

Theoretical Framework for Restructuring Online Public Access Catalogue (OPAC) for the New Generation of Users

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Abstract – Library catalogues have embarked into a new world of chaos and begun to lose its value in information dissemination because of the profound impact of various factors which have taken place outside the library world. In this day, providing only bibliographic information is insufficient to meet the current demands of the users. OPACs should be able to give information, and also should be a vibrant and interactive tool. It should consist of many new components to raise the level of its patrons' expectations. This paper is the authors' final part of the research study. General features of OPACs were contemplated in the first part of analysis. In the second part of analysis, OPACs were compared with the features of Amazon and Google. Based on these two research studies, this paper proposes a comprehensive theoretical framework for restructuring the library catalogue to make it as a user-centred tool and to fulfil present pressing demands. The suggested framework covers both the cataloguing standards and the computer technology to uplift the proficiency of OPACs for the new generation of users.

Keywords: Library Cataloguing, Online Public Access Catalogue, Catalogue Standards, Features of Amazon, Features of Google

I. INTRODUCTION

OPAC is in its important crossroad to meet the anticipation of the Internet savvy library patrons and also to compete with other kinds of information providers outside the library world. A huge amount of information can be obtained by the library patrons without using the library resources and without any adeptness in the information searching process. The significance of the library begins to diminish because of these factors, even though the library constantly develops its collections to meet the information requirements of its customers. Collection development is not the only factor to attract its users towards the library. Simplicity and seamlessness to find the required information are other important criteria which are to be given due importance in the contemporary world. In addition to that, some other

phenomena such as interactions and reaching beyond the local collections while searching for information have influenced to a great extent. These tasks could be accomplished by revamping the OPAC. This paper focuses on this objective mainly based on the authors' previous two research studies.

II. REVIEW OF LITERATURE

OPACs played a central role in the information dissemination process primarily in the academic institutes but the scenario has changed nowadays. OPAC cannot be as effective as before. OCLC research survey has proved that 89% of the undergraduate and graduate students start their search on search engines and only 2% start their search at the library website [1]. Several steps are usually involved to find information in OPACs. Multiple access points, different type of databases and complications in information searching confuse the library customers and finally it leads to under utilize the library resources. As a consequence of these reasons everyone approaches Google even though the library resources are reliable [2]. One of the recent research studies in the universities of Sri Lanka has confirmed that the trend of moving towards the Internet for the information need is continuing. Moreover the students don't prefer to use OPAC. This study further ascertains that the users want to search information from electronic resources and to use technology to communicate with the library staff [3]. It justifies the need of change in our approach in delivering the library services.

The catalogues are recently encountering yet another trend that is Web 2.0. The web has become a place of collaboration and participation where users no longer only receive but also create and share content. Web 2.0 principles have made trendy web services even more attractive for users and put libraries in the position where they need to reconsider their services and role in the information environment, governed by new generations of library users. Libraries can develop better user-centered catalogues only by identifying and understanding the desires and behaviours of end-users [4].

Users can find ratings, comments, book cover images and inside pages of book in Amazon. These features provide immense insight about books to the users. Amazon offers suggestions from the purchaser as well. Steps should be initiated in OPACs to offer similar services to find the exact resources. AlenkaSauperl and Jerry D Saye pointed out in their paper that the unpopularity and underutilization of library catalogues made the librarians often disappointed even though catalogues have been developed with much care. Users are not accustomed well with OPACs. It is time to develop more user-oriented OPACs with an attractive user interface [5]. Currently OPACs have not fully embraced these kinds of services. Tam Winnie, Cox Andrew M and BusseyA performed a research study on the features of next generation OPACs, which shows that the development of next-generation OPACs in UK academic libraries is very much in its infancy. Only one university has embedded a next-generation catalogue - Encore by Innovative Interfaces. More than sixty percent of the OPACs do not have any of the new features such as faceted browser, simple search box, comments and ratings, RSS feeds and tag cloud. Relevance ranking, book jackets and table of content are the features that libraries have implemented the most. These findings may seem to indicate that librarians have given higher priority to features that bolster search functionality and enrich content than features with Web 2.0 technologies [6]. From the technical point of view as well as observation of many research studies, accentuation on OPAC restructuring has become mandatory to serve in a better way to the library client's forexuberant experience in information searching process.

