

Evaluating the Usability and Efficiency of the National Oil Corporation - Digital Library in Libya

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Abstract - This paper presents a preliminary discussion on some of the results from a survey aimed to explore, describe and explain some of the usability characteristics in digital library evaluation in the Libyan context. The study is framed in the evaluation of a bilingual digital library: The National Oil Corporation (NOC) - Digital Library in Libya. It is worth mentioning in this context that this study is the first of its kind to address evaluation issues in the context of Arabic language and it is limited to evaluate the effectiveness of the design of the prototype digital library which was designed using Greenstone digital library software. This paper discusses the evaluation of the prototype and reviews the analysis of the questionnaire, which was used for gathering data pertaining to the digital library that was built. The paper intends to discuss the methodology used for evaluating the prototype digital library, the framework, and the steps implemented to reach the final goal. Users' opinions and views on the digital library are also presented in this paper. Evaluating the prototype digital library is considered an important stage towards developing a full-scale NOC digital library.

Keywords: Digital Library Evaluation, Open Source Software, Usability

I. INTRODUCTION

This paper presents the evaluation of NOC digital library which was designed for the central library of the National Oil Corporation to improve the services provided to end-users and to strength the expansion of research activities within the organisation. The NOC is considered the corporation under which all oil enterprises in Libya run their business. In fact all oil has to be sold through NOC which carry out marketing operations of oil and gas, locally and abroad. For this purpose, NOC has its own fully owned companies which carry out exploration, development and production operations, in addition to local and international marketing companies.

Different approaches have been used by digital library developers depending on their evaluation goals (Solis, 2005) [1]. Buchanan, (2009) states that usability and usefulness can be readily combined, and that questionnaire and observation are valid multi-method approaches [2]. For the NOC digital library a usability-centred approach was applied to evaluate users' perceptions as to the ease of the use of the prototype library and to assess users' satisfaction. To achieve the

evaluation of the prototype library, the work has been divided into different phases, each stage is subdivided into steps and each step further contains a series of tasks. Thus the total work is broken down into manageable portion.

II. OBJECTIVES

The purpose of this stage is to assist in answering the following questions:

1. What are the problems facing library patrons in using the prototype library?
2. To what extent was the prototype library efficient in assisting users to get the most from it?
3. To what extent was the user interface successful in assisting library users to find and discover relevant resources in the most convenient way?
4. To what extent were browsing and searching facilities suitable for end users? Is there any need to modify these facilities to meet users' needs and requirements?.

III. DRAWING UP AN EVALUATION PLAN

Prior to designing the questionnaire a plan has to be established which clarifies what sort of data should be collected and for what purpose. Saracevic (2004) views digital libraries as complex social, institutional, and technical systems [3]. No evaluation can possibly address all of these aspects together. Thus different approaches have been used by other researchers to achieve different evaluation goals, e.g. a systems-centred approach, a human-centred approach, a sociological approach, an economic approach, and a usability-centred approach. Chowdhury (2006) concludes that Digital libraries differ significantly from one another in terms of their nature, content, target users, access mechanisms, etc., and consequently it is difficult to measure the usability of such diverse digital libraries through one set of universally accepted tools and benchmarks [4]. Fuhr (2007) states that digital libraries are complex systems; they can be, and are viewed from different perspectives [5]. The methods and metrics for the evaluation of (DLs) may vary according to whether they are viewed as institutions, as information systems, as new technologies, as collections, or as new services. The International Standards Organisation (ISO)

defines 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” [6]. As usability of the constructed digital library is considered to be one of the most important issues and can reflect to great extent the success of the prototype library, the researcher assessed the following elements:

A. Interface Features

- a. Search facilities (e.g. simple vs. expert search).
- b. Attractiveness and consistency.
- c. Language of the interface.
- d. Navigation options. Cross collection search, and usefulness of results.
- e. Visual appearance: use of colours, typography, layout and graphics, font size, and font type.
- f. Personalisation of the interface, e.g. the ability to define the number of records on one page, sort options, etc.

What needs to be discovered through this evaluation?

- a. Ease of use. To evaluate users' perceptions as to the ease of the use of the library.
- b. Quality of user experience.
- c. How satisfied are the users? Satisfaction and success.
- d. What changes are required?

IV. METHODOLOGY

After designing the questionnaire, a pilot test was done with three librarians and information systems people in the NOC that matched the profile established for participants. The pre-test questionnaire was distributed to the selected participants personally by hand after explaining the objectives of the study. The pre-test questionnaire was an important step to review and edit the post-test questionnaire before its final distribution. The feedback showed that the questionnaire was over-long and needed to be modified and that some questions needed to be eliminated. Furthermore, some respondents felt that statements were not obvious which caused difficulty in terms of understanding some of the questions. The pre-test questionnaire was made up of three general sections:

- a. The characteristics that users wanted the new library to have;
- b. Search tools and preferences;
- c. Quality of users' experience and required changes.

