

# Developing Information Services for Special Library Users by Designing a Low Cost Digital Library: The Experiment of NOC-Digital Library

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## Abstract

*This research originates from a belief that special libraries in developing countries need to modernise and implement their ICT infrastructure and articulate information policies that will facilitate the exploitation of information resources to the optimum to increase national productivity. Special libraries and information centres in developing countries in general and in the Arab world in particular should start building their local digital libraries, as the benefit of establishing such electronic services is considerably massive and well known for expansion of research activities and for delivering services that satisfy the needs of targeted users. The aim of this paper is to provide general guideline for design a low cost digital library providing services that are most frequently required by various categories of special library users in developing countries. This paper also aims at illustrating strategies and method approaches that can be adopted for building such projects. The paper intends to describe the phases and stages implemented for building a low cost digital library services for the NOC. It also aims at highlighting the barriers and obstacles facing Arabic content in the digitization stage.*

**Keywords: Digital libraries, Electronic library services, Open source software**

## Introduction

This research originates from a belief that information services for special library users in Libya are poor and not well developed because they are suffering from a general weakness in their principles foundations, equipments, ICT infrastructure, resources, and cadres making it unable to comply with their duties and obligations towards their end users. Developing special library services and activities in Libya should be achievable through implementing and exploiting today's technology. Therefore, it is anticipated that designing a low cost digital library services and introducing electronic services will assist in solving a great deal of problems in addition to meeting the needs and requirements of the users. Furthermore, relying nowadays on conventional technical procedures in libraries in general and in special libraries in particular has proved to be the wrong path to success. For that reason, a shift to information technology and its applications would seem to be essential to give these institutions the capability of providing reliable services to targeted end users. It is also important to point out in this context that

information and communication technologies present new opportunities and challenges for libraries in general and special libraries in particular. There is a general agreement that special libraries are passing through a phase of dramatic changes due to the ongoing challenges being posed by information and communication technologies. Accordingly, they are challenged to explore new ways to accept and implement the changes made by IT to be fit enough to serve the experts, scientists, and research workers, who always demand specialised services perfectly, faultlessly, and accurately. Most scientific information today is available in a variety of formats such as CDs, DVD, Internet web sites, etc, which requires knowledge of specialised information handling techniques. Therefore, qualified well-trained staff and modern technological equipments should be available to boost technical procedures and services to an effective level and to enhance and foster productivity and expansion of research activity. It can be assumed that special libraries in developing countries need to modernise and implement their ICTs infrastructure and articulate information policies that assure the exploitation of information resources to the optimum to increase national productivity by utilising the information infrastructure. Improving IT education and research environment may be expected to create new business and facilitate industrial research. This in turn will foster related human development and enhance the total economy. Seeing the importance of today's technology and its capability for improving library services in addition to realising the recommendation of the World summit on information society (WSIS,2005) regarding exploiting modern ICT to foster productivity and expansion of research activity, the researcher come to the decision to build a low cost digital library for the National Oil Corporation as a module.

## **Digital libraries**

There is no doubt that there are many different views in the literature as to the actual nature of digital libraries. This paper does not intend to provide a comprehensive collection of definitions of the digital library, but rather a number of representative definitions. A variety of terms are still used interchangeably worldwide such as electronic library, hybrid library, library without walls, cyber library, virtual library etc. Arms (2000) views digital libraries as “managed collection of information with associated services, where the information is stored in digital formats and accessible over a network”. Witten (2003) defines the digital library as a focused collection of digital objects, including text, video, and audio along with methods for access and retrieval, and for selection, organisation and maintenance of the collection. The digital library federation (DLF) define digital libraries as “organisations that provide the resources, including the specialised staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities.” According to jeng (2006) a digital library in the 21<sup>st</sup> century has the following characteristics:

- It is an organised and managed collection of digital objects
- It is accessible over internet or server
- It is a global information infrastructure and;
- Should offer service.

The last point indicates that there is a difference between a digital collection and a digital library in that a digital library should offer service to end users. Therefore, a digital library is considered a collection of information objects and a collection of services that should be provided by the digital library. “The definition of a digital library that came up in March 1994 in Digital Library

Workshop emphasised that a full service digital library must accomplish all the essential services of traditional libraries and also exploit the well- known advantages of digital storage, searching, and communication. (Chowdhury , 2002)

Leiner (2009) reports that “There are a large and varied set of services, including services to support management of collections, services to provide replicated and reliable storage, services to aid in query formulation and execution, services to assist in name resolution and location, etc.”

**Design Framework**

This section focuses on the design for a proposed low cost digital library for the National Oil Corporation, which is one of the leaders in the energy sector (in fact all local and foreign companies in the oil sector in Libya run their business under the NOC). It discusses the methodology used for designing the proposed digital library, the framework, and the steps implemented to reach the final goal. Designing a digital library usually comprises several stages. These phases are shown in the following flow diagram.

