

Developing ISO 9241-151 Product Certification Process: Challenges

Kürşat Çağiltay¹, Ozge Alacam², Nihan Ocak³, and Feride Erdal³

¹ Department of Computer Education and Instructional Technology,
Middle East Technical University, Turkey

² Department of Informatics, University of Hamburg, 22527 Hamburg/Germany

³ Human Computer Interaction Research and Application Laboratory,
Middle East Technical University, Turkey

{kursat,nihan,ferdal}@metu.edu.tr,
alacam@informatik.uni-hamburg.de

Abstract. ISO 9241 Ergonomics of Human-System Interaction Standard, which is also called as Ergonomic requirements for office work with visual display terminals, is a standard containing many parts about ergonomics of human computer interaction. In this paper, we aim to elaborate the challenges evoked during ISO 9241-151 Product Certification Process handled at the Middle East Technical University (METU), Human Computer Interaction Research and Application Laboratory (METU-HCI-LAB), which is the first and only accredited laboratory of Turkish Standards Institute-TSE within the scope of “TS EN ISO/IEC 9241-151”.

Keywords: ISO 9241-151 Guidance on World Wide Web User Interface, Usability guidelines.

1 Introduction

It is an undisputable fact that the computer, which was once only operated by experts during the years it was first introduced and produced in small numbers, is now an indispensable part of human existence. Therefore it gains more and more importance that the computers and the software running on them i.e. the interfaces need to be effectively and efficiently used by everyone and should be further improved to meet that need.

The web sites and applications is one of the subset of information technologies, and their multi-purpose and changeable nature can be considered as a big challenge that web developers and designers regularly face with. In order to provide a quality of the service, there are different standardization and guideline systems; some of them are prepared and recognized with certificates from large organizations such as ISO (The International Organization for Standardization), HHS (U.S. Department of Health and Human Services), JISC (Joint Information Systems Committee for higher education) while some of them can be considered as more small-sized and flexible [17, 18] which aim to provide quick guidance for interface designers to evaluate

their own application step by step in the course of production in easy and optimal way [15, 16]. However, to have a recognized certificate, well defined and standardized checklists are needed to be employed, and the evaluation of their effectiveness and efficiency as well as applying comparative studies to detect superior /inferior properties [14] to provide better framework is another crucial topic.

ISO 9241 Ergonomics of Human-System Interaction Standard, which is also called as Ergonomic requirements for office work with visual display terminals, is a standard containing many parts about ergonomics of human computer interaction. This main standard has various sub standards. According to definition of ISO 9241-151 Guidance on World Wide Web User Interfaces [1], which is one of these substandard and also topic of this paper, “it provides guidelines for the user centered web sites aiming to make user friendly interfaces by increasing usability of them”. The following five main issues are addressed in this guideline:

- high-level design decisions and design strategy;
- conceptual content model;
- content objects and functionality;
- navigation and search;
- content presentation.

This guidance also contains lots of references to other standard documents such as for design [2,3,4,5,6], process [7,8,9] and evaluation domain [10,11,12].

In order to perform ISO 9241-151 product certification process in Turkey, a laboratory should clarify the conditions of “EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories standard [13]” and needs to be accredited from the Turkish Standards Institute (TSE). Additionally, laboratory should be one of the subcontractor laboratories of TSE. After meeting these criteria, the certification process can take place. This organizational structure lets the laboratory to be third party that is located between the Turkish Standards Institute that is responsible from the final decision of providing certificate and the customer that demands the certification to assure that the interface meets ISO 9241-151 usability criteria.

In this paper, we aim to elaborate the challenges evoked during ISO 9241-151 Product Certification Process handled at the Middle East Technical University (METU), Human Computer Interaction Research and Application Laboratory (METU-HCI-LAB), which is the first and only accredited laboratory of Turkish Standards Institute-TSE within the scope of “TS EN ISO/IEC 9241-151”. This paper firstly aims to provide information about laboratory environment and procedures during certification process, and then discuss the challenges that are observed. Besides, it also aims to enlarge upon the challenges by providing suggestions one by one. The detection of these challenges have an invaluable contribution in the elimination them by providing improvements in the methodology.

2 METU HCI Research and Application Laboratory

METU Computer Center, Human Computer Interaction Research and Application Laboratory, has carried out activities to support the tests which are conducted to develop user friendly interfaces for information systems since 2006. In order to support the development stage of the web pages of departments / units, to assist the designers with the design of interfaces developed by the Computer Center of University, to carry work on accessibility, to provide a medium for academic research purposes and to provide support for the development of effective and efficient interfaces cooperating with other universities, the public and the private sector, Human Computer Interaction Research and Application Laboratory has been activated.

