

UDC: 681.3:377.4

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**USABILITY AS A WAY TO IMPROVE THE EFFECTIVENESS OF
INFORMATION SYSTEMS IMPLEMENTATION**

DOI:10.14308/ite000489

Lately, the information systems of different types, particularly systems to manage scientific research, have been widely introduced into education and science. However, the ways of optimizing the implementation of such systems as well as the improvement of their effectiveness have not been adequately studied. That is why further research is needed for possible ways of improving the information systems implementation. The effectiveness of the information systems implementation is largely dependent on the presence of a "friendly" interface system, on its usability.

The goal of the paper is to determine the theoretical aspects of the "usability" concept and to study how the usability improves the efficiency of information systems in scientific research management. The subject of this research is to study the usability as a means of improving information systems efficiency using as an example the information system to manage scientific research at the National Academy of Pedagogical Sciences of Ukraine. This paper examines the main approaches to the evaluation of information systems usability. The paper also describes the testing of information system usability in research management. The research made it possible to conclude that the usability is a factor that increases the efficiency of an information system and allows potential users to better understand, organize and summarize business processes.

Although the application of the principles of usability is a promising direction, it is one of the little studied problems in the Ukrainian systems engineering. The detailed study of usability basic rules will allow developers of information systems to create better products with "friendly" interfaces. These rules will help users better understand the content of newly created information resources and therefore will facilitate their implementation and usage.

Keywords: *an information system, management, scientific research, usability.*

Today one of the priorities of this country is to develop an information society that provides for people's interests and needs, an open high-tech society aimed at innovation development, a society that will enable every citizen to create and store information, to have free access to it, as well as to use and share it with others.

Modern trends in the organization of society, especially its apparent informatization, have become the basis for the expansion of information technology usage in education and science. In recent times, information systems have been widely used to manage scientific research.

However, the information system efficiency is largely dependent on the presence of a "friendly" interface, the presence of which allows the user to work with the system quickly and easily, performing necessary operations "intuitively".

But the effectiveness of the information systems implementation is largely dependent on the presence of a "friendly" interface system, on its usability.

The goal of the paper is to determine the theoretical aspects of the "usability" concept and study the impact of usability as a factor in improving the efficiency of information systems implementation to manage scientific research.

The subject of this research is to study the usability as a means of improving information systems efficiency using as an example the information system to manage scientific research at the National Academy of Pedagogical Sciences of Ukraine.

The testing ground of the study was the information system "Scientific Research: Planning, Control, Monitoring" <http://planning.edu-ua.net> (hereinafter referred to as IS "Scientific Research"). The system is built as the corporate Intranet portal of the National Academy of Pedagogical Sciences of Ukraine (hereinafter referred to as "NAPSU") using the Microsoft Office SharePoint Server 2007 [1].

Given below are definitions of the basic concepts required to describe the research.

The document is a material object that contains fixed information specifically designed for its transmission in space and time.

The electronic document means "any information presented in a digital form and conveyed to an agency or a third party, where "information" may include some data, a text, sounds, codes, computer programs, software, or databases.

Management in businesses and organizations is a function that coordinates the efforts of people to accomplish goals and objectives using available resources efficiently and effectively. Management comprises planning, organizing, staffing, leading or directing, and controlling an organization or initiative to accomplish a goal.

Management is the most effective and creative instrument aimed at using and controlling social and economic systems [2].

Document management means the coordination and control of a flow (storage, retrieval, processing, printing, routing and distribution) of electronic and paper documents in a secure and efficient manner to ensure that they are accessible to authorized personnel when it is required.

The information system (IS) is a combination of hardware, software, and infrastructure as well as trained personnel that are organized to facilitate planning, control, coordination, and decision-making in an organization

The systems development life cycle also referred to as the application of development life-cycle, is a term used in systems engineering, information systems and software engineering to describe the process of planning, creating, testing, and deploying an information system. The systems development life-cycle concept applies to a range of hardware and software configurations, as a system can be composed either of hardware or software only, or a combination of both.

