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Emerging Initiatives in Library Management Systems

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Abstract— The paper discusses briefly the evolution of library management systems (LMS) and how changes in technology, information environment, user expectations and searching behaviours, competition from related application streams and the availability of enterprise- wide systems particularly in academic and research environments have influenced changes in LMS functionality and design. The drawbacks of current LMS offerings, both commercial and open source, are then described followed by a description of major new initiatives that have taken place in the last two or three years leading to new ways of freeing the LMS from its monolithic nature into one which supports new workflows via services-oriented architectures (SOA) and web services. These initiatives, particularly that of the OLE Project, extensible Catalog, the recommendations of the Digital Library Foundation (DLF) and National Information Standards Organization (NISO), and the recent proposal of OCLC to move LMS into a web-spaced platform using cloud computing paradigms are discussed.

I. INTRODUCTION

Library Management Systems (LMS) or computer- based systems that automate one or all functional areas of a typical library have had a history of evolution going back to the mid-1950s. LMS have also been referred to as Integrated Library Systems (ILS) in later years to reflect the fact that all functions are managed via a central database (what is today being called a siloed application) with processes that transparently exchange data between functional components such as catalogue records and circulation transactions. This paper examines current initiatives that will determine the future of LMS. To understand and appreciate these initiatives it is important to briefly look at the past and recount the influences that have played a role in the evolution and how new have made it necessary to rethink the design of LMS.

The paper discusses the drawbacks of current commercial and open source LMS and the need for new design principles that take advantage of new software and interoperability paradigms such as services oriented architecture (SOA) and web services that have arisen from the distributed nature of the web, changing user behaviors and the need to manage both core functions of a traditional LMS, new electronic resources plus the capability for interoperating with external applications, e.g., course management systems, personnel directory systems, that are now becoming an integral part of institutions. Initiatives of the OLE Project, the extensible Catalog Project, the proposals of the Digital Library Foundation (DLF), the National Information Standards Organization's (NISO) proposals for best practices and OCLCs recent proposal to use cloud computing paradigms to move the traditional LMS to becoming a fully webspaced one (as opposed to just webbased) are discussed as pointers to the emerging future of LMS.

II. A SNAPSHOT OF THE EVOLUTION OF LMS

The evolution of LMS since the mid-1950s till the present day is seen to have taken place in five different phases as below.

First generation systems

.Standalone un-integrated applications beginning with circulation

•No standard metadata in use.

•The emphasis was on library housekeeping efficiencies, little or no concern for user access.

•Most applications were home grown.

•Very little vendor interest in LMS; and

•Mostly main-frame computer based and batch processed systems.

Middle generation systems (1960s– 1970s)

•Metadata standard for bibliographic records (MARC) became available.

•Emphasis was on exchanging bibliographic data, centralized cataloguing and distribution of catalogue cards.

•Systems were developed by vendors which leveraged the catalogue data in other modules circulation, acquisitions.

•First generation integrated LMS came into being.

•These were targeted to single libraries.

•Proprietary backend designs (e.g., flat files) were common; and Mostly minicomputer based; character-based interfaces some systems were still home- grown.

Pre-Internet generation (1970s – up to 1990s)

•Networking via LANs and WANs became possible and libraries began to ask for networking of closely related libraries.

•Microcomputer-based systems with richer interfaces.

•Client-server LAN systems became the norm.

•Interactive applications became possible with GUIs.

•Vendor systems with networking capabilities became available.

•Most integrated systems had similar functionality with small differences.

•First generation OPACs made their experience.

•Federated searching became possible via the z39.50 Information Retrieval protocol. Movement away from proprietary to RDBMS- based backend systems and Sleazed search systems.

Internet generation (Web 1.0) (1900s – 2000)

•Initial move was to host the OPAC on a web server; other functional modules were still locally administered.

•Rich GUI front ends using tools like Visual Basic, Visual C++ became available.

