible customers and affect the image of the company. It should also be remembered that if we are talking about a product that the consumer did not like, then he has the right to return it to the seller. It is impossible to return the tourist service due to its non-preservation properties. Therefore, the site should take into account not only technical features, but also take into account geographical, national, ethnic, mental, etc. differences between the provider (manufacturer) of the service and its potential consumer.

"A tourist product is a set of material (consumer goods), non-material (services) consumer values necessary to fully meet the needs of tourists that arise during their trip (trip) and are caused by this particular trip. In practice, the tourist product is understood as the three main types of possible offer on the market" [32]: 1) the main one is a tour, or a comprehensive tourist service. Firms tour operators (they can also be called the organizer) offer a variety of tourist travel programs, which are further sold to the consumer to meet his own needs (retail), as well as intermediary firms, travel agencies (wholesale buyers) who want to have economic benefits from this; 2) separate tourist services. Among them are services for transportation and further accommodation, assistance in obtaining a passport, insurance, organization of an excursion program, ensuring the possible provision of car rental and others; 3) it is also possible to provide tourist goods, namely: a variety of information materials (catalogs, reference books, maps, dictionaries, etc.) that can be useful for travelers abroad. So, the tourist product includes the following three components: a tour, additional tourist and excursion services, goods [32].

Tourist product is a complex of tourist services necessary for the needs of a tourist during his trip. It is a complex of tourist services that combines at least two such services that are sold or offered for sale at a certain price, which includes transportation services, accommodation services and other tourist services not related to transportation and accommodation (services for organizing visits to cultural, recreational and entertainment facilities, selling souvenirs, etc.)" [33].

Basic principles of tourist product development:

1. Travel product can be of any type, starting with cultural, educational, recreational sites, heritage or business center.
2. The tourist product must be authentic and must reflect the unique attributes of the destination.

3. The travel product must have the support of the host community.
4. The tourist product must respect the natural and cultural environment.
5. The tourist product should be different from competitors, avoiding blindly copying developments.
6. The tourism product must have enough scale to make a significant economic contribution, but not too large to create high economic leaks [34].

When carrying out activities related to the identification of the level of quality of services of travel companies, it is possible to use a large number of methods and methods. In international tourism, the best are: SERVQUAL, SERVPERF, SIT, mystery shopping and the diagram of K. Ishikawa. They are most often used in practice travel companies [32].

The quality-of-service model, which was also called SERVQUAL, was developed and put into practice in 1998 by well-known American marketers Zeithaml, A. Parasuraman and Leonardo Berry. The basis is the method of shooting and measuring the quality of services, working on the feelings of customers.

The SERVQUAL model, first of all, is a qualitative analysis. The observed quality can be measured due to general environmental factors, as opposed to the satisfaction survey, which is generally influenced by the outcome of the transaction between the seller and the buyer. This scheme can be used in the process of finding the shortcomings of the tourist service and eliminating them.

In the original questionnaire there are almost 100 parameters, among which the most important are: reliability; Responsiveness; Competence; access; Courtesy; communication; reliability; security; customer knowledge; material things. In order to consider in detail as many offers of tourist products in Ukraine as possible, it is necessary to single out tourist operators and travel agencies that offer their products to Ukrainians.

The SERVQUAL model is presented on Figure 1. Source: Toolshero, by Patty Mulder [35].