The tutor is a university or college teacher who is responsible for the instruction and supervision of students assigned to him.

Usability makes the process of using and learning a man-made object easy. Such an object can be a software, website, book, tool, machine, process, or any other thing a user interacts with.

Requirements for the development of research management information systems

Today all the major functional requirements for a system (its reliability, capacity, accessibility, safety, etc.) are identified established and supported by all systems.

In this paper we are going to consider the possibility of heightening the efficiency of the IS by increasing its usability. We believe that this system quality influences efficiency of IS implementation.

What is Usability? *Usability* is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use [3].

Usability means that the people who use a specific product can do it quickly and easily to accomplish their own tasks. This definition rests on four points:

1. Usability means focusing on users;
2. People use products to be productive;
3. Users are busy people trying to accomplish set tasks;
4. Users decide when a product is easy to use.

In fact, *usability* is a quality that makes sure that something works well, that a person of average (or even below average) abilities and experience can use the thing - whether it's a Web site, a fighter jet, or a revolving door - for its intended purpose without getting hopelessly frustrated [4].

Usability is actually a philosophy or a belief in designing a product that will meet a user needs and help him acquire useful experience. Besides that, it is also the specific process and

methodology that are meant to reach the real goal of usability. A new usability process starts by looking at who is going to use a product, how well he understands his goals and needs, and whether he is capable of selecting the right techniques to answer the question, "How well does this product meet the usability requirements of our users?" (Whitney Quesenbery)

It is important to realize that usability is not a single, one-dimensional property of a user's interface. In fact, usability has multiple components and is traditionally associated with these five usability attributes: learnability, efficiency, memorability, errors, satisfaction [5].

Usability is a measurable characteristic that, to a greater or lesser degree, describes how effectively a user can interact with a product. It can also be thought of as how easily a product is to be learned and used. (Jeff Axup, UserDesign)

The human-centered design is characterized by the following characteristics: the active involvement of a user in the process and a clear understanding of his task requirements; an appropriate allocation of function between a user and a technology; the interaction of design solutions; multi-disciplinary design.

Usability definitions contain some metrics that allow to evaluate usability:

Effectiveness is the accuracy and completeness with which users achieve certain goals. Effectiveness indicators include solution quality and error rates.

Efficiency is the relation between the accuracy and completeness with which users achieve certain goals and the resources expended in achieving them. Indicators of efficiency include task completion time and learning time.

Satisfaction is the users' comfort with and positive attitudes towards the use of the system.

That is why the traditional interpretation of usability as "easy to use" is too simplistic. Because it ignores the criteria listed above. In other words, the interface can be user-interaction, but completely unnecessary for the user. *The main idea*: usability cannot be considered and assessed in isolation from the user and context.

Improving the usability of the system is the concept design of an interface of software oriented for maximum visual and psychological comfort for the user.

World experience of software products indicates that this quality is considered quite significant now. World Usability Day was founded in 2005 and has since been held annually.

In studying the value of usability as an important quality of a system, which increases the efficiency of its implementation and subsequent use and exploring possible ways to improve it, we turned to the experience of commercial organizations.

Particular attention is paid to the methods and techniques of improving usability which are used by developers of the IC System. This particular system is currently being promoted in our research institute. It should be noted that for commercial organizations the main purpose of which is to sell their goods and services, usability issues come to the fore. But we believe that the quality level of IS which are implemented in non-profit organizations should be as high as possible.

System users show little interest in what software platforms, products or interesting technology solutions have been used for creating website or portal. The user needs a clean and simple design that is handy in use and navigation.

IS developers face the major challenge today which is to create a product that will be necessary and convenient for users. It should be quick to operate [6].

So, when developing a site and necessary technical requirements for it, a "friendly" interface has to be created with respect to future visitors and users.

To do this, developers have to use the clear and understandable structure of a site so that the user could easily find the right information. Of no less importance are content integrity and text presentation.

The most difficult part in the planning of the site, in terms of usability, is the inability of implementers to look at the site through the eyes of a user. To solve this problem, "usability testing" is recommended for site customers and developers.