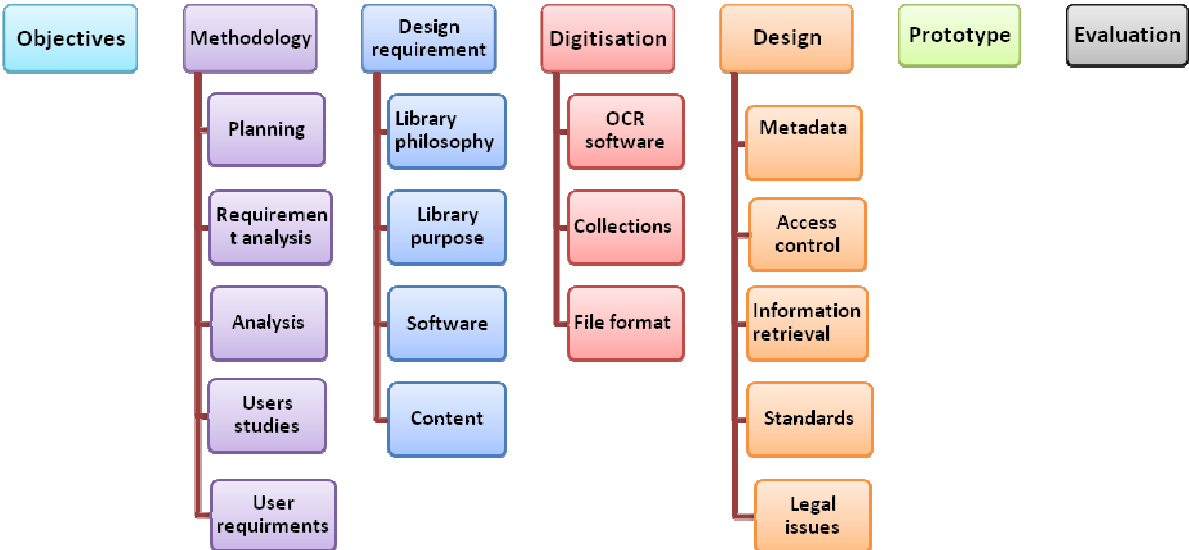


Figure 1: Flow diagram

**Objectives**

The first crucial step is to decide the objectives of designing the digital library. This step has to be considered early – before any further steps are taken. The whole project will be worthless without clear objectives. The objectives of this design are summarised as follows:

- Developing the standard of services presented to targeted end users to enhance the level of research activities within the organisation.
- Using and putting into practice modern ICT to improve the current level of services and to solve the problems that the central library at the National Oil Corporation faces.
- Producing a design for a low cost digital library that provides not only access to and retrieval of information, but also the services that are most frequently required by the users.

## Methodology

An experimental system design approach was used for the designing of the proposed digital library. The BNET dictionary defines this approach as “the planning of the procedures to be used in an experimental study” (BNET dictionary). This approach was applied because it was found to be the most appropriate method for such projects. The design of a low cost digital library encompass various stages. The phases that follow are part of the system design approach. Each phase consists of a number of stages, each stage is subdivided into steps and each step further contains a series of tasks. Thus the total work is broken down into manageable portions.

## Planning

The planning stage comprised a survey of the current state of special libraries and information centres in the energy sector. The energy sector was chosen due to its significant role in supporting the Libyan economy which relies mainly on the revenues from the oil sector; these account for almost all of its export earnings and about 25 percent of its GDP. Oil is currently said to be providing the government with its main source of revenue and constitutes 99% of Libya's exports. The National Oil Corporation was chosen for this model from a number of local and foreign oil companies in the country because 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.

The planning phase is considered a fundamental process of understanding why a digital library should be built and determining how it should be built. Questions examining economic, technical, and organisational feasibility i.e.

- What exactly is the project? Is it possible? Is it practicable? Can it be done?
- If we build a digital library, will it be used?
- Economic feasibility:  
Are the benefits greater than the costs? If benefits outweigh costs, then the decision is made to design the library.
- Technical feasibility:
- Do we have the technology? If not, can we get it?
- What is the current scenario of ICTs within the organisation?

The aforementioned questions were answered in this phase to determine the expected value of designing a digital library service. A feasibility study is a short assessment of the proposed digital library to determine whether the projected library can effectively meet the specified business requirements of the organisation as well as to identify constraints, budget, time, ICT infrastructure, and resources.

A surveys, which comprised of questionnaires and interviews with manager of the information unit in the NOC, have focused on the following:

- ❖ Policy in relation to:
  - Computers
  - Networks
  - Internet: Type and speed
  - Intranet

- ❖ Policy related to content, focusing on:
  - Electronic resources
  - Budget
  - Access control
- ❖ Policy related to management:
  - Familiarity
  - Willingness to provide efficient and effective service
  - Vision: e.g. visions with regard to developing ICT policy.
  - Plans: e.g. any plan for moving towards an electronic library service.
- ❖ Policy related to training
  - Users' training
  - Librarians' training
  - Cost and type of training programmes

## **Requirement analysis**

Developing services that meet the expectations of users and customers is critical to success. Requirements analysis is the foundation of a user-centred approach, and helps to create projects and services that appeal to and meet user needs (D'Hertefelt, 2009). User requirements analysis is not about asking users what type of services they want. User requirements analysis is about understanding users' current practices and the problems they encounter. This stage is comprised mainly of the analysis of fieldwork, which has been done to allow an availability check of the required components needed in the design of the digital library. Requirement analysis shows what elements and components are necessary for the proposed digital library. This stage should provide answers to questions such as:

- For whom is the digital library going to be designed?
- Who are the key users?  
Administrators – Internal research staff – External researchers – Academics - Other
- How many users are going to benefit from the proposed digital library?
- What is the actual status of the ICT infrastructure in the organisation?
- What type of material is already in digital form?
- What sort of materials need to be digitised?
- What items are distributed within the organisation or the institution?
- What Items or resources are outside the organisation or the institution?