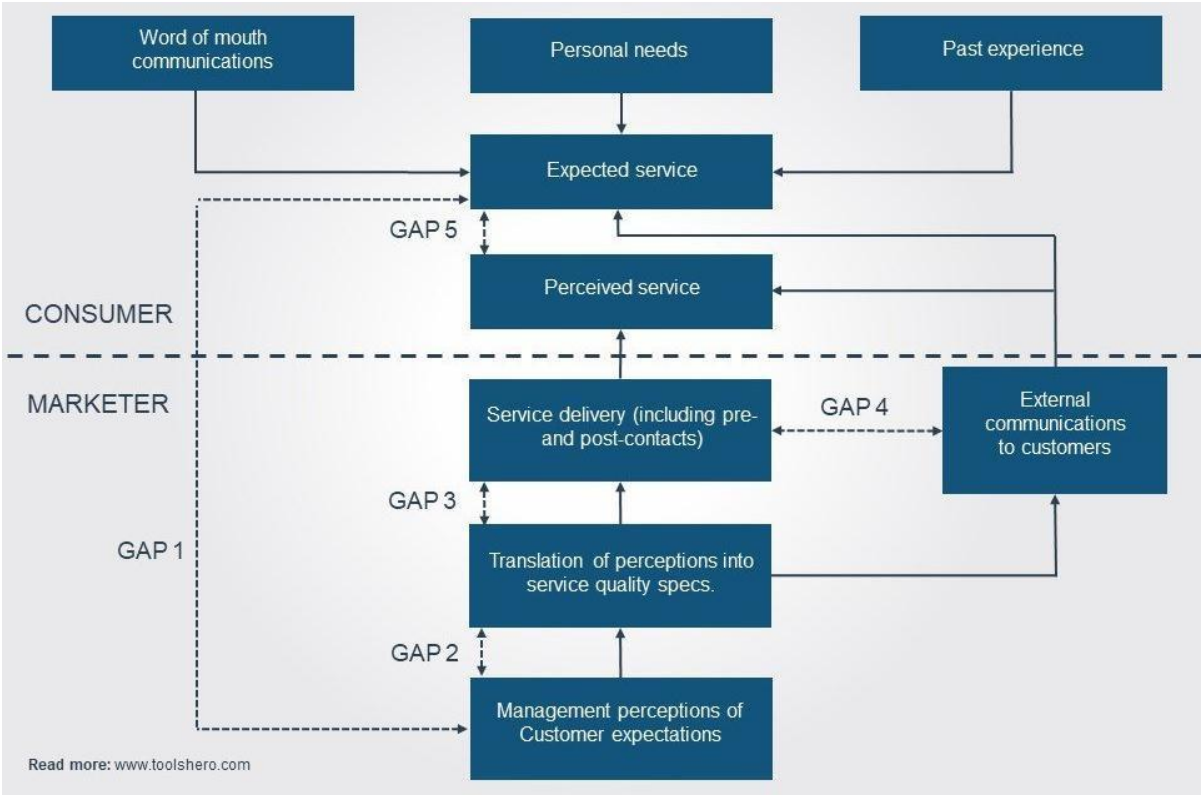

Figure 1: Model SERVQUAL

The main tour operators involved in promoting tours in Ukraine and the world through the network are: Chord Tour, Join UP, Anex Tour, TEZ Tour, TPG, Coral Travel, TUI Ukraine, Pegas Touristik, ALF.

These tour operators are the most famous in our country and cover the main market share. They create and offer products such as: beach holidays, ski resorts, Euro tours, bus tours, exotic trips, wellness tours, etc.

It should be noted that there are a lot of touristic agencies in Ukraine. The services provided by "HALUPAtur" are focused mainly on individual tourists or very small groups consisting of three or four people. The market niche is large enough to make a profit, and at the same time small enough to be attractive to large travel companies that serve large flows of tourists. Currently, the company attracts customers through its own website and social networks. But there is a problem with the sales funnel through the site, his technical analysis was performed. According to the results of the test, it was decided to develop a new one that would support new technologies (the old one was on the outdated PHP 5.6 technology) and had several features in both design and functional, which in turn influenced the overall perception.

In order to understand the problem in detail, it was also decided to analyze the advantages and disadvantages of existing competing sites in the relevant region, thanks to which problems can be avoided when designing a new site. The design process involves collecting information about the market and competitors. During the experiment, not only competitors' sites were considered, but also those that have mistakes in the design of the interface among travel agencies of Ukraine. Among such sites in which there are mistakes in usability, there are sites [36, 37], it should be noted that the results of the study on them are published after a certain time, so that this does not have an impact on their activities, so that some of the classic problems cited have already been fixed. It should be noted the most common problems with usability of competitors: some pages are overloaded with text; excessive design; a cumbersome structure that makes it difficult for the user to navigate and search the site; too many menu items, which in turn reduces the likelihood of ordering the corresponding product/service; Also, the logic of building a site map is not clear; maladaptive design, because the rules of accuracy of clicks are not suppressed, and have rather small main elements of transitions.