There was a necessity to overcome the problems encountered in the pre-test questionnaire. Therefore, the post-test questionnaire has had to be corrected and modified previous to final distribution to the selected sample. All statements which were felt to be ambiguous were edited and rewritten. In addition, English terms that were used in the

questionnaire were changed into Arabic language to avoid misunderstanding. Furthermore, all statements, which were found to be difficult for the users were deleted and replaced with simpler statements.

A number of questionnaires were distributed to a sample of employees and research workers within the National Oil Corporation in different departments and administrative units. In addition, a number of questionnaires were distributed to managers and systems people in different locations of the same organisation. The mechanism used for selecting a sample of special library users is described below.

According to the labour force statistics for the oil and gas sector issued by the Manpower Planning Department in Libya in September 2007, the number of employees and workers at the National Oil Corporation totalled 908 people. In order to have a manageable sample of special library users, a small sample from the total number of employees was selected (5%) and the questionnaire was then distributed to 40 employees and research workers in the organisation. In addition to that six questionnaires were distributed to managers and systems people in the corporation. According to Nielsen (2003), in this type of surveys on usability, from the fifth user on, most of the usability problems that maybe found in an information system are already identified. From then on, the results present little variability. Additionally a small sample of users was used as it was recognised that the evaluation process would require volunteers to use the prototype digital library for a period of time and that a large sample would involve diverting a considerable amount of resource from sore activities. Questionnaires were distributed at random to National Oil Corporation employees who had visited the central library of the NOC for three consecutive days and had volunteered to participate. In the test, they were requested to freely search the prototype digital library for a period of between 15 and 20 minutes and then to answer the three sets of questions. It was assumed that through this exercise, the participants got a general understanding of this library. From the 46 questionnaires which were distributed to NOC library users, 38 questionnaires were completed representing a response rate of (83%). As this figure is acceptable in research and academic studies, the figure was judged to be reliable and acceptable and to give good indication regarding the effectiveness of the design of the prototype digital library. 96% of distributed questionnaires to managers and systems people were returned complete.

V. ANALYSIS AND DISSUSSION

TABLE I CALCULATIONS OF RESPONSES FOR THE FIRST QUESTION

| Feature | Very poor | Poor | Barely acceptable | Good | Very good | Rating average | Response count |
|------------------------------|------------|-------------|-------------------|-------------|-------------|----------------|----------------|
| Arabic interface | 1 (2%) | 4 (11%) | 3 (8%) | 19 (50%) | 11 (29%) | 3.92 | 38 |
| English interface | 2 (4%) | 2 (4%) | 7 (18%) | 17 (48%) | 10 (26%) | 3.82 | 38 |
| Navigation options | 8 (21%) | 4 (11%) | 12 (32%) | 8 (21%) | 6 (15%) | 3.00 | 38 |
| Cross-collection search | 7 (18%) | 9 (24%) | 8 (21%) | 10 (26%) | 4 (11%) | 2.87 | 38 |
| Simple search | 2 (4%) | 4 (11%) | 6 (16%) | 12 (32%) | 14 (37%) | 3.84 | 38 |
| Expert search | 2 (5%) | 2 (5%) | 3 (8%) | 23 (61%) | 8 (21%) | 3.87 | 38 |
| Full text searching | 9 (24%) | 11 (29%) | 3 (8%) | 7 (18%) | 8 (21%) | 2.84 | 38 |
| Clear and readable text | 7 (18%) | 13 (35%) | 3 (8%) | 5 (13%) | 10 (26%) | 2.95 | 38 |
| Font size and type | 8 (21%) | 11 (29%) | 6 (16%) | 9 (24%) | 4 (11%) | 2.74 | 38 |
| Visual appearance | 2 (5%) | 7 (18%) | 3 (8%) | 14 (37%) | 12 (32%) | 3.71 | 38 |
| preferences | 2 (5%) | 4 (11%) | 8 (21%) | 12 (32%) | 12 (32%) | 3.66 | 38 |
| Personalisation of interface | 8 (21%) | 4 (11%) | 2 (5%) | 14 (37%) | 10 (26%) | 3.37 | 38 |

Here is how the rating average for the first row in the first question Arabic interface was calculated.

$$1(1) + 4(2) + 3(3) + 19(4) + 11(5) = 149$$

Sum of selected choices or calculated frequencies:

$$1 + 4 + 3 + 19 + 11 = 38$$

Sum of frequency times column weight divided by the sum of selected choices:

$$149 / 38 = 3.92$$

The rating average is 3.92.