In brief, the requirements analysis should also indicate the need for the following:

- ❖ Internal documents which include:

- Reports
- Statistics
- Standards
- Technical data
- Publications by people within the organisation
- ❖ External documents which include;
  - Purchased materials (in either hard copy or electronic format)
- ❖ Documents obtained from other resources

## **Analysis**

Several interviews were conducted at this stage to gather information related to information resources and services in the energy sector. The intention of these interviews was to identify the most needed and frequently used resources, most common problems, etc. The result of these interviews was a list of the most frequently used resources and common problems. In addition to this, it was possible to recognise how users would prefer to use these resources, and what approach was currently being used for the retrieval of information resources. From this, it was possible to establish the metadata and the requirements needed for designing a digital library in this situation. The interviews conducted also focused on identifying frequently used resources and the format of these resources or documents, whether these resources were in hard copy or in electronic form and if they had specified internal resources which would consist of reports and publications created by employees within the targeted organisation. External resources were also identified and the means used for acquiring these resources were identified.

## **User studies**

User studies are considered to be one of the most important activities in the design of a digital library. The first survey focused on special library users and highlighted a considerable demand for information resources. The survey focused on what users really want and what they actually get. Research results have also shown that there is a huge gap between supply and demand. It was obvious that special libraries in Libya were not in a position to offer a good level of services due to the problems they face. Therefore, designing low cost digital library services may be expected to improve the services presented to end users and to satisfy, to a large degree, the diverse needs of end users.

## **User requirements**

The first survey was conducted in order to shed light on the status of special libraries and the level of user satisfaction with existing services. The results of the survey revealed that users seek out heterogeneous resources. Reliance on homogeneous resources, which comprise one sort of information materials i.e. print materials, proved to be insufficient to satisfy users' requirements. Consequently continuing to provide homogeneous resources has affected the services in a negative way. The survey findings also revealed a scarcity of electronic materials. Therefore, it is essential to start providing heterogeneous content that comprise various kinds of materials and information resources. Electronic services constitute a new horizon for special library users that should be rediscovered in order to find out what is new in a world, which

expands every day with new innovations. Provision of heterogeneous information resources as well as materials suitable for teaching, learning and research should enrich research activities in many ways and should improve the condition of the current services. Moreover, access to a multi-content digital library should contribute to the development of ongoing research and supply targeted end users with new possibilities. In order to recognise what sort of information resource is most required from a user viewpoint, the survey included a question on this particular issue. The responses showed that electronic journals ranked first (95%), followed by electronic books (90%). Official publications and reports were also ranked at the top at 95% and 90% respectively; statistical data was also popular at 90%. Newspapers and patents ranked last at just 40% and 50% respectively with literature reviews at 60% and specifications at 65%. The figures also illustrate other information materials such as literature reviews, standards and specifications whose demand goes up and down according to user preferences. As previously stated, there are various information resources but only some of them were found to be essential and, from the user perspectives, to be obtainable in electronic form in a digital library.

## **Design**

Once the requirements analysis is concluded, the next step is to design the proposed digital library. The design phase decides how the system will operate, in terms of hardware, software and available infrastructure. The first step in the design phase is to develop the design strategy or the framework. In fact, there are several points that need to be considered before starting the physical design of the proposed digital library. These are as follows;

### **Library purpose and philosophy**

The purpose of designing the proposed digital library originates from the actual need of users to have access to information resources that support their research work and everyday jobs. This was evident from the first survey and the lessons learned which have shown that there is great need for designing electronic services to meet user needs and requirements. The proposed digital library should support research activities in different ways. The digital library must be accessible to all research workers and company staff wherever they are regardless of their location. This means that company workforces, either in the main office or in regional branches, should benefit from accessing available resources any time, 24x7. For example, workers in the oil sector need access to seismic technology. Because of the importance of seismic technology, its data needs to be available all the time for research workers in oil fields and engineers working in oil fields who will benefit from accessing the required data through the digital library, so long as they have the basic infrastructure. Since oil fields are already connected to the Internet through Satellite, accessing, browsing, and searching the digital library will not be a problem in this sense. Users who want to access sensitive materials such as data centre collection (technical library) of the corporation should also have the ability to access any sort of document from anywhere in the country regardless of their location (security settings allowing). The digitisation of the corporation's technical reports and production reports will also be of great importance as it will preserve and safeguard sensitive documents from loss and damage and at the same time will mean they can be accessed in the most convenient way possible.