III. OBJECTIVES OF THE STUDY

The following are the objectives of this research study.

1. To analyze the features of the OPAC;
2. To compare the features of OPAC with Amazon and Google;
3. Theoretical Framework of the study to develop a state-of-art OPAC.

IV. METHODOLOGY

Keeping the present scenario in view, the authors had performed two types of research study on OPACs of selected academic institutes of Gulf Cooperation Council (GCC) nations. GCC nations are Bahrain, Kuwait, Qatar, Saudi

Arabia, Sultanate of Oman, and the United Arab Emirates (UAE). It enlightened the current status of OPACs of the selected samples, observed both developments as well as areas for further developments and reiterate the inevitability of modernising the OPACs. A review of literature and the findings of these two analyses are the basis for the proposal of new theoretical framework.

A questionnaire had been developed for the first part of analysis, which comprised bibliographic information, types of documents covered, access permission, information searching efficiency and additional options. These factors had many subcomponents for the comprehensive study and had been weighed up to appraise the general features of OPACs. The questionnaire was circulated to many academic libraries in GCC nations, in which thirteen responses were received after sending reminders. Catalogues of 24 libraries have been accessed directly for this purpose. Out of these thirty seven OPACs, twelve are from the Sultanate of Oman, four from Saudi Arabia, seven from Qatar, four from Kuwait, one from Bahrain and nine from the UAE. The direct access facility has provided hands on experience to the researcher to carryout the research in a successful way.

A checklist was prepared for the second part of analysis with the reference to the features of Amazon and Google. Basic search, advanced search, spell check-up, truncation, Boolean operators, search history, refine search option, document type, similar items, help option, email, print, save options, relevancy, content enrichment, accessibility, faceted navigation, personal recommendation, recent searches and user's participation were used as parameters in the analysis. Data had been collected from twenty eight OPACs, in which five OPACs are from the Sultanate of Oman, one OPAC from Bahrain, four OPACs from Kuwait, six OPACs from Qatar, four OPACs from Saudi Arabia and eight OPACs from UAE.

V. ANALYSIS OF FEATURES OF OPACS

This research found many notable developments in OPACs. The presence of modify search option; relevancy factor and current status of the documents are some of the developments. Links have been given to e-books and bibliographic databases. OPACs are capable of handling different type of resources, but this feature requires more attention to handle them effectively. All OPACs can be accessed irrespective of their geographical locations. Incorporation of keyword and Boolean search options in majority of OPA Cs are note worthy developments.

Apart from these advancements, this study divulged the areas for further enhancements. OPACs are poorly designed to provide information in the article level which is mainly due to the cataloguing standards for example AACR2 are based on the principles of pre-machine period. Federated search and stemming of words facilities are not seen in most of the OPACs. Additionally this study pinpoints the areas such as links to search engines and open sources to boost up the potential of OPACs. All these functionalities are imperative to improve the scope of the library catalogues.

VI. COMPARATIVE STUDY OF OPACS WITH FEATURES OF AMAZON AND GOOGLE

The second part of analysis had brought out many interesting facts bothin advancements and defectiveness in OPACs. Email option, save option, search history, full text access facility, faceted navigation, relevance ranking, similar results and table of contents options are the cutting-edge characters of these OPACs. Inclusion of book cover image and different type of information resources are remarkable enhancements.

Proximity search and stop word removal options are indispensable to empower the information searching capability, which are missing in many OPACs. Spell check option, professional review, excerpts, and popular list features are lacking, which are evidences for poor content enrichment. Accessibility is another area for upgrading. User participation for example ratings, forum, users' review comments, and tag option are not incorporated in a majority of OPACs. Absence of personalised recommendations and RSS feeds are other snags to make OPACs as a robustproduct. OPACs are unsuccessful in utilising the social networking concept. These findings insist there is a wide gap to reach the level of Amazon and Google, even though there are many developments.

VII. THEORETICAL FRAMEWORK TO DEVELOP A STATE-OF-ART OPAC

Findings of these two analyses portray the status of OPACs of the selected samples at the time of research study. Perception of these studies confirms that the developmental activities in the cataloguing world are in a linear fashion, but this approach is not adequate to revitalise OPAC. A multifaceted approach should be categorically adopted to change the landscape of the catalogue. This section proposes a new framework with multifaceted approach which includes the shortcomings found in the two part of analysis.