•When reliable Internet connectivity became widely and cheaply available in the 1990s, new client server systems that used the web for data storage and transaction processing became available.

•Platforms like JAVA and .NET became the development options for web applications. Open source OS platforms like Linux made an entry. Few applications and quite geeky. Backbends were still predominantly RDBMS- based and search systems were SQL-based.

III. POST 2000 – THE WEB 2.0 ERA

The Web became the platform of choice for software. Development philosophies changed from finished product to workinprogress and frequent updates delivered over the web.

The web has become from an information delivery only platform to a participative platform. Ordinary individuals contributed via blogs, wikis, podcasts and social networks. This has impacted the expectations that library users have from libraries and LMS.

•Web services via protocols and APIs resulting in information reuse, greater interoperability, RSS/Atom feeds, mashups enhanced user experience in discovery applications, e.g., Amazon, Library Thing.

•Open source offerings make a serious entry into the marketplace;

•Dissatisfaction with the monolithic nature of the LMS and the OPACs is increasingly voiced.

•The consolidations and mergers in the commercial market place is evidence of upheavals in the industry.

•New kinds of enterprise applications have become available to institutions and there is demand for better integration of LMS with such systems.

The snapshot overview of the evolution can also be seen from the point of developments in technology, e.g. changes from using mainframe to mini-computers to microcomputers; from software for unintegrated systems to integrated systems; from single library systems to multi-library and networked systems; from using proprietary to relational database backbends; and from LAN-based systems to web-based systems. Developments in both hardware and software technology and the use of new paradigms such as the relational model, object-oriented analysis and design, client-server architectures and languages particularly well-suited to the World Wide Web have had an influence on the evolution. A major technological influence has been the growth of the web and its distributed environment under different platforms, formats, languages and data models requiring that the LMS supports interoperability

Changes in the information environment

The emergence of new forms of

Information, e.g., the web page, electronic forms of conventional information objects such as audio and video, full- text, e-serials. The plethora of formats in which information objects could occur (e.g., in proprietary ones (MS-Windows-based) or as open formats such as HTML, XML, PDF, open document format, MP3, MP4, WMV, JPG, TIFF, etc.) have also required that LMS should be able to deal with new information objects.

Changes in user behaviours and demands

This has probably been most challenging of all influences on the evolution of the discovery interface or OPAC built into LMS. Some of the searching and use behaviours that have challenged LMS are:Users want greater freedom in managing their access to information. Users want access not only to just library-held information but to other material types and on the web in general.

•Users seek a simple search interface that is not only easy to use but also retrieves items ranked by relevance and points to related items, reviews, recommendations, and allows a degree of faceted searching

•Users want access to full-text and other digital content and expect the library to assist them in obtaining the full text or other digital content via the LMS;

The Google generation (the teens of today, who have been brought up on the web and its resources unlike their predecessors) demand the freedom to tag items of their interest, access to information by their own tags or those of peers in a social network. Recommendations, and peer ratings of materials that may be useful to them.

IV. DEVELOPMENT OF NEW METADATA STANDARDS AND PROTOCOLS

Although the MARC metadata standard has been a long-standing one for bibliographic records, its complexity and the need for a high level of training for its use to create metadata records is a shortcoming in its use by non-librarians, e.g., authors, painters, musicians, social activists who are today also generators of information. These require to be described in institutional and web- based search systems including generic search engines. This has led to the development of simpler and more generic metadata schemas such as Dublin

Core. Other information objects, e.g., courseware and learning objects require metadata that is not covered well enough by bibliographic standards. It is important to recognize that today's users, particularly in the academic world, require access to other materials as well and they expect that the LMS should be able to inter-operate with such systems in meaningful ways. The open access movement and the development of the OAI-PMH has enabled the development of institutional archives of scholarly contributions. These are valued by researchers and faculty and there is demand for the interoperability of such resources with the LMS.

Emergence of related application streams leading to pressures from librarians, endusers as well as Institutions.