## **Software**

There are various types of software available for the creation of the proposed digital library. However, because the main principle of this research is to design a low cost digital library, selection from diverse freely available software is a complicated question. Moreover, due to the availability of a variety of open source software that could serve the purpose of the

proposed library, selection of appropriate software was a vital issue. Greenstone software was selected due to its good reputation and its support for different languages, which is an essential aspect for the design of bilingual content. In addition Greenstone is capable of displaying the user's interface in multiple languages and handling collections of text, pictures, audio, and video files. The program also offers flexible browsing facilities and can run on Windows and UNIX. Despite the availability of various open source software programmes required for building digital libraries such as Dspace,(jointly developed by MIT Libraries and Hewlett-Packard Labs), Eprints, Open repository, Open publication system, Fedora, DigiTool, etc., many organisations and institutions worldwide have built their digital libraries using Greenstone software, for example:

- Indian Institute of Science Publications Database
- Indian Institute of Management
- Sudanese Association of Libraries and Information
- Sudan Open Archive

However, the most important reason for selecting Greenstone software lies in its capability for building bilingual content, as this feature is not available in all other open sources software. None of the previously mentioned software is capable of building Arabic content or displaying the user's interface in Arabic. Greenstone software is capable of that because the software is supported by UNESCO, which encourages developing countries to participate in the current information revolution by adopting modern ICT systems. Designing a bilingual digital library that could support both Arabic and English languages was a crucial aspect due to the following:

- English is the second most used language in Libya.
- Most of the literature written in any branch of knowledge can be found in English.
- A considerable number of research workers, especially in the energy sector in local and foreign companies in Libya, are non-Arabic speakers.
- A substantial number of Libyan research workers are acquainted with English.

## **Content**

As content is considered the key to success for any digital library, further attention was given to this issue in order to guarantee the achievement of research goals and the success of the proposed digital library. As there are a number of foreign research workers and employees in the NOC it was decided to create bilingual content in the form of Arabic and English collections. It was also decided to display the user's interface in two languages so that users could easily browse and search the constructed library in both languages. This means that the proposed digital library can serve users whose first language is English (native English speakers) and users whose first language is Arabic (native Arabic speakers). By so doing, the proposed library should be highly effective and efficient in providing a variety of electronic services to end users. Initially, the content of the proposed digital library will comprise the following collections:



**Collections of NOC Digital Library**

**Theses**

**Technical Data**

**NOC Publications**

**Statistics**

**Acts & Legislations**

**Resolutions**

**Reports**

**Management**

**E - Journals**

**Standards & Specifications**

**General Collections**

**Videos & Galleries**

**The Scientific Library**

**CDS / ISIS Database**  
Arabic resources



**CDS / ISIS Database**  
English resources

**External resources: Based on open access portals in Oil and Gas**

## **Content creation**

This step covers the digitisation processes and prerequisite selections of materials and decisions, in addition to the subsequent manipulation and management processes (Dawson,2003). A variety of decisions have to be made on various aspects before starting the actual design. For example, should optical character recognition (OCR) be applied to create text files and should files be held as images and text. If OCR is found to be technologically and economically feasible, the output will have to be carefully checked before dissemination. Choice of formats was another challenge, so it was determined to choose the format according to the nature of original documents. Decisions also have to be made on aspects such as whether to use HTML or rich text to display plain text. For this, it was determined to use HTML for displaying plain text. Other issues related to PDF files such as whether to use PDF or other plug-ins such as the Microsoft word plug-in for displaying documents. A PDF plug-in is important because it is ideal for retaining complex layouts. There are also various formats for image and even more choices. Whilst JPEG is a common format, PNG is spreading quickly, and TIFF can be possibly recommended for printing or preservation (Dawson,2003).

## **Digitisations**

Before starting the digitisation process, it was crucial to find out the types of available information resources that would make up the collections. Therefore, the second survey and interviews conducted with librarians and people at the central library of the NOC focused on this matter. Suggested collections were divided into two groups. The first set comprised those already in electronic form (which were created as digital files) or those converted to digital form (for example scanned documents). The second set comprised traditional documents (printed documents).Suggested documents were also divided into Arabic and English documents.

## **English collections**

Materials in English may already be in digital form, but in different formats, e.g. PDF, rich text, and MS Word. It is worth mentioning in this context that a decision has to be made before starting to design the digital library whether to display the content of the library in the original format of the document or in HTML format. It is desirable to display the library's content in more than one format to give users the choice of viewing the content in various formats. PDF format is popular for downloading purposes (Dawson, 2003). Traditional print documents, scanned using OCR, are easily displayed in HTML without any problem. However, the Greenstone system is not capable of retrieving such materials when a search is performed. To overcome this problem all materials converted into PDF using OCR were transformed into searchable PDF using a transformation programme such as ABBYY PDF Transformer 2.0, Adobe PDF professional or Nitro PDF professional. After transformation, Greenstone software was able to retrieve target content when a search was performed. Digitally generated materials (born-digital materials) in PDF format were also be converted into searchable PDF format in order to be retrieved. Regarding documents in rich text and Ms Word, no problems were faced in displaying such documents as HTML.

## **Arabic collections**

Considerable problems were faced in the process of building Arabic collections. In fact, the problem with the Arabic language is related to the poor performance of OCR systems in this domain. Born-digital documents in the Arabic language are easily displayed and retrieved as HTML by the Greenstone system when a search is performed. However documents scanned and converted either to PDF or MS Word can be neither displayed nor retrieved by Greenstone.