The usability testing is a technique used in a user-centered interaction design to evaluate the product by testing it on users. This can be seen as an irreplaceable usability practice, since it gives

direct input on how really users use the system. This is in contrast with usability inspection methods where experts use different methods to evaluate a user interface without involving users.

The usability testing focuses on measuring a human-made product's capacity to meet its intended purpose. Examples of products that commonly benefit from usability testing are foods, consumer products, web sites or web applications, computer interfaces, documents, and devices. The usability testing measures the usability, or ease of use, of a specific object or set of objects, whereas general human-computer interaction studies attempt to formulate universal principles.

Currently, there are two common ways of usability testing:

- Service orders to a specialized Web Studio. The disadvantage is the high cost of such services, which is why many companies choose to opt out of the test site.
- Attracting of the target audience for testing. This method is much cheaper and easier.

Methods of Usability Testing

A usability test involves a carefully-planned scenario or a realistic situation, wherein the person performs a list of tasks using the product being tested while observers watch and take notes. Several other test instruments such as scripted instructions, paper prototypes, and pre- and post-test questionnaires are also used to gather feedback on the product being tested.

The usability testing can be performed using paper "prototype" of the site; using HTML - the layout of the site.

The main objective is to obtain information from the tester about the structure of the site, site functionality, accessibility symbols and navigation functions "[7].

The testing should be started as early as possible and then periodically repeated. An effective technique is competitors' sites usability testing. This allows to avoid many mistakes in the design stage of the project. The testing of the site is preferably to be performed after its release in the Internet.

According to Jakob Nielsen, "Studies of user behavior on the Web find a low tolerance for difficult designs or slow sites. People don't want to wait. And they don't want to learn how to use a home page. There's no such thing as a training class or a manual for a Web site. People have to be able to grasp the functioning of the site immediately after scanning the home page — for a few seconds at most"[8].

Jakob Nielsen has developed a number of techniques for rapid and economic improvement of the user interface, including heuristic evaluation. He is the holder of 38 U.S. patents targeted mainly at improving the user experience of the Internet.

Usability Evaluation

The key to developing highly usable sites is the employment of a user-centered design. The expression, "test early and often", is particularly appropriate when it comes to usability testing. You can and should test as early as possible in the process and the variety of methods available allow you to assist in the development of content, information architecture, visual design, interaction design and general user satisfaction.

Opportunities for testing include:

- Baseline usability testing on an existing site
- Focus groups, surveys or interviews to establish user goals
- Card Sort testing to assist with IA development
- Wireframe testing to evaluate navigation
- First click testing to make sure your users go down the right path
- Usability testing to gauge the user interaction end-to-end and
- Satisfaction surveys to see how the site fares in the real world.

Any one or a combination of these tests will radically improve the usability of your site, system or application.

Usability evaluations can capture two types of data: qualitative data and quantitative data. Quantitative data notes what has actually happened. Qualitative data describes what participants thought or said.

- Once you have gathered your data, use it to:

- Evaluate the usability of your website
- Recommend improvements
- Implement the recommendations
- Re-test the site to measure the effectiveness of your changes.

There are various methods of usability examination. For example, the direct methods include:

The “usability testing”: this technique involves "Think aloud".

The observation is the simplest of the techniques. You need to watch how a user works in a familiar environment. It is the most appropriate to finalize the existing product or business process automation.

The heuristic evaluation. Usability specialists review the interface under study in terms of its conformity with the generally accepted "heuristic" design principles. Each method involves from three to five (3-5) experts working independently of each other.

Indirect methods include:

Surveys/questionnaires and interviews. Most of these methods are used to assess subjective parameters such as job satisfaction.

Focus groups. A group of 6-9 users headed by the moderator discuss for about 2 hours their requirements and an existing interface.

Logging and the user feedback (self-reporting or logging actual use).

Self-reporting logs are usually used during the early phase of the design period when a prototype or first draft is available and there is still opportunity for the user feedback to be included in the product's design. Self-reporting logs are an especially effective technique for technical communicators, as they can provide information about a document that is much more valuable than simply having a user review the document without the product in front of them/him.

