Using expert evaluation to assess the usability of the National Library of Software Programs

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ABSTRACT

In the last years, there is an increasing demand to develop a national repository for software programs, especially in the area of public administration. This kind of e-service is required both by vendors interested in promoting their products and funding institutions, interested to estimate the costs and to improve the cost/benefit ratio. The National Library of Software Programs (BNP) is a software application that has been developed during a national research project. This paper presents a case study of usability inspection of this web application. The results revealed several usability problems that were mainly related to the difficulty to create an account and to register online a new product, failure to download the information about a product and the lack of information about products.

Keywords

Usability, usability inspection, usability heuristics, digital libraries, software catalogs.

INTRODUCTION

Over the past decade, the global software and services market has known a continuous expansion having as growth engine the quantitative and qualitative evolution of user requirements, coupled with the evolution of ICT technologies, each provider trying to impose on the market with innovative, increasingly complex and diversified software products.

In this context of the competition of the available software solutions, it has appeared a need for computer systems to provide facilities for grouping in one place the software vendors along with their products, and to provide for users the right tools for search, retrieve and recommendation of software products complying with their requirements.

At European level, OSOR - Open Source Observatory and Repository for European Public Administrations has been launched with the purpose to support and encourage the collaborative development and reuse of publicly funded applications for European public administrations [14].

In the last years, there is an increasing demand to develop a national repository for software programs, especially in the area of public administration. This national repository is required both by vendors interested in promoting their products and funding institutions, interested to estimate the costs and to improve the cost/benefit ratio.

This paper presents a case study of usability inspection of a web application: National Library of Software Programs (BNP – Biblioteca Nationala de Programe).

BNP is a software catalog that enables the registration of software products and provides useful information about these to interested users. The web application has been developed during a research project and has been evaluated for usability in March 2017.

The rest of this paper is organized as follows. The following section presents some related work in the area of usability evaluation and usability of digital libraries. In section 3, the case study is presented. The paper ends with a conclusion and future work.

RELATED WORK

Usability evaluation

The ISO 9241-11 standard defined usability as 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 [7].

The goal of the usability evaluation is to identify usability problems, help the developers to fix the problems and, this way, improve the usability of the interactive system. A usability problem has been defined by Nielsen [12] as any aspect of the user interface which might create difficulties for the user.

The usability problems are rated according to the potential effect on user's task on three severity levels: major, moderate, and minor:

- major: failure to accomplish the task goal or a significant loss of data or time.
- moderate: has an important impact on task execution but the user is able to find a way.
- minor: is irritating the user but the impact on the task's goal is not important

A good practice requires fixing the important usability problems (severe and moderate) before the first release of the application.

There are two main categories of usability evaluation methods: the inspection methods (expert evaluation) and the user testing.

Usability inspection is carried on by experts that are evaluating the user interface against a set of widely accepted usability principles. The inspection methods are less expensive but more subjective (depend on the

evaluator's expertise). Another advantage is that usability inspection can be carried on in the early stages of the development process [4, 20].

The usability inspection provides two kinds of measures:

- Quantitative: number of usability problems in each category.

- Qualitative: detailed description of individual usability problems.

There are a lot of usability inspections, from which the most widespread is the heuristic evaluation proposed by Nielsen & Molich [13]. The evaluation is done against ten usability principles (heuristics).

Another set of principles has been proposed by Bastien & Scapin [3] in the form of ergonomic criteria. The set is structured into six groups: user guidance, workload, adaptability and control, error management, consistency, and compatibility. For each criterion, the definition, the rationale and some examples of guidelines are given.

Since heuristics and ergonomic criteria are too general, a lot of research has been devoted to extending them with more specific or more detailed usability principles.

The literature review of Quinones & Rusu highlighted several ways of developing and validating heuristics in order to address the evaluation requirements of specific application domains [18]. They noticed that the most frequent approaches to developing heuristics are either based on existing usability heuristics or on a methodology to create usability heuristics.

Heuristic evaluation has been criticized because it is mainly oriented towards fault finding than to the task goal [9]. As Cockton et al. [4] pointed out, rule-based methods such as heuristic evaluation or guidelines-based evaluation are system-centric and evaluate the usability as a property of the system.

Based on several comparative evaluations of the same website, Molich et al [11] concluded that the evaluation results depend on the selected tasks, methodology, and evaluators.

An inspection method that is task oriented is the heuristic walkthrough [19]. Another task-based inspection method has been proposed by Pribeanu et al. [16]. In this method, the usability problems are explained with an extended set of usability heuristics. This set integrates the heuristics of Nielsen & Molich with the ergonomic criteria of Bastien & Scapin. The structure follows the six general ergonomic criteria. The method has been used for the evaluation of municipal websites. Later on, the heuristics have been revised in order to better address some specific user-centred design issues [17].

Usability of digital libraries

The term "digital library" applies mostly to repositories of publications in a digital format that can be downloaded or viewed. By analogy, the catalogs of software products may be included in the same category. Similar usability problems could be found in both digital library systems and software catalogs, regardless the type of content.

A lot of research has been carried on to assess the quality and usability of digital libraries [2, 8]. However, the interest in usability is low and the focus is more on usability as a quality attribute than on the evaluation.

Dalkıran et al. [5] consider usability in the context of digital libraries as "the ease of use, proliferation and the extent of satisfaction it provides to its users". Kling [10] draws attention to usability issues that go beyond the design of interfaces of multi-user systems, such as digital libraries, and to the organizational usability design issues. Pighin & Brajnik [15] evaluated the retrieval techniques which are a typical feature of the software catalogs.