One of the important stages of the design process is to analyze user trends, in order to identify them it is also necessary to understand what makes the site convenient and understandable for any user on the Internet.

According to the study [15], the most important for the user is: the presence of a clear structure; nice look; the elements present did not distract from the content; presentation of information without repetition; simplicity for perception and so on. All this allows you to analyze the market and competitors more specifically.

It is also necessary to remember about the page loading speed, it should not exceed more than 3 seconds, this affects the quality of timely access to information and the reaction of the user himself. It should also be remembered that sales conversion rates for internet sites are dependent on the purchase/order process and comfort. Therefore, the speed of loading the site, structuring, which facilitates the choice of an order, or useful information quite strongly affects the choice of the user, and he retains pleasant memories of the service provided (user service) of this site and increases the chance of further / repeated access of the user to this resource.

According to the research topic, it should be noted a study conducted by Oracle [24], according to which there are common reasons for forcing the user to use resources other than the Internet:

- couldn't find all the information I needed to make an online purchase.
- desire to touch and look at the product "live";
- desire to compare products of the same type, but different firms.
- desire to receive the goods immediately.
- the process of buying on the site turned out to be too complicated or there was an error in the operation of the site;
- desire to find out the details regarding the product.

Having considered the requirements and used in practice for information on the web resource [25–27, 38], when performing the examination of the site, they were conditionally divided into classes according to the following points:

1. The structure of the site. A simple and understandable structure helps to convey the necessary information to the user. Each page should have a link to the main page. The link can be one of the items of the horizontal or vertical menu, or the logo of the site or company, which is located in the

header of the site. A good style in website design is to use one navigation system on all pages of the site.

2. No errors. The site must work correctly, because every mistake, or wasted time will adversely affect user satisfaction and popularity of the site.

3. Content. The idea of the resource should be on the main page and be the first information that the user will see and understand what kind of site it is, why it can be used in its practice, and how it can be useful to the user and what tasks it will allow to solve. Therefore, it is not necessary to load the site with unnecessary information so as not to mislead users.

4. Some rules [25–27, 39]. Next will be considered the most popular.

In accordance with the considered trends imposed by users on sites and the provided generalized process of developing a user-oriented design, the main problems that exist on competing sites are further described in more detail [36, 37]. To do this, in the process of analysis, several pages of competitors' sites were considered, on which there are errors.

Paying attention to Figure 2, you can see the highlighted area, this is one of the problems on the site. As shown, after going to the "Franchising" page, it is not possible to return to the main page through the "JoinUP" logo, but on other pages such a function exists. The article [10] analyzes such an example in detail and provides recommendations, namely, you need to divide the menu items into sections that can be accessed from any page. It also provides a reasonable conclusion that sites with such errors require / take a lot of time to search for the necessary information for the user, and quite often they cannot find what they need. Because of this, quite often the user, either does not stay long on such a web page or no longer enters at all.

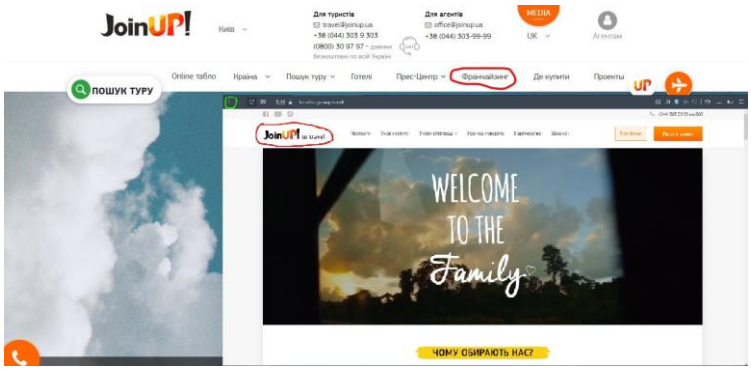

Figure 2: Main page of the site https://joinup.ua/uk/

There is also a technical problem, if the user wants to go to the "tour search" section and after "for hot tours", then this section simply does not open.