Database producers, e-journal publishers, providers of data, audio and video feeds and content, subject portals, learning management systems, enterprise-wide information systems have their own workflows, search interfaces, applications and metadata standards. There is a growing demand from librarians, users and institutional heads that libraries should interoperate their systems with these related applications to permit access to a wider information base and to avoid unnecessary duplication of similar data across applications and avoidable errors in transactions that may take place between LMS and other applications, e.g., between a LMS's acquisitions system and the Institution's Purchase Management System.

Limitations of Current Crop of LMS in Today's Context

One of the advantages of current offerings of LMS is that it tightly integrated all functions within a common application as a means of increasing efficiencies. However, what was once considered to be a virtue, has many drawbacks in the changed times of today. Some of the drawbacks are:

•The LMS is a complex, closed system, the software uses proprietary code and is expensive to license and difficult to customize even if the software is open source. The complexity of the code militates against customization by a third party. Even if this is theoretically possible, it is expensive in terms of development costs.

•The LMS imposes rigid workflows. These are suitable for conventional materials. The management of electronic resources requires different workflows, e.g. management of: digital rights, management of access rights to e-journals, implementing consortia borrowing, document delivery and access to full text via applications (e.g. openURL) and protocols. Libraries are faced with two options: either to use the inefficient workflows to manage eresources with their LMS or to implement a parallel system for the management of electronic resources. Parallel systems are obviously an additional burden in terms of costs and maintenance.

•New enterprise-wide information systems, personnel directory systems and purchase management systems are being implemented. Current LMS do not integrate with the new systems. Libraries create complicated processes for extracting data from the enterprise systems, reprocess data inside the LMS, and then send data back to the enterprise systems, e.g. student or patron data; library acquisitions data

•Lack of integration with widely used tools, e.g. database search systems, institutional repositories is a serious deficiency. Libraries cope with these problems by developing add-on components or by purchasing new LMS components and writing programs to connect them to them to the LMS

•It is nearly impossible for a library to integrate its commercial ILS with tools outside the LMS, such as a course/learning management system or social-networking tools.

•Current OPAC offerings of LMS, most of which are librarian-centric do not provide the discovery experience that many users are accustomed to in collateral systems •New OPAC offerings in the commercial space, e.g. Endeca, Primo, Aqua browser, improve user experience, but purchasing and implementing a second OPAC is an extra expense and an extra support burden on top of costs and support for the LMS. New open source OPAC offerings such as Scriblio, VuFind have also become available, but use of these requires programming effort on the part of libraries and the need for the vendor of the LMS to expose ways in which third party applications can use the data embedded in their application.

•The work done and experience gained to add-on new workflows in existing LMS to cater to the management of newer resources is not easily transferable to other LMS products or to other libraries trying to solve the same problems.

New Initiatives in the Redesign of LMSLibrarians and vendors; bodies such as the NISO, DLF and associations such as the ALA; and active web forums (e.g. the List on New Generation Catalogs, NGC4LIB) have discussed these in several live meetings, online forums and webinars. In the last two years there have been very proactive initiatives. Among these, the following initiatives have made significant progress and their findings will The OLE Project (www.oleproject.org) under the leadership of the Duke University, USA

•The DLF Discovery Interface (DLF-DI) Task Force

•The NISO Best Practices for Designing Web Services in the Library Context

•The extensible Catalog project of the University of Rochester, USA

V. Conclusion and Future Work

The LMS industry is going through a profound transition thanks to the initiatives presented here. The end of an era and the beginning of a new one in the evolution of LMS is seen - from that of a library-specific one to that of an enterprise-wide one. Vendors are evaluating how to respond. They will not become redundant if they adapt. Commercial and open source offerings incorporating the ideas and work of the initiatives mentioned above among others will, no doubt, become

available. Open source initiatives, particularly the Community-Sourced ones, are likely to significantly expand the options for libraries, worldwide. Services to libraries will probably be the next big opportunity rather than products.

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