Moreover, in this case the Greenstone system is not capable of performing a full text search. This means that the Greenstone system is unable to extract words and terms occurring in the text if digitised materials are entered as scanned images. Despite the availability of many specialised OCR programs that claim the capability of converting Arabic from digital image to digital text format, such as Readris 11, none of these programs is capable of dealing with Arabic characters and of converting documents 100 percent. Experience has shown that no programme in this domain is able to give reasonable results as the percentage of success did not exceed 50 percent. Even the retrieval of digital-generated documents in PDF format with this system is difficult when a search is performed, because they are simply not searchable. The Greenstone system cannot recognise and search characters that are not written in ASCII code, which is a standard code used so that data can be moved between computers that use different programmes. It is worth mentioning in this regard that born-digital documents in Arabic can be displayed and retrieved by the Greenstone system provided they are in MS Word, rich text, or searchable PDF. To overcome problems associated with the retrieval of objects in PDF format, documents of such types were carefully reviewed and more attention was given to their associated metadata so that users could exploit enabled browsing facilities instead of search facilities for retrieval purposes. Developers should therefore avoid scanning Arabic content using OCR systems. Nevertheless, conversion of Arabic content already in digital form from rich text or Ms Word to PDF proved to be practical. As regards the format for image, there are also various formats for image and even more choices, as mentioned previously. However, for NOC digital library JPG was used for image.

### **Information organisation: classification and indexing**

In order to make searching more reliable, and allow users to browse across collections, there is a need for controlled methods of information classification. Therefore, the Library of Congress Subject Headings was proposed as a means of linking diverse collections into a coherent information structure, in addition to Arabic subject Headings as a primary means for linking collections in Arabic. The terms of both subject headings needed to be included in the metadata and were used in contexts where international compatibility was required. In order to keep consistency among collections, controlled terminology for place names and organisation names, as well as for technical terms, is necessary where appropriate as authority files, e.g. names of oil fields, names of concessions, and names of areas and locations.

### **Metadata**

Regarding metadata, the question of which metadata standard to use was a key issue. Because of the availability of diverse metadata standards, there was a need to find out which standard could serve the purpose of building the collections of the proposed library. The Dublin core metadata standard was expected to meet the requirements of building the required collections. However, the standard was tested and some field elements had to be added in order to correspond with the methods of information retrieval by users. Metadata elements were added for example to the collections of technical library (data centre collection) to correspond with the method of information retrieval by users, e.g. concessions and locations.

### **Information retrieval**

As web users have become used to the simplest possible search interfaces (Google interface for example) and very fast results, there is no need in the short term to provide complex search facilities for the proposed digital library. Enabling users to search fields such as

title, creator, and subject terms, and then to search other metadata fields if no matches are found, then continue with full-text searching or cross-searching only if no matches are found in any metadata fields, was considered sufficient at this stage. It is worth mentioning in this context that Greenstone software enables users to search collections in different ways. Specifically, the software offers users the capability of doing advanced searches across different collections (cross-collection search) by adding a mixture of collections before performing a search.

## **Authentication or access control**

This issue is concerned with policies for controlling access to different types of content; therefore it raises different questions. For example, should all digital content be accessible to all users across the Internet? Is it necessary to control who can access specific collections and make use of it? Should the content of the proposed digital library contain sensitive documents that would affect the company business harmfully if such documents were accessible over the Internet? These issues were discussed and studied before starting the actual design of the digital library. Greenstone software has a built-in access control mechanism which allows collections, and even individual documents, to be restricted to authorised users using a password protection scheme. This mechanism can be applied if the company prefers to apply restrictions to some specific content. A policy for controlling access to different digital content should be written by managers of information units, in companies seeking to build digital libraries, who should take into consideration the negative and positive impact of open access. According to the recommendations of the manager of the information unit in the National Oil Corporation, it was decided to protect some sensitive collections such as the data centre collection, the thesis collection, and e-journals.

## **Standards**

Initially, the core standards applied to the proposed digital library were: Dublin Core and MARC 21 for metadata; Library of Congress subject headings, and Arabic Subject headings for subject vocabulary; AACR2 for resource descriptions; JPG for image. These standards are important for the consistency of resource description across collections and for assisting information retrieval.

## **User interface**

The user's interface is considered an important issue and it is an essential element of the proposed digital library. The design of the prototype had to take into consideration simplicity, consistency and flexibility. The main issue before starting the design of the user's interface is to understand the main priorities from the users' perspective. Therefore, how the interface should be designed depends on users' opinions and can be decided after conducting some interviews with people in charge and with a number of potential users. Because the user's interface can be designed in different ways, it is crucial to understand users' primary preferences in order to produce a practical design. The second survey and the interviews carried out with librarians, and some potential users from the NOC, shed light on their preferences. This was an essential step before starting the design of the prototype. The most significant issue which was faced within the design stage was in relation to producing a practical design with two different interfaces. On the one hand, it was crucial to design an Arabic and English interface to display collections in Arabic and English. On the other hand, it was also important to build the same collections in a flexible way that could be displayed exactly the same, on any interface. In fact, the Greenstone system has the ability to display multiple interfaces without difficulty. However, producing a

practical design that enables users to browse and search collections on different interfaces is not an easy task, as both interfaces should have the same features to display collections effectively and efficiently.