Quantitative methods include “usability metrics”. While conducting usability tests, designers must use usability metrics to identify what it is they are going to measure (or the usability metrics). These metrics are often variable and change in conjunction with the scope and goals of the project. The number of subjects being tested can also affect usability metrics, as it is often easier to focus on specific demographics. Qualitative design phases such as general usability and user satisfaction are also typically done with smaller groups of subjects. Using inexpensive prototypes on small user groups provides more detailed information, because of the more interactive atmosphere, and the designer's ability to focus more on the individual user.

Generally, the use of sophisticated quantitative methods in the study of usability is not justified. The widely-accepted method is testing the system by users. It involves the following:

- Selection of users and definition of specific operations;
- Users performing the most common basic tasks;
- Tasks should be set without prompting a user or putting leading questions to him;
- Testing should be conducted separately for each user of the system.

Each user should solve problems facing them independently as tutor assistance or intervention can significantly affect the results.

There is an assertion that to identify the most serious usability problems it is enough to bring to the testing five users. Instead of a one large-scale study it is more appropriate to conduct several small tests, introducing the changes to the design gradually, one after another. Such method permits you to correct errors as soon as they are identified. The method of the sequential analysis of a design enhances the quality of the final product best of all.

For our research we chose users: one person from every identified group. Testing involved a group of eight people. At the beginning of each new test, the composition of a team was changed as new testers were recruited from each group.

During one cycle of the test, members of a group performed routine operations with documents which they usually perform at their offices and organizations. For example, a secretary worked with the document "Departmental Data"; a research institute accountant formed the document "Data on Financial Situation" etc.

We wanted to evaluate the system's ability to process documents without difficulty or effort as well as to find out how smooth workflow processes are in the system that supports them. We also wanted to evaluate the features and benefits of the Portal IS "Scientific Research. Therefore all members of the group performed the operation on a portal to evaluate the user-service portal, sections menu navigation and other functions.

The impact of usability on the efficiency of the information system implementation

Users of information systems are reluctant and sometimes cannot articulate the sequence of actions that they perform. However, such a sequence proves to be indispensable for IS developers because it enables them to describe business processes which they use as guidelines in their work.

For decades, the circulation of documents at research institutes has been conducted in paper form. And today it is extremely difficult to transform this inefficient system into an electronic system of communication as it meets a strong resistance of users. So, a decision has been made to pass to the electronic system step by step using paper documents alongside with electronic ones. Taking into account this approach to the problem, we deemed it expedient to use the method of sequential analysis of the system which enabled us to correct mistakes discovered during the "usability" testing within the framework of each cycle [9].

Workflow research institutions, established for decades in paper form, it is very difficult to reduce to electronic form, even slowly. It is extremely powerful user's opposition. Therefore, it was decided to move to a paperless form in stages, first using paper documents simultaneously and gradually abandoning it. When using this approach was the use of an effective method of sequential analysis, which gave an opportunity to correct identified during usability testing errors within each cycle [10].

This method proves beneficial for all participants in the research process as it improves the quality of the staff, reduces time used for creating and processing documents, their search, updating, etc. The quality of the system increases if requirements of a user are well defined. The improved quality of the system will undoubtedly increase the level of a user's performance and give him satisfaction from using the product. And as a result, it will increase his motivation for further use of the system. And some users came up with interesting ideas and initiatives as to how the quality of the system could be improved even further. They offer ways of optimizing the system in order to achieve the desired functionality and services.

Conclusions

Our research into the usability of information system and its impact on the efficiency of IS implementation has made it possible to conclude that the usability is a factor that increases the efficiency of an information system and allows potential users to better understand, organize and summarize business processes.

In the process of the research we have learned that even experienced employees are not fully aware of the role and place of their activity in the overall system of document circulation at research institutes. This becomes particularly evident already during the pre-survey stage and during the formulation of system requirements.