Utilisation of current technology and introducing new amendments in the cataloguing standards are the two ways of approach to modernise the catalogue. Keeping this aspect in view, the researcher proposes a new framework to develop the library catalogue with all required elements and to continuously enhance the calibre of the library catalogue. This new framework has two major sections. The first section deals with essential functionalities. The second section describes the way of implementation and rationales.

A. Essential Functionalities

The key functionalities for the next generation library catalogue are listed out here as per the authors' research study to develop an ingenious catalogue. This list will grow or change from time to time because of the rapid development in the information technology field. Many new sophisticated features may appear soon and some of the existing features may become obsolete. The catalogue professionals should consider these technological advancements during the development of their catalogues to entice the users to use OPAC as a worthwhile tool.

- Table of contents
- Modify search option
- Relevance ranking
- Current status of the document
- Email and save options
- Links to e-resources and full text access facility
- Remote access facility
- Keyword and Boolean search options
- Faceted navigation
- Similar results
- Book cover image
- Different type of resources
- Login, saved search and search history features
- Proximity search
- Links to search engines
- Spell check
- Stop word removal
- Handling of periodicals in the article level
- Content enrichment
- Federated search

- Stemming of words
- Links to open sources & digital library
- Professional review
- Excerpts
- Popular and recommended list
- Accessibility
- Rating
- Forum
- Users' review comments
- Tag
- Personalised recommendations
- RSS feeds
- Social networking and
- Alert Service

B. Implementation Procedure and Rationales

Introducing new rules and fields in the cataloguing standards will help to add some of the above features. However other required features can be integrated with the help of the advanced computer technologies in the design stages of OPACs. A versatile OPAC can be developed with the use of Web technologies such as mark-up languages, client side scripting language(s), server side scripting language(s) and RDBMS. The user interface design could be done with the use of mark-up and client side scripting languages such as HTML 4.1, XML, Cascading Style Sheets (CSS), jQuery, AJAX, etc.,. Choice of RDBMS is based on the existing database system used in the current OPAC applications. It could be combination any of the following such as Oracle, MySQL, SQL Server, DB2, etc. Server side scripting languages could be any one of the following such as PHP, JSP, ASP.NET, RUBY on Rails, etc.,. Developing OPAC applications with PHP and MYSQL combination will ease the process because these technologies are open source and have better connectivity. SQL Server and Oracle databases are commercial RDBMS with more features.

1. Modifications in the Cataloguing Standard

Competency of the library catalogue should be enhanced to handle its own print collection as it is still dominating in the academic environment. Library of Congress's (LOC) proposal of including Table of Contents (TOC) is one of the ways to enrich the catalogue. TOC of books is present in many OPACs of the selected samples. In MARC 21, field 505 is used to include TOC. Similarly TOCs and abstracts

of journals should be included in the catalogue, which is unavailable at this moment. Fields are to be created in the cataloguing standards for this purpose. Now, inclusion of TOCs and abstracts are possible because most of journals are published both in print media and electronic media, which helps to download the TOCs and abstracts from their electronic version counterparts. In addition to that, advanced level scanners are available to scan TOCs and abstracts in the readable format such as Word and PDF. The full text is essential to handle the periodicals in article level. If the library subscribes to e-journals; provision should be created on the OPAC to access full text from the retrieved results.

In addition to that, Book coverage image, professional reviews, summaries and annotations should be included in the cataloguing standards as these fields now begin to appear in the latest OPACs and helps the users in finding the relevant documents. Ultimately it will help to enrich the bibliographic records of our library catalogue. These fields can be downloaded from publishers' websites, Amazon and also from other resources to include in OPAC. Adding these fields in the library catalogue should be considered while revising the cataloguing standards. If these fields are included in the cataloguing standards, small libraries can import these fields from other library catalogues to develop an interactive OPAC for their user community. Metadata currently available in cataloguing standards cannot give information. Hyperlink provision to full text in the cataloguing standard will be the solution for this problem.

To manage the speedy changes in the computer field, cataloguing standards should not deal only with how to catalogue information resources, but also should explain how to develop OPAC with all functionalities by using computer technology in a separate chapter of the standard, which is the need of the hour.