## **Legal issues**

“Intellectual property and copyright is a considerable issue for nearly all digital libraries therefore it is important to understand the legal issues and to follow legal requirements”. (Dawson, 2003). In the short term, legal issues were not considered to be a serious restriction as most of the documents that were to be digitised belong to the National Oil Corporation and most of these documents are internal correspondences, statistical data, reports, and publications by research workers and employees of the National Oil Corporation, in addition to a CDS/ISIS data base which is a bibliographic database in Arabic and English for the holdings of the central library of the NOC. The proposed digital library will also include links to free portals in the oil industries which are not under copyright. In the long term, the NOC has a documented policy regarding copyright issues. This policy supposed to regulates the use of copyright materials as well as intellectual property.

## **Prototype**

After designing the proposed digital library, the library was tested in order to discover if there were any problems with the design. The prototype was taken back to Libya in order to get feedback on the design and to evaluate the library. The prototype was useful in many ways: it was built to test the function of the proposed library and to solve unexpected problems. The point of the prototype was to assist in building the full system.

## **Evaluation**

This is the last stage in designing a digital library. This phase is an important stage as the evaluation will assist in developing the proposed digital library and lead to an improved implementation based on the information collated in the evaluation. The next chapter will discuss the evaluation process and demonstrate the results of the evaluation which will lead to the full design of the NOC digital library. The following section provides an overview of the digital library and its collections.

## **An overview of the National Oil Corporation – Digital Library**

This is a snapshot of the NOC digital library which has been designed with the aim of developing the services currently provided for end users. The following screenshot shows the collections of the library. As can be seen, the digital library consists of fifteen different collections. Preferences and help options are located at the upper right corner. Users may set their preferences before starting to browse the library and can consult help options to get more information about how to use the digital library. The digital library home page shows different icons. In order to navigate the library, users have to select a collection by clicking the preferred icon. Once the icon is clicked, the user will be directed to the appropriate collection and a new page will open.



Figure 3: Library interface

The next screenshot shows the thesis collection. This collection is authenticated and requires users to sign in, which means that users have to enter a username and a password in order to view the collection. The NOC digital library contains some other collections that are restricted to authorised users – especially collections that contain sensitive documents. The collection’s name is placed in the upper left corner of the banner. In the upper right corner home, help, and preferences are placed. The home button if clicked will return the user to the home page to select a collection.



Figure 4: Sign in page

The following screenshot shows the CDS/ISIS collection. This is a bibliographic database of the holdings of the central library of the National Oil Corporation. This collection consists of bibliographic details of about 3400 records taken from the NOC CDS/ISIS database. One can browse the publications by title, author, editor, keyword, type of source and location. Advanced searches can be performed using title, creator, keyword, and year of publication, Dewey class, and terms occurring in the text. The search terms can be combined using Boolean operators. By default search is case sensitive, although the preferences can be changed. Browse facilities can be clearly seen under the banner. The user can browse the publications by title, author, editor, keyword, type of information source, and by location of the source in the central library. In fact, the CDS/ISIS database, which is a standalone database, was converted to web interface using the Greenstone facility so that users can search and browse the central library catalogue from anywhere, provided they have Internet access and basic ITC infrastructure.



Figure 5: CDS/ISIS database

The following screenshot displays the advanced search facility. Users can enter a query directly into the space provided and click on “run query” or use “advanced search” which can be performed using title, creator, keyword, year of publication, Dewey class, and terms occurring in the text. The search terms can be combined using Boolean operators. Users have to set their preferences to “advanced search” in order to be able to perform this task as the ordinary search is set by default to plain search. The preferences button also enables users to change the search preferences in regard to query mode, query style, case differences, word ending, accent differences, and search history.

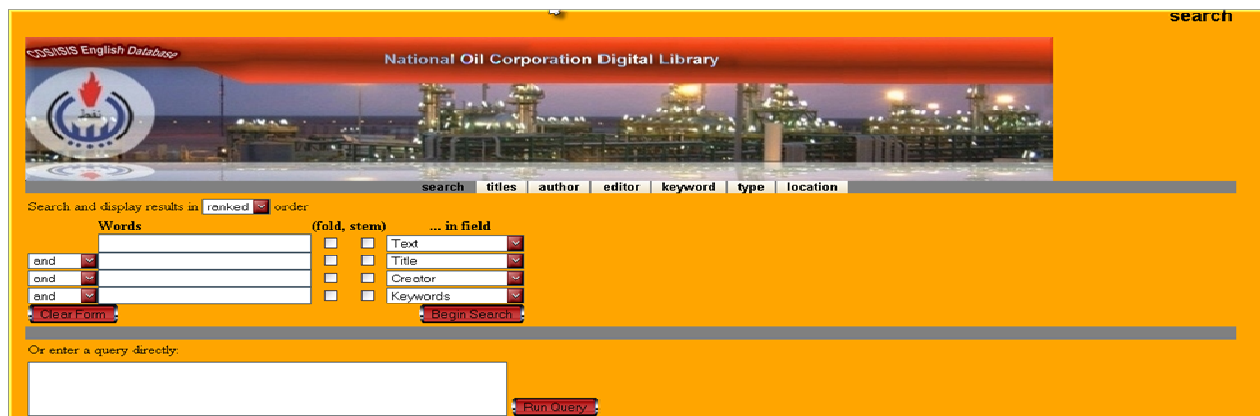


Figure 6: Advanced search facility in NOC digital library

The following screenshot displays titles from the CDS/ISIS collection in browse mode. It can be seen that titles are arranged alphabetically from A – Z and then from 1 – 9. Users can browse the titles under particular letters. Users could also browse the database using author, editor, and keyword in the same way.