Although the application of the principles of usability is a promising direction, it is one of the little studied problems in the Ukrainian systems engineering. The detailed study of usability basic rules will allow developers of information systems to create better products with "friendly" interfaces. These rules will help users better understand the content of newly created information resources and therefore will facilitate their implementation and usage.

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Стаття надійшла до редакції 04.06.2014.

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ЮЗАБІЛІТІ ЯК ЧИННИК ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ ВПРОВАДЖЕННЯ ІНФОРМАЦІЙНИХ СИСТЕМ

Останнім часом у галузі освіти і науки активно впроваджуються інформаційні системи різного спрямування, зокрема і для управління науковими дослідженнями. Однак, оптимізація шляхів впровадження таких систем і чинники, що впливають на її ефективність, досліджені недостатньо. Потребують подальшого пошуку можливі шляхи підвищення ефективності впровадження інформаційних систем.

Ефективність впровадження інформаційних систем значною мірою залежить від наявності «дружнього» інтерфейсу системи, тобто її юзабіліті. Предметом дослідження є юзабіліті як засіб підвищення ефективності впровадження інформаційних систем.

Метою статті є визначення теоретичних аспектів поняття «юзабіліті» та дослідження її впливу на підвищення ефективності впровадження інформаційних систем на прикладі інформаційної системи менеджменту наукової діяльності.

У статті розглянуто основні існуючі підходи до оцінювання юзабіліті інформаційної системи. Коротко описано тестування юзабіліті інформаційної системи менеджменту наукових досліджень, яке проводилося в межах виконання дослідження.

Дослідження дало змогу зробити висновки, що юзабіліті є чинником, який підвищує ефективність роботи системи і дає змогу потенційним користувачам краще зрозуміти, систематизувати й узагальнити уявлення про виконувані ними бізнес-процеси.

Застосування принципів юзабіліті є перспективним, однак належить до мало розроблених питань в українській програмній інженерії. Ретельне вивчення основних правил юзабіліті дасть змогу розробникам інформаційних систем створювати більш якісні продукти з «дружніми» інтерфейсами. Вони забезпечать краще сприйняття змісту ресурсу користувачами, підвищать ефективність впровадження та використання розроблених інформаційних ресурсів.

Ключові слова: інформаційна система, менеджмент, наукова діяльність, юзабіліті

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ЮЗАБИЛИТИ КАК ФАКТОР ПОВЫШЕНИЯ ЭФФЕКТИВНОСТИ ВНЕДРЕНИЯ ИНФОРМАЦИОННЫХ СИСТЕМ

В последнее время в отрасли образования активно внедряются информационные системы различного направления, в том числе и для управления научными исследованиями. Однако, оптимизация путей внедрения таких систем и факторы, влияющие на ее эффективность, исследованы недостаточно. Требуют дальнейшего поиска возможные пути повышения эффективности внедрения информационных систем.

Эффективность внедрения информационных систем в значительной степени зависит от наличия «дружественного» интерфейса системы, т.е. ее юзабилити.

Предметом исследования является юзабилити как средство повышения эффективности внедрения информационных систем.

Целью статьи является определение теоретических аспектов понятия «юзабилити» и исследование ее влияния на повышение эффективности внедрения информационных систем на примере информационной системы менеджмента научной деятельности.

В статье рассмотрены основные существующие подходы к оценке юзабилити информационной системы. Предложены краткие инструкции тестирования юзабилити информационной системы менеджмента научных исследований, которое проводилось в рамках выполнения исследования.

Исследование позволило сделать выводы, что юзабилити является фактором, который повышает эффективность работы системы и позволяет потенциальным пользователям лучше понять, систематизировать и обобщить представления о выполняемых ими бизнес-процессах.

Применение принципов юзабилити является перспективным, однако относится к мало разработанным направлениям в украинской программной инженерии. Тщательное изучение основных правил юзабилити позволит разработчикам информационных систем создавать более качественные продукты с «дружественными» интерфейсами. Они обеспечат лучшее восприятие содержания ресурса пользователями, повысят эффективность внедрения и использования разработанных информационных ресурсов.

Ключевые слова информационная система, менеджмент, научная деятельность, юзабилити