2. Utilization of Computer Technology

1. Handling of Electronic Resources and Open Sources

The library catalogue should be designed to handle all its resources efficiently. Federated search facility is to be integrated for searching simultaneously the print collection, e-journals, e-books, online databases and its digital repositories to give unsurpassed access to breadth and depth of information. The e-resources are not the part of OPAC in the present setup as per this research study and have to be searched separately. The critical issue is electronic resources are not like print format resources. Most of the e-journals

and e-books cannot be treated as an individual element and are part of electronic databases. Cataloguing them is not practicable and not needed because all fields become access points including the full text. E-journals, E-books, Databases, Bibliographic information and Digital repositories should be indexed into a single data store and made available for the users' query through OPAC. Apache Solr can be used for indexing and searching records. The result should be displayed with hyperlinks to access full text of the retrieved results. PHP or ASP.NET sort of programming languages can be used to get done these provisions. This single search facility can break the barrier and can draw the attention of the users. Developing OPACs with this capability will increase the importance of the library catalogue.

Open sources are available plentifully and ever growing on the Internet for all subjects. Library professionals must be able to identify the relevant open sources for the core subjects of their parent organisation to incorporate in the OPAC. Directory of Open Access Journals, BENTHAM OPEN and HighWire Press are some of the examples for open sources. Metadata have to be harvested for this purpose from these resources and should be indexed for searching. Tools are available to harvest metadata for example free OAI-PMH tools, Public Knowledge Project Open Archive Harvester and Virginia Tech Perl Harvester. Searchable index can also be created. Indexing engines like Lucene is another break through in this field to create indexes. The current technology eases the process of indexing and integrating them with OPAC for searching. Results can be displayed with hyperlinks to access full text of the retrieved results. Besides Google books, Google Scholar, Scirus type of search engines, and Amazon are to be searched by the library catalogues. It can be accomplished with existing coding or with less coding.

2. Additional Features for Information Searching

Information searching capability is the most fundamental quality to judge the performance of OPAC in line with other information mediation tools. Additionally it paves the way to maximise the utilisation of all resources and to obtain the information beyond its limit. More attention is to be paid to make OPAC as a prevailing information searching tool to compete with Amazon, Google and other similar kind of products. At the same time, the searching should not be complex in nature and should not frustrate the users. To accomplish this onerous task, a single search box similar to Google search box must be created for common search.

It should be as effective as Google search box and should search all fields including full text to satisfy both novice users and experts. Apart from this, advance search option with various combinations of searches including Boolean search option should be included for the benefit of experts. C++ programming language can be used to create this facility. Python, Java and .NET programming languages can be used as frontend languages for the same. Faceted navigation and similar results search mechanism support the users to narrow down their search. The proximity search option is to be refined for its effective application. These features can be made available with their full potential by Apache Solr and Lucene.net. Apache Solr is a blazing fast, scalable, open source enterprise search server built upon Apache Lucene.

Stemming of words and stop word removal features can too augment the information searching process. Software coding or third party tool is required to accommodate these in OPAC. Similarly the dictionaries can be incorporated for spell check functionality. .NET, Java, Python and C++ can be utilised to write programmes to have them in our OPACs. It is obvious from this study that the information searching capability of OPAC purely relies on the computer technology and not on our cataloguing standards. Therefore, the library professionals should be ready to use the computer technology to build the modernised OPAC.

3. Relevance Rank

The system should display the retrieved results based on relevance ranking. Matching of the search terms can be considered with various access points such as subject headings, article titles, and author name as well as matching with abstracts and full text. Relevance Ranking Technology such as "term frequency – inverse document frequency" algorithm can be applied to obtain the results on the first page of the results itself. Circulation data, list of recommended books for all subjects, popularity and users' comments can be augmented to judge pertinence of a resource especially in the academic environment. When users login for searching, their search history should be contemplated with users query to increase the precision level of retrieved results.

4. Display of Results

Display of results should be understandable as per users' whim. Customisation options for the front end delivery of retrieved results are obligatory. Facility to save the searched results and able to re-run the saved results are to be part of

OPAC. The library catalogue should go beyond the realm of the users' expectation to boost up their discovery experience. These characteristics can be infused with OAPC by using the current web technology.