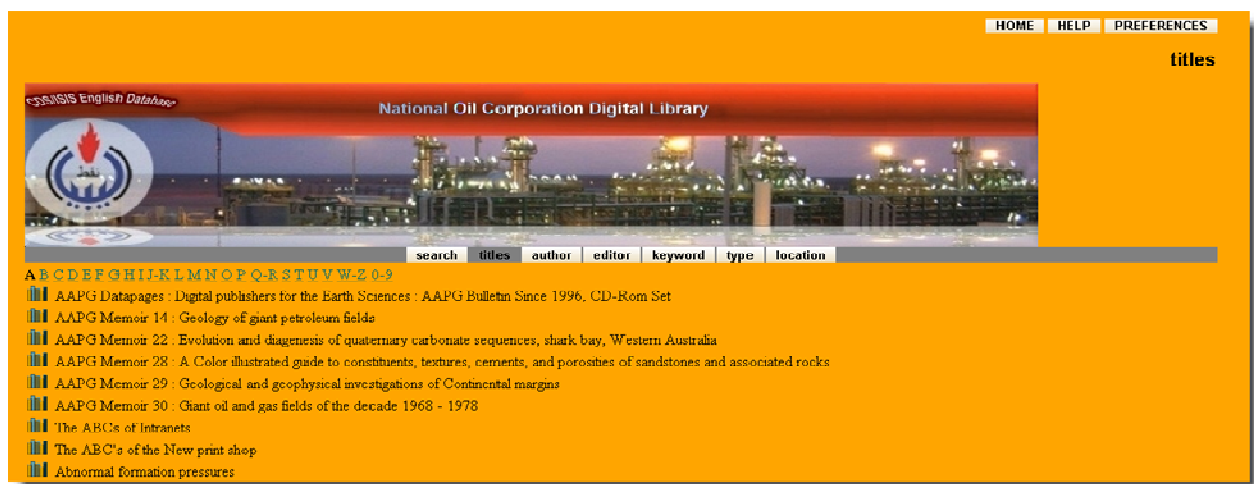


Figure 7: Browse facility

The aim of the following screenshot is to explain how users could perform a cross-collection search. This collection contains a number of reports. To perform cross-collection searches within this collection, users should first click the preferences button and then check the collections they want to search. As can be seen on the snapshot there are four sub-collections to include. If all these collections were checked, the Greenstone system would perform searches in all included collections, and as a result retrieved documents would be from a range of collections. To prevent the system from searching sub-collections, users should uncheck the name of the collection to be excluded.



Figure 8: Cross-collection search

This screenshot shows the previous collection on the Arabic interface. The same principles could be applied in regard to cross-collection search.





Figure 9: Arabic interface

The Arabic interface in advanced search mode can be seen in the screenshot below. Users should follow the same principles used on the English interface to perform advanced searches on the Arabic interface. Users can enter a query directly into the space provided and click on run query or use advanced search which could be performed using title, creator, keyword, year of publication, Dewey class, and terms occurring in the text. The search terms can be combined using Boolean operators.

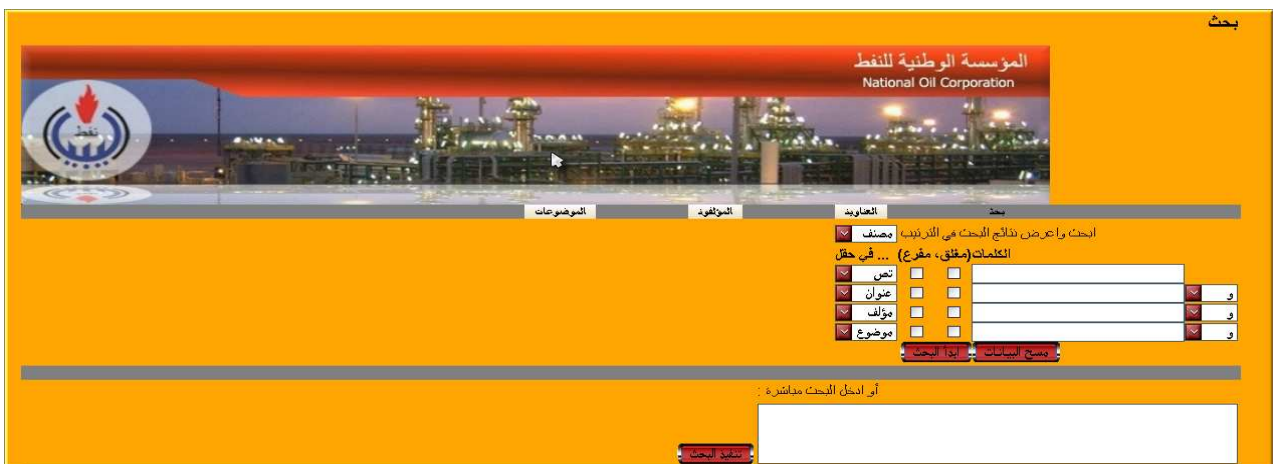


Figure 10: Arabic interface in advanced search mode

The following screenshot displays some titles of a collection called standards and specifications. It can be seen that the name of the titles appear first in English and then in Arabic. Displaying the collection in this way can assist target users in different ways. Two small icons are placed beside each title. These icons show library users that the object can be displayed in HTML and in PDF.