CASE STUDY

The BNP web application

The Software National Library (BNP) is a software library developed by ICI Bucharest with the purpose to collect, store, archive, manage and make available the software products developed in Romania [1]. BNP has created as an OSOR-compliant software registration structure so that to enable the information exchange between the national and European platforms.

The entities included in the BNP are defined in a unitary way in a sufficiently flexible format to allow the description of any type of software products. In Figure 1, the home page of the application is presented.

Figure 1. The home page of BNP

The main objectives of BNP are:

- Efficient structuring of information about software products that are used in the public administration institutions and in the business environment;

- Promoting the software products, especially Romanian ones, through a set of modern procedures for information dissemination;

- Increasing the degree of interoperability of information systems from public administration;

- Stimulating the competitiveness of the IT business environment, including exports, also by facilitating the development of partnerships for the development and use of IT products.

The Software National Library (BNP) centralizes in an on-line catalog the existing commercial software products and those developed through research projects. BNP provides

a platform and a flexible development environment that facilitates access to and dissemination of information related to the software products developed in Romania

The potential users of the BNP system are the software developers (private and state-owned companies), software vendors, and the software users (public administration, businesses, academia, and researchers).

A first prototype has been launched at the end of 2016 and several software providers were invited to register their products in the library.

Method

In this study, an expert evaluation method has been used that is task-oriented. Four experts tested the application in a task-based approach with the purpose of anticipating the difficulties of a real user.

The evaluation tasks are presented in Table 1.

Table 1. The evaluation tasks

No.	Task
1	Create a user account on the platform
2	Obtaining information about the software products
3	Adding a new product on the platform
4	Sending opinions and suggestions

The usability problems are detected and rated following a task-based approach. The usability problems have been explained and documented by using the set of 25 heuristics presented in Table 2 [17].

Table 2. The set of usability heuristics

User Guidance	
1	Visibility of system status
2	Prompting
3	Immediate feedback
4	Information architecture
5	Grouping / distinction
6	Legibility
Workload	
7	Concision
8	Recognition instead of recall
9	Minimal actions
10	Information density
Adaptability and control	
11	Flexibility and efficiency of use
12	Experience of the user
13	Explicit user actions
14	User control
Error management	
15	Error prevention
16	Quality of error messages
17	Error correction
Consistency and standards	
18	Consistency
19	Compliance with standards and rules
20	Significance of codes
Compatibility	
21	Compatibility with the user
22	Task compatibility
23	Task guidance and support
24	Help and documentation
25	Esthetic design

The evaluation has been performed in two steps:

- Individual evaluation: each evaluator tested the application independently and recorded the usability problems for each task.
- Collaborative consolidation: removing the duplicates, removing the false usability problems, agreeing on a list of unique usability problems, agreeing on the severity rate and finalizing the description.

The following information has been recorded for each problem: context and location, anticipated difficulties, cause, suggestions for improvement, usability principle (heuristic) violated, and severity.

The similar usability problems were integrated following the "similar changes" technique [6].

The reliability has been assessed with two indicators: the average detection rate and the average agreement between any two evaluators.

Evaluation Results and discussion

The number of problems detected by each evaluator varied from 10 to 18. In the second step, the individual problems have been analyzed in order to eliminate the duplicates and the false problems, agree on the severity, and produce a common problem description. A number of 3 problems have been discarded (false problems).

The collaborative consolidation resulted in a total of 28 usability problems, as shown in Table 3. The detection rate varied between 32% and 34% with a mean of 39.29%. The average any two agreement was 20.91%.

Table 3. Usability problems per task and severity

Task	Total	Major	Moderate	Minor
1	9	1	5	3
2	11	2	5	4
3	3	1	2	-
4	5	-	2	3
Total	**28**	**4**	**14**	**10**

Four major problems have been detected:

- Difficulty to create an account for a new user.
- Failure to download the information about a product.
- Lack of information about all products (the application only enables the display of recently registered products),
- Difficulty in registering online a new product.

The user guidance is very weak. There are important usability problems that are related to the organization of menus. The horizontal menu is placed above the page header which makes it difficult to notice. The vertical menu is weakly structured and makes it difficult to find the information needed.

The main cause is the fact that the application has not been designed for the online registration of software products. The main concern was related to a rigorous verification of the vendor and of the information provided. This added a lot of bureaucracy, including the requirement to sent a formal request by mail. This approach proved to be wrong because many software providers lost their interest and gave up to send their products. This is clearly shown by

the relatively small number of products that have been registered.

There is no search facility to find the software products according to a search criterion. In general, it is difficult to find how to register a new product or how to send an opinion. Other moderate usability problems are related to the error prevention: mandatory data fields are not marked and there is no data validation.

The minor usability problems are related to inappropriate annotation of the user registration section, the English version of the application is not functional and the software catalogs present insufficient information.

CONCLUSION

This case study brought useful results for the developers. Overall, the BNP web application is far from being usable. First priority is fixing the software bugs and prepare the support for the online registration.

It is obvious that the application has not been designed having in mind a set of clearly defined user tasks. The second priority is to define the users' tasks that are critical for the successful use of the application.

The next version should reconsider the design in order to improve the information architecture, provide adequate user guidance, ensure the online registration of products, and include a search engine.

This work was the first step in the usability evaluation of the application. Before the release of the new version, the usability inspection will be repeated. Then a user testing will be conducted in order to finalize the evaluation report and prepare the official launching of the application.

Acknowledgement

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