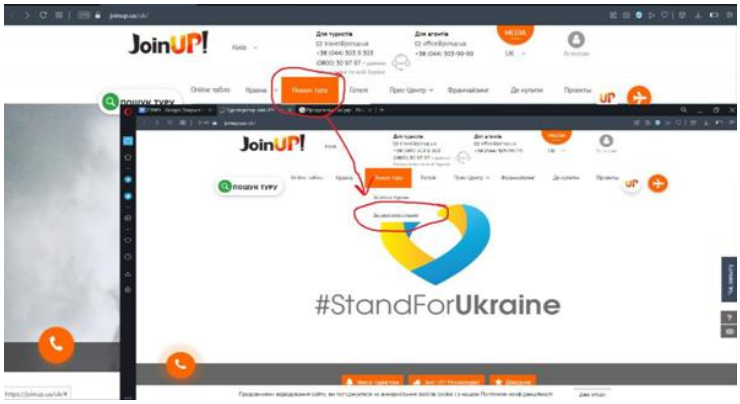

Figure 3: Problems with site navigation https://joinup.ua/uk/

During the analysis, another significant error was also found in the "Online Scoreboard" section, this site did not fix the error for 10 days, which indicates that there is no additional support.

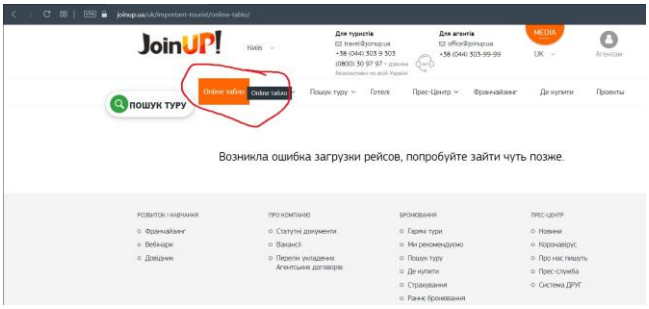

Figure 4: Problems with changing the location on the site https://joinup.ua/uk/

When we talk about technical problems, the most important, is still the speed of loading the site. According to research, the standard for average page load speed is 2 seconds. The longer your site loads, the more likely it is that the client will go to a competitor. The next common mistake is to have a large number of 404 pages. The situation is especially aggravated by the fact that they may not be designed (as in our case, the page simply does not respond to actions) and the user will be taken to the standard error page. If there are too many such messages, even a very loyal customer will go to competitors. Therefore, it is always important to remember that the technical component also has an impact on the final impression of the consumer about the product.

There is still a widespread problem related to the localization of the site, after selecting "UK" language on the project page, not all text is corrected.

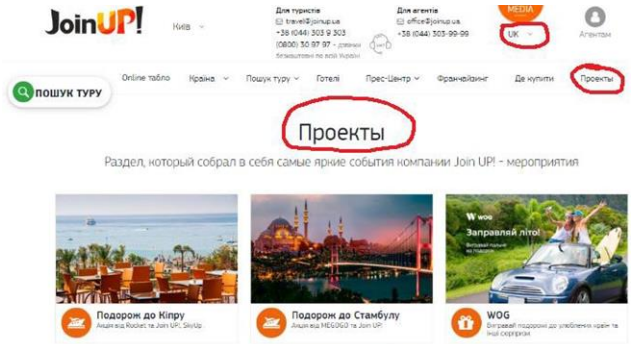

Figure 5: Problems with localization on the site https://joinup.ua/uk/

In terms of pragmatic content, website texts can be considered as a separate type of advertising, because they perform the function of self-representation of the company [40]. In order for the site to be attractive to different users and to create the brightest possible image of destination and attract potential visitors, the translated text must meet all the criteria for high-quality translation: no speech errors, compliance with communicative norms, transfer of pragmatic installations, adaptation of information taking into account the specifics of the market and the national mentality.