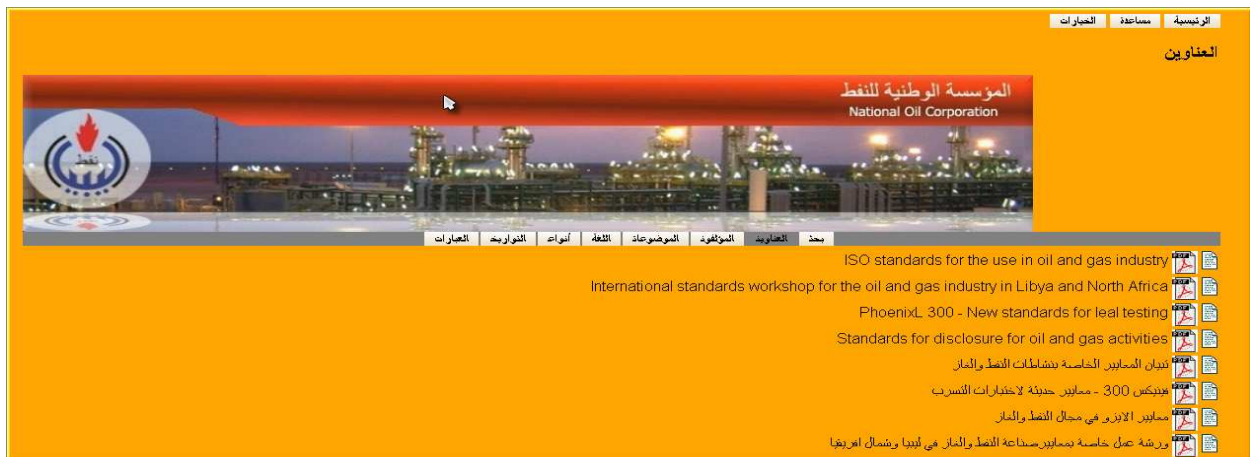


Figure 11: A view over standards and specifications collection

The next screenshot displays some photos of the video and gallery collection. JPEG format was used as it is a very common format.



Figure 12: Video and gallery collection

The following screenshot shows the open access resources collection. This collection consists of some free portals in the energy sector. These free portals have been added to the collections of the NOC digital library in order to provide users of the digital library with free open access to resources in the fields of oil and gas. This enables users to search the portals without having to leave the digital library.



Figure 13: Open access resources collection

This screenshot displays the collection of e-journals. The e-journals collection is made up of NOC subscribed electronic journals. Users can login using a username and password. When users make their selection and choose the journal a message appears on the screen warning them that the link they have selected is external to any of their currently selected collections. If they still wish to view this link and their browser has access to the Web, they can go forward to this page; otherwise they use their browser's "back" button to return to the previous document.

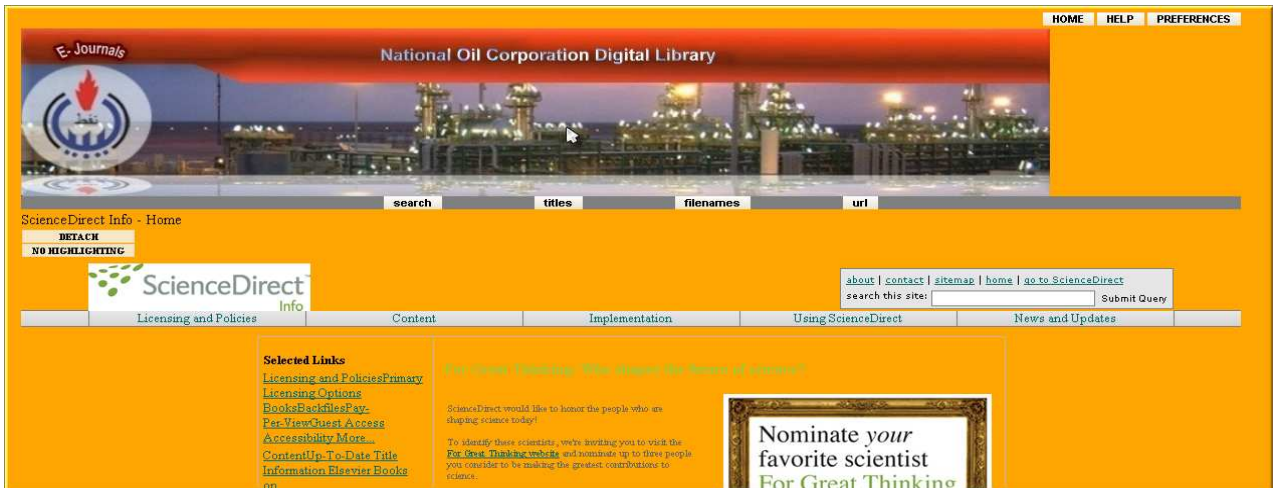


Figure 14: E - journals collection

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