This means that the respondents selected between columns 3 and 4 or between barley acceptable and good, but very closer to good or 4.

Overall grade or indicator for the first question = 3.38.

TABLE II CALCULATIONS OF RESPONSES FOR THE SECOND QUESTION

| Statements | Strongly disagree | Disagree | Tend to agree | Agree | Strongly agree | Rating average | Response count |
|---|-------------------|------------|---------------|-------------|----------------|----------------|----------------|
| My experience with the library today was quite pleasurable | 3 (8%) | 3 (8%) | 6 (16%) | 12 (31%) | 14 (37%) | 3.82 | 38 |
| I was able to navigate easily in the digital library | 6 (16%) | 8 (21%) | 10 (26%) | 10 (26%) | 4 (11%) | 2.95 | 38 |
| The results I obtained in my searches were relevant | 9 (24%) | 5 (13%) | 7 (18%) | 14 (37%) | 3 (8%) | 2.92 | 38 |
| The design of the library is clear, simple, and consistent | 2 (5%) | 2 (5%) | 8 (21%) | 12 (32%) | 14 (37%) | 3.89 | 38 |
| Search and browse facilities are good enough for retrieval of information | 2 (5%) | 4 (11%) | 10 (26%) | 12 (32%) | 10 (26%) | 3.63 | 38 |
| The library works fine in both languages | 7 (18%) | 9 (24%) | 4 (11%) | 8 (21%) | 10 (26%) | 3.21 | 38 |
| Personalization of the interface made my experience more enjoyable | 7 (18%) | 3 (8%) | 11 (29%) | 9 (24%) | 8 (21%) | 3.21 | 38 |
| The digital library offers reliable links to other electronic resources | 6 (16%) | 4 (11%) | 2 (5%) | 12 (31%) | 14 (37%) | 3.63 | 38 |

Here is how the rating average for the first row in the second question was calculated.

Sum of frequency times column weight

$$3 \times (1) + 3 \times (2) + 6 \times (3) + 12 \times (4) + 14 \times (5) = 145$$

Sum of selected choices or calculated frequencies

$$3 + 3 + 6 + 12 + 14 = 38$$

Sum of frequency times column weight divided by the sum of selected choices

$$145 / 38 = 3.82$$

The rating average is 3.82

This means that the respondents selected between columns 3 and 4 or between barley acceptable and good, but very closer to good or 4.

Overall grade or indicator for the second question is 3.41

It would be rather difficult to extract any conclusion from this numbers, but it gives a general idea on how to compare those questions that were graded either below or above this number. Below is a list of indicators that have larger deviations from the indicator calculated for the first question.

Above the indicator 3.38

- Arabic interface (3.92)
- English interface (3.82)
- Simple search (3.84)
- Expert search (3.87)
- Visual appearance (3.71)

Below the indicator 3.38

- Cross-collection search (2.87)
- Full text searching (2.84)
- Clear and readable text (2.95)
- Font size and font type (2.74)

Below is a list of indicators that have larger deviations from the indicator calculated for the second question.

Above the indicator 3.41

- My experience with the library today was quite pleasurable (3.82)
- The design of the library is clear, simple, and consistent (3.89)
- Search and browse facilities are good enough for retrieval of information (3.63)
- The digital library offers relatable links to other electronic resources (3.63)

Below the indicator 3.41

- I was able to navigate easily in the digital library (2.95)
- The results I obtained in my searches were relevant (2.92)
- The library works fine in both languages (3.21)
- Personalisation of the interface made my experience more enjoyable (3.21)

The first block shows a high performance in the design of the Arabic and English interface in addition to high performance in the design of the visual appearance and search and browse facilities. The features with a poor grade reflect some design problems. The grades given to font size, font type and clear and readable text may reflect some problems that need to be fixed and improved.

In the second question, again, the first block shows a high performance in terms of general accessibility and users' satisfaction but the grade given to relevant search results may also reflect a problem with advanced search facilities especially in the Arabic interface where stemming does not work as it should be as the recall of relevant documents in the set of all documents returned by a search was too low.

VI. CONCLUSION

The overall grade returned for the first and second question is quite reasonable as the highest grade was five. This indicates that a considerable number of the library's characteristics seem to be efficient and effective. The design of the Arabic and English interfaces was quite good as (50%) and (48%) respectively of returned responses demonstrated that the design was quite good. Simple and advance search was also quite reasonable according to users' feedback (3.84) and (3.87). Font size and type of font reflected some design problems and need to be fixed by changing both the type of the font as well as the size.

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