When analyzing competitors, a common problem associated with changing the location was also identified. If the user wants to choose a location, for example, Lviv, the page will reload, and the location will not change and is protected by the city. Kyiv.

Figure 5: Problems with changing the location on the site https://joinup.ua/uk/

It should also be noted that the site does not specify "Your country Ukraine?" to facilitate the choice, and also does not have a question regarding the city of residence. It should also be noted that there is no function of the approximate type "Not far from you...". This primarily facilitates the work with the site and provides advice especially when customers change their location, temporarily come to another region for personal reasons or for work, wintering or a long journey. It should also be borne in mind

that sometimes some companies and hotels offer different prices for tourists from different countries and regions of the country.

Consider the problems that are also important when developing a good site. One of the very interesting problems displayed on the site [37], the logo is made very small, and the user will not be able to see and read everything.

Figure 6: Logo enlarged from the site https://www.anextour.com.ua/

It should be remembered that the logo is the business card of the company, it helps to pack the brand, branded products and become more competitive. That is, it aims to enhance the effect of memorization; demonstrates stability, reliability, success; emphasizes the status, image, prestige and reputation of the company Therefore, when developing it, it is necessary to comply with all the main requirements regarding the logo it is necessary to use knowledge in the field of psychology, stylistics, design and marketing.

Another rather interesting technical issue we've encountered is that each page opens in its own tab.

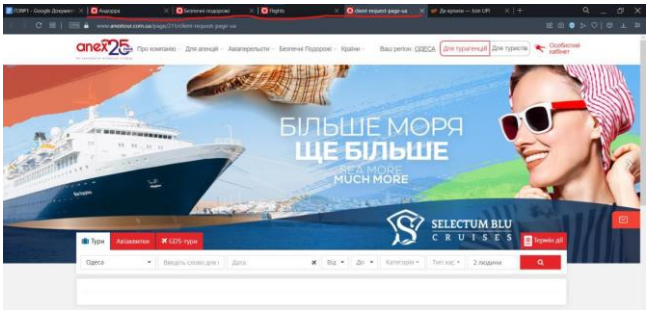

Figure 7: Incorrect opening of pages https://www.anextour.com.ua/

This is a rather non-standard error that affects both the overall customer satisfaction and the use of device resources. No need to abuse the client's patience. All this can lead to quite bad results and affect the positive image of the company.

Quite a trivial technical problem that arises for beginners in the development of sites, namely the lack of control of data entry formats and the necessary checks. Search by date allows you to enter incorrect characters in a string with a date (no verification).

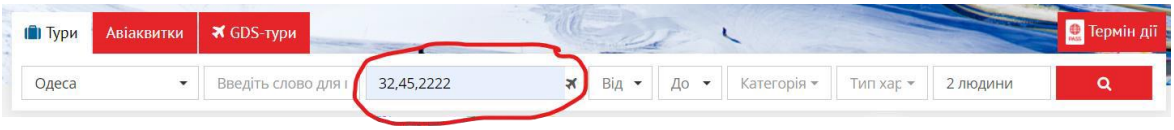

Figure 8: Uncorrected date entry https://www.anextour.com.ua/

It’s needed to help users enter data correctly and organize a check for erroneous input of information. There are different types of fields for collecting information – these are text fields, password entry fields, drop-down lists, checkmarks, switches, file downloads and much more. Taking into account the management of data entry formats makes the interaction with the site less difficult to fill out, more intuitive and increases conversion.

The next step in accordance with the task is the definition and selection of models, methods and metrics by which the development and evaluation of the interface will be carried out. During the implementation of this item, the following usability models and methods were selected: needs model, consumer behavior patterns, AIDA model, method for determining the identity of a person / user,

McCall model, contextual scenario method, Content audit method, information grouping method (Information grouping, method for assessing consumer attitudes to competitor's software, Fitts' law, navigation maps, modular grid, subjective satisfaction, heat map, scroll map, card sorting, analysis of data collected by feedback services (Google Analytics, Google Tag Manager, etc., A/B testing (A/B testing), testing compliance with usability standards, etc.