In usability studies conducted to evaluate the usability of interactive interfaces at our laboratory, together with the traditional usability methods and the data provided by the eye tracker, more reliable results are provided. With this facility, information about users' experiences about interfaces at the design stage, during the design process or afterwards, how users make use of them, what problems users encounter are obtained thus further improvements are made possible. In short, it is aimed to develop usable interfaces to assist users in making less mistakes and in achieving the task in a shorter time with less difficulty.

METU Human-Computer Interaction Research and Application Laboratory is a medium established to carry out the studies, which are mentioned above, and the lab consists of a test and a control room. During the experiment, it is possible to get feedback by recording emotional responses of users, eye movements, and monitor screen, so as to evaluate the applicability of any given software.



Fig. 1. METU HCI Lab

Beginning from 2012, the laboratory has been started to work as the first and only accredited laboratory of Turkish Standards Institute-TSE within the scope of “TS EN ISO/IEC 9241-151 Ergonomics of Human-System Interaction - Part 151: Guidance on World Wide Web User Interfaces” standard in accordance with the “ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories” standard of TSE.

3 Certification Process

In this section, the steps followed for user interface certification process are presented. Certification process consists of 5 main sections, these are

- i. Preparation and sampling;
- ii. Experiment;
- iii. Analysis;
- iv. Reporting and
- v. Evaluation.

The standard provides guidelines to handle the procedure during each of these steps in detail. The first step, which is “Preparation and Sampling”, starts with the arrival of the application according to rules specified in corresponding procedure. Afterwards, the acceptance procedures including evaluation of sample and agreement with the customer are employed. An important entity in this step is to find appropriate tasks which can give broad idea about the usability of the website.

In the second step, the experiment is conducted. As it is expected, it is the most common way to evaluate the usability of the website according to ISO 9241-151 checklist. In METU-HCI-LAB, in order to investigate the website from different perspectives, we employ additional experiment methodology, which is user centered usability evaluation enhanced by eye tracking technology. By this additional methodology, we can obtain not only the problem that does not meet the criteria, but also what kind of problem this is, and what kind of solution should be employed based on the strong empirical results obtained from both performance data of the participants (number of errors, success rates etc.) and eye movement data.

Then, next step is the analysis of the collected data. Firstly, user centered usability study is analyzed. The results of this analysis contain data for both performance and eye tracking data according to corresponding procedure and they can indicate the parts of the interface with usability problems. Afterwards, this data is used to support the process that requires the fulfilling of checklist. For the analysis based on the checklist, the uncovered criteria are identified. Then, these criteria are sorted according to their importance level.

The fourth step is the reporting the results obtained from each methodology in a combined manner.

As the final step, the decision about ISO 9241-151 Certification for the product is given. If the product is evaluated as “appropriate for certification”, the usability report is presented to the customer and TSE. If the product is evaluated as “insufficient for certification”, the evaluation with all the steps mentioned above are repeated until the product meets the criteria or the customer withdraws the product from the certification process.

4 Challenges

Throughout the entire process, each step has some challenges that should be dealt with carefully. Additionally, there are also some challenges that are related with more

than one step, in particular they are about the entire certification process. These are variability of the purpose, user and content regarding the interface. The flexibility of the evaluation, scope of the interface, level of granularity can also be considered as important aspects that should be taken into account during this process. Another important topic is the need of update and technology change, and website's ability to maintain the standard under these conditions. Moreover, rapid improvements in the technology introduce the necessity of the divergence from unitary structure and this requires the integration of additional guidelines to the evaluation procedure without losing the requirements of the main standard, which is ISO 9241-151. This intertwined structure between the technologies makes the certification process complicated. The timing to apply this standard to evaluate the website is another important aspect of this topic, the cost in terms of both expenditure and time gets multiplied when the standard is postponed to later stages (from design to implementation).

Since product is a website interface in ISO 9241-151 certification process, the purpose, user and content of the interface differs from each other so that each interface should be examined according to its own properties. Therefore, the evaluation should be flexible to cope with this variability and at the same time, it should make ensure that the minimum criteria have been met. The variety on the purpose leads the need highlighting of different levels/aspects of web sites and web applications.

When the scope of the website in terms of content, target user group or services provided gets deeper and deeper, the evaluation gets complicated due to level of granularity. Also, making classification problematic criteria's importance level is hard for the websites with different purpose and content. Another challenge comes with the nature of content provided by web sites. Majority of the web sites are frequently updated, not only in terms of information but also the technology. Therefore, the web sites have high risk to lose the minimum requirements that the standard requires unless they are monitored carefully. For example; as the number of mobile devices increases, the usability of web services provided for these devices has been important topic. Now, the mobile technology can be considered as inseparable from touch screen technology. This means that the web sites provided for mobile applications should be meet the criteria from not also usability but also ergonomics perspective. This intertwined structure among the technologies makes the certification process complicated because the main parts of the web sites are covered from different standards. From another perspective, for the matter of certification, generally these guidelines are applied after the development and design process has been completed. This process consumes more time with more costs.