5. Good Impressive Interface

"Most of the designs of OPACs interfaces are not much effective in helping the users during their search for information. Interface designs in OPACs are less user-friendly and would not allow interactivity with the user during their search sessions. OPACs are one of the highly visible end user searching tools" [9]. The interface is playing a crucial role in attracting the users towards the library catalogue and should be grafted as attractive, responsive, intuitive, concise and an efficient one. Advanced web designing tools and multimedia components are currently available to develop an aesthetically pleasing interface. JQuery, AJAX, CSS and JavaScript are widely used to create intuitive, impressive and user-friendly interface. While developing OPAC, the developer should develop it to comply well with WWW consortium's HTML standards, which will improve the accessibility.

6. Alert Service

Many online databases are providing Alert Services to their customers in their field of interest. Google Scholar too offers this service. Server side scripting languages make it possible. Offering this service to the users will make them more dependable on the library catalogue. Alert service is a potential service, which eases the selective dissemination of information service. No one could have imagined this sort of services in the card catalogue era, which was a daunting task. SQL statements can interact with database. Servlets provide user account authentication and transaction control logic and the capability to run jobs at future times and also to send email message via Java mail. Many other open source mail systems are also available now.

7. Personalised Services

Personalised services such as search history, email, print, save, rating, users' review, tag, personalised recommendations, forums, RSS feeds and popular list can be added in the design stage of OPAC with the help of Server side scripting languages and database. Adding these features can make OPAC as an interactive and dynamic tool, for example users can tag the library books and can take part in the cataloguing. When patrons search the OPAC, tag clustering

enables them to find the relevant information. Users' review is another criterion to identify the pertinent resources. It is a dynamic field and needs continuous monitoring. Professional collaborations among the users through OPAC are practicable by introducing these services. The library catalogue should create RSS feeds for users to subscribe to update them with the latest additions in OPAC for example new books, new contents and new services. The libraries should embrace this technology to energise the Current Awareness Service. These services are nowadays embedded in social media websites. Tools and scripts are available to include RSS feeds. The latest programming languages for example PHP also support to create this option. Furthermore compatibility of OPAC with mobile phones has to be considered while developing the OPAC as it is an upcoming trend. This has not been taken into account while analysing. Mobile apps to be use in all major mobile platforms can be developed by the libraries with the help of current computer programming languages for example JavaScript and CSS. Some open sources like Kurogo and Android are available to develop mobile applications. The mobile technologies make the OPAC ubiquitous. These facilities are expectations of the Internet savvy users and can be made available in the library catalogue without making any change in the cataloguing standards. Likewise, OPACs can be integrated with social networking such as Facebook, twitter etc. OPAC will be permanently placed among the library users and users can freely access OPACs on these social networking websites. Excerpt is yet another service to be deployed, which can penetrate into the document for pertinent information. As everyone looks for information rather than documents, this service gets its impetus. Amazon and Google books and our own digital collections can be utilised to implement this service with proper coding while developing OAPC. Proper indexing, searching and optimization techniques will help to speed up the data retrieval process. As per this framework, state-of-art OPAC can be developed with all necessary components with the assistance of appropriate computer programming languages and by making necessary modifications in the cataloguing standards.

VIII. CONCLUSION

The research study considered the current position of the library catalogue in the light of modern users' expectations, general features of OPAC; and impact of Amazon and Google. The findings of this research compel the need of

total revival in the library catalogue. Besides, it ascertains the fact that the cataloguing standards are not having adequate rules to accommodate new format of information resources and are incompetent to provide the required information. Re-examining the function, design and usefulness are to be critically deliberated for invigorating the library catalogue. In addition, this research study stresses the point that research activities are to be accelerated to revamp the library catalogue to keep the pace of the developments taking place outside the library world in handling information.

Improvements of OPAC are not dependent only on cataloguing standards like before. The role of computer technology is predominant in making a powerful online catalogue. Bridging both the latest technology and cataloguing standards is the ultimate way to redesign the library catalogue. The researcher recommends a new framework in this research study to create such opportunity. The ultimate aim of this framework is to develop OPACs to keep the market demand. The creation of OPAC with all essential qualities is possible as per this research study. The proposed theoretical framework ostensibly opens the door to develop a full-fledged library catalogue with the ability to adapt the rapid technological innovations.

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