From the previously described for the analysis of the site, you can choose such aspects as the absence of errors, design (adherence to one style), structuring of the web page (correct construction of the menu, placement of content).

The next stage is the assessment of the compliance of the design with the requirements, namely the assessment of software, regarding possible errors in the design of the interface. In accordance with this, the main problems that exist on the sites [3 6, 37] as the main competitors, as well as on the current version of the site "CHALUPAtur" were further highlighted. A table of problems was compiled according to the type to which they belong. In accordance with this, some specific features were agreed. It is necessary to add to the main page promotions, sales, perhaps the approach of holidays, as other large travel agencies have long begun to use.

Each page of the site should have a link to the main one, the navigation system should be the same on all pages, non-existent links should not exist. The fullness of the pages, according to their names, and supplemented with Google maps tags. It is also necessary to take into account the characteristics of people with disabilities, namely visually impaired users. Regardless of the width of the computer screen, the image can be viewed well or there is an opportunity to enlarge it for correct perception. It is necessary to add a magnifying glass function to facilitate navigation and customization of the site for people with special features, which is a good tone for Ukrainian sites, and de jure for European ones.

Also, the new site must follow the three-click rule and the rules of seven. The necessary information is quick and there are no more than seven items in the navigation menu. The structure of the site should be quite convenient and understandable. Also, the presence of advanced search.

For a more detailed analysis and confirmation of the quality of the created interface and the provision of recommendations, further analysis was carried out using Fits' law.

To begin with, we give the wording of the law – this is a general law concerning sensory-motor processes, linking the time of movement with the accuracy of movement and with the distance of movement: the further or more accurately the movement is performed, the more correction is necessary for its implementation, and accordingly, more time is required to make this correction. Formula for calculations [41]:

$$T = a + b \log_2(\frac{D}{W} + 1), \quad (1)$$

where T – the user's work time from the menu in (ms), a and b – the coefficients of skills and abilities of the user with a particular device, D – the distance from one to another menu item, W – the width of the menu item when moving to it from another menu item. For approximate calculations, we use the following values of constants in the equation of Fits' law: a = 50, b = 150.

The width of the menu items is 160 mm, the distance from one menu item to another is 3 mm. Based on these data, you can calculate the user's time from the menu, which is: 51.2 seconds. Also, thanks to the site [41], which demonstrates the principle of operation of the Fitts law, you can also calculate how much time the user spends. In accordance with the above, it can be argued that the results obtained indicate that it is difficult for the user to get along them with the cursor, and also that a lot of time is needed to interact with the menu, so it should be improved to obtain more adequate data in accordance with the expediency of placing it elements should also be carried out "Card sorting".

According to the above, it can be concluded that it is much better to use the Fitts Law than not to use it.

Also, during the study, an assessment of the errors found on the “CHALUPAtur” website was carried out. The assessment was carried out in accordance with the calculation of the economic impact of the found usability errors on potential revenue. According to the assumption that the share of failures for reasons related to usability is 20% (constant = 0.2), the calculation will be made according to the formula [42]:

$$The\ Price\ of\ a\ Mistake = V * M * \left(\left(\frac{100\%-Conversion}{100}\right) * 0{,}2\right) * K * N, \quad (2)$$

where V – the number of visitors to the site "CHALUPAtur" for the selected period; M – the amount

of the average check for the period, UAH; *Conversion* – the current percentage of visitors' conversion to buyers, %; *K* – reduction factor of usability errors (serious error – 0.1; small error – 0.05; comments – 0.01); *N* – number of errors related to usability.

The number of visitors to the site "CHALUPAtur" for the selected period is 500 people. The amount of the average check for the period is 4000 UAH. Conversion rate – 1.4% (7 purchases per day per 500 visitors). The reduction factor of usability errors is 0.1. The number of errors related to usability is 5.