Another challenge rises from the absence of the public awareness about the importance of user-friendly interfaces. It is very important to create public awareness, which provides repulsive force for organizations to have standardized and certified web pages. For the expanded standardized user interfaces, it very important for organizations to acquire awareness of developing certificated websites is a distinguishing feature among other organizations and its worth to spend time for usability studies.

5 Suggestions

Our proposed certification process contains additional steps that approach to evaluation from different aspects and handle it as a coherent usability approach instead of evaluation and reporting of the interface only according to ISO 9241-151 checklist. We believe that the process from the evaluation to subsequently implementation of the results to the interface can be handled in a healthier and clear way by this approach although it requires more time with respect to only checklist evaluation. In order to assure that the result of the evaluation, all parties; the laboratory, TSE (via the laboratory) and customer should be meet on the same ground at the onset of whole certification and evaluation procedure. As mentioned in the previous section, due to the variety of the interfaces in terms of aim, scope etc, the evaluation approach should be not only flexible but also comprehensive. Therefore deciding on the additional evaluation techniques should be clarified and agreed beforehand. Furthermore, providing good communication channels that supports the whole process is one of the core actions. Preserving copyrights is another issue that should be handled delicately. The former two issues are handled carefully by the procedures defined and guaranteed by EN ISO/IEC 17025, one of the quality management systems for laboratories. Therefore, the pre-requisite of having EN ISO/IEC 17025 ensures the quality of service provided by the laboratory that evaluates the interface. However, the regular monitoring of the requirements of EN ISO/IEC 17025 and applying improvements immediately become fatal in developing ISO 9241-151 certification process.

Moreover, ISO 9241-151 checklist evaluation gives general overview of the interface with respect to predefined criteria and detects the points that the interface failed. However, as we discussed previously, our proposed procedure covers the step of providing solution, which is specific to that interface in order to get rid of the usability problems. Therefore, additional evaluation methods such as eye movement analysis or expert analysis accompany to checklist evaluation. We believe that the contribution of these additional methods is indisputable in order to overcome the challenges presented in this paper, since each of them focused on different aspects of the interface such as cognitive load, esthetics, highlighting an information (such as advertisements).

Addition to challenges faced before testing or during test, there still exist many challenges for the post-test period. Coherent analysis of the data comes from different sources is one of these crucial issues. Employing user-centered analysis before employing checklists helps us to approach checklist with the extensive knowledge and experience about the interface. Therefore detecting local and global problems of the website via checklist turns to more transparent process. The reporting is another core step of the post-test procedures. Employing different analysis methods and degrade them to the decision of providing certificate, and at the same time, providing clear and applicable solution which is specific to the interface for the customer is highly dependent onto this step. Therefore, we provide the final report in multilayered way. First of all, the analysis from each method is reported individually, then in another layer, their results are combined in a way that each

usability problem is presented with its location, how it is detected, the problems caused by this specific issue, and suggestions for possible solution. Finally, based on this detailed result, summary tables are prepared and presented as a final layer to provide quick overview.

So far, the suggestion to the challenges arise during the certification process has been proposed, however as mentioned in the previous section, to not have public awareness about the necessity of this usability requirements is another issue that is closely connected to the success of this certification process. How the public foundations approach to this certification process and benefits of the entire process play important role to extend the usage of ISO 9241-151 standard. Additionally, when the customer see this certification as an assurance of providing good quality of web-service, the next step, which is providing continuity in the quality of the service with the guidance of ISO 9241-151 have a chance to be grounded in more established structure.

6 Conclusion

In the recent years, web sites have become much more interactive with their interfaces adding more features. As a result of this, new area of research has developed to analyze content, navigation, graphics, usability and many more categories. Organizations are now taking advantage of these research areas to complete missing key components and eliminate weaknesses of their interfaces.

Web interfaces has spread such a way that it become an integral element of businesses. In terms of competitiveness, having better designed, informative and usable web pages are the main goal of firms and organizations.

Although ISO 9241-151 certification process is a complicated process, it is very important to raise awareness of usability. It brings major benefits like, the clearance of the services by the users that user interface provides, easy accessibility and so on. Although it is hard to do the documentations that the standard requires, it must not be forgotten that, the job produced after all the process is a standardized job and contains high quality.

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