After completing the calculation, the cost of the error is 200 000. According to the result of the study, it can be concluded that there are a number of necessary conditions for the site, without which it is impossible to do, they comply with existing rules and standards. Reviews play an equally important role, as their buyers and potential buyers will be able to find out the impressions of the tour from other people and have the opportunity to ask questions. This will greatly facilitate the process of determining with the tour and reduce the impact of causes, that force the user to use other communication channels and encourage them to choose another site. It would be very convenient to have a mode that would allow you to change the language on the site, user-friendly and a night mode function that would ease the tension on the eyes.

In accordance with the above and the above calculations, we can conclude that usability errors have a negative impact both on the intention to carry out the target action on the “CHALUPAtur” website and on satisfaction with the interaction.

It should also be noted that the use of the provided generalized process of developing a user-oriented design, as well as the data on models and usability methods used in the process of developing and evaluating the software interface given in Table 1, greatly simplify the process of determining the necessary work, models and metrics when designing the software interface.

The considered requirements for information on a web resource and design errors highlighted in the experiment make it possible to further identify the main "scarcity zones" in terms of user interface design. Thus, reducing the percentage of user dissatisfaction and reducing the psychophysiological tension of users, which in turn allows us to design a more ergonomic design.

5. Conclusions

As a conclusion throughout the work, it can be noted that the results obtained make it possible to identify the objective need to use various sets of characteristics and characteristics to assess the quality of innovative software. All the tasks set at the beginning of the work of the study were solved.

It has been proven in practice that it is necessary and mandatory to use analytical aspects of usability, which help not only to facilitate the process of software development, but to calculate and take into account in advance the necessary metrics that use the design process in order to further positively affect the popularity and attractiveness for the user.

It should be noted that in order to obtain a comprehensive assessment of the quality of the software, it is advisable to simultaneously use various elements, such that are tainted to simplify the process of determining the necessary work, models and metrics when designing the software interface. Among them, considerable attention should be paid to the generalized process of developing a user-oriented design, as well as the data on models and usability methods used in the process of developing and evaluating the software interface given in Table 1. It should also be remembered that if it is necessary to obtain a comprehensive assessment of the quality of a particular software, an individual system of indicators and characteristics should be formed in accordance with the type and specifics of the software.

The models and methods systematized during the study cover the process of designing and evaluating software interfaces as much as possible and provide an opportunity to effectively assess the degree of usability of the program. An improved generalized process of developing a user-oriented software design makes it possible to make a detailed assessment of the necessary work, that is, it is an effective tool for studying the ergonomics of the software.

Further work of the authors will be focused on the practical application of metrics and the formulation of new results achieved through a formal description of the software [43].

The benefits of using the provided generalized design development process, as well as the data on models and usability methods used in the process of developing and evaluating the software interface, presented in Table 1, are aimed at:

- improving the quality of software;
- reducing the number of design errors;
- assessment of the priority of investing in software, its modernization and development;
- increasing the level of software usability compared to the level of competitors;
- increasing the popularity of software designed, developed or analyzed;
- determine how long it will take to perform specific tasks in accordance with the software functionality;
- increased convenience and clarity of the use of the developed software;
- increasing user satisfaction with the interface and the software itself ;
- identifying the changes necessary to improve productivity and user satisfaction, and as a result of the popularity of the software;
- making learning easier for new users;
- and more.

The application of the above methodical approach to determining the main elements and performing usability analysis allows each company to evaluate not only the general standard parameters of the quality of the software, but also to focus on the key features of each specific solution.

The work applied a comprehensive multi-level approach to the analysis of user performance and ergonomics of the software, on the basis of which a scheme of experimental assessment of the degree of ergonomics of the Website was prepared, taking into account, in addition to the success of the tasks on the site and the subjective assessment of user satisfaction, a number of objective indicators of reliability and psychophysiological price of the user's activity and makes it possible to obtain quantitative indicators. Thanks to this, you can reduce design errors, as well as affect the popularity of the software itself.

The obtained results will allow to continue work on solving the problem of choosing models, methods, and metrics for evaluating software used in the development throughout the WC [44].

Further research is related to the analysis of existing metrics used in the design and development of software interfaces, which are aimed at improving the quality and reliability of software by improving the interface design process. Special attention should be paid to the standards of the IEEE and ISO / IEC series used in the design of world software development practice.

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