Advent of Digital Libraries and Measuring Their Performance: A Review

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Abstract

Developments in the field of information technology, like increased capacities of digital storage media, growth of the world wide web and access to internet, sophisticated search engines, fast processing power and reduced computer costs have clinched the case for digital libraries. On the basis of a literature survey, the paper attempts to define a digital library; lists the advantages offered by digital libraries; gives the importance of measuring the performance of libraries against their objectives; gives the progress in developing performance indicators for digital libraries; and lists the difficulties that may be faced in implementing a system of performance indicators.

1. INTRODUCTION

The information explosion and information technology (IT) revolution, particularly, the ability to convert text, images, audio and video information into digital form, has led to the emergence of the digital information era. Developments like, increased capacities of digital storage media, growth of the world wide web and access to internet, sophisticated search engines, fast processing power, reduced computer cost and increase in the number of electronic publications have clinched the case for development of digital libraries.

Application of IT in the libraries has progressed to varying degrees in different developing countries and in different library centers within a country. Use of IT in a library may involve one or more computers for inventory management, circulation management, providing internet access, bibliographic database and search facilities, etc. Besides these, information resources in the form of electronic journals, e-books, CD-ROM databases, open source literature made accessible through the world wide web,

etc., may also have been built up. Because of this wide diversity in the form, content and services related to information in electronic form, the question whether a library may be termed as a 'digital library' becomes difficult to answer.

Considerable initial and recurring investments need to be made for building information infrastructure, acquisition of information resources, personnel training, etc. The library managers must, therefore, have to justify these investments to the funding bodies on grounds of measurable performance indicators related to the services to the clients.

In this context, the paper, based on literature review, has attempted to present a brief state-of-art on the subject of digital libraries covering the following aspects: (a) a definition of a 'digital library', (b) why libraries must turn digital in the current context?, (c) a brief overview on Indian scenario with respect to digitization of libraries and the digital divide, (d) performance indicators for digital libraries as followed in some developed countries, and (e) difficulties likely to be encountered in

implementing a system of performance indicators in digital libraries.

2. DEFINITION

The advent of digital libraries has changed the role of the library and information professionals, as well as the required user capabilities. It is therefore important to understand what, in fact a digital library is:

The digital library has been defined in many ways. A digital library, like any library, is a service that is based on principles of selection, acquisition, access, management and preservation of information resources, meant for a specific client community. [1] An informal definition of a digital library is a managed collection of information, with associated services, where the information is stored in digital formats and accessible over a network. A key part of this definition is that the information is managed. A stream of data sent to earth from a satellite is not a library. The same data, when organized systematically for convenient use of clients, becomes a digital library collection. [2]

The Digital Library Federation*, USA has proposed the following comprehensive definition of a digital library.

"A digital library is an organization that provides appropriate resources (including specialized staff) that enable selection, structuration, intellectual access, interpretation, distribution, preservation of the integrity, 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."

This definition emphasises that a digital library, like any library, is more than a mere aggregation of information resources: it is a service which is based on principles of selection, acquisition, access, management and preservation, related to a specific client

community. All of these principles are relevant when we consider the practical issues involved in service delivery.

Some definitions are short but comprehensive in scope. According to Lesk, [3] a digital library is 'a collection of information that is both digitized and organized and which offers capabilities beyond those of the traditional library'. Larsen [4] defines a digital library as a 'global virtual library – the library of thousands of networked electronic libraries'. Griffin [5] defines a digital library as 'an organized collection of multimedia data with information management methods that represent the data as useful information and knowledge to people in a variety of social and organizational contexts.'

A digital library collection may include two types of information resources. One type comprises the 'digital original' resources, which are sometimes referred to as resources that are 'born digitally.**' The other type comprises 'digital surrogates', which are created from traditional information resources through format conversion. While both types of resource have the same access and management requirements, they raise different issues of selection and acquisition; and their preservation imperatives are also different.

Some examples are given by Margaret E Phillips. [6] Some other definitions of 'digital library' are broad enough to embrace services that integrate access to both, the digital and the traditional (e.g., print) materials. [6]

3. ADVANTAGES OF DIGITAL LIBRARIES

The benefits of information collections in digital form for preservation and access and in management of large quantities of information have been recognized by both library professionals as well as users. Digital libraries can store a large volume of digital information in archival form. It provides the users fast search tools, immediate access to the rapidly-growing information in multimedia form quickly on the screen in an interactive mode; it also offers access to expensive and special collections of information from any

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* Digital Library Federation (DLF) is a consortium of libraries (in Washington DC) and related agencies that are pioneering the use of electronic-information technologies to extend their collections and services

**The phrase "born digitally" has been popularised recently by the DLF and the Council for Library and information Resources (CLIR).

remote location and by multiple simultaneous users.[7]

The fundamental reason for building digital libraries is that they provide better delivery of information than was possible in the past. Arms has provided a comprehensive list of potential benefits of digital libraries as follows:[2]

❑ The digital library brings the library closer to the user

A digital library brings the information to the user's desk, either at work or at home, making it easier to use and hence increasing its usage. With a digital library on the desk top, a user need never visit a library building. The library is wherever there is a personal computer and a network connection. The access to the collections expands beyond 'working hours'.

❑ Computer power is used for searching and browsing

Computing power can be used to find information considered to be better than manual methods for finding information particularly for reference work that involves repeated leaps from one source of information to another. Hyperlinks to other sources within a source provide obvious advantages.

❑ Information can be shared

Libraries and archives contain information sources that are unique to them. Placing digital information on a network makes it available to everybody or at least to those who have subscribed to it. This is a vast improvement over expensive physical duplication of material, or the inconvenience of traveling to a location where some unique material is stored.

❑ Information can be updated easily

Much important information needs to be brought up-to-date continually. Keeping information current is much less of a problem when it is in digital format and stored on a central computer.

❑ Interactive access of information become possible

Print form may not always be the best way to record and disseminate information. A database may be the best way to store census data, so that it can be analyzed by computer; remote sensing satellite data can be rendered into graphic form in many different ways when digitally available; a mathematics library can store mathematical expressions which may be manipulated by programs. Audio and vediographic information can also be stored, accessed and 'played back' on users' desk.

There is another group of potential benefits. Digital libraries can provide a wide range of services that allow collaboration and exchange of ideas. The potential for convergence between the technologies of electronic mail and teleconferencing and digital libraries present exciting possibilities.

4. PERFORMANCE INDICATORS FOR DIGITAL LIBRARIES

Performance measurement is a methodology that is applied to organisations and institutions to measure their effectiveness, efficiency and cost-effectiveness.[8] It is a management tool that allows the administrator to obtain the concrete performance data for a meaningful evaluation of an organisation's performance. The evaluation process prima facie, requires formulation and articulation of a mandate, and of specific objectives. Once the objectives have been established and clearly defined, the performance of an organisation can be measured against its objectives, and evaluated accordingly. Performance indicators are created by devising such quantitative and qualitative data elements and combinations thereof that evaluate the performance of an organisation or of its function/service against the set of given objectives and which are comparable across similar other organisations/ service/ function.[8]

Some performance measures libraries have used in the past for conventional services are: circulation figures, number of library members, number of reference questions answered, number of people who come to the library, number of books in the

collection, etc. The purposes of such indicators are to analyse data in order to clarify the output and outcome of the library services and see how well the library is performing.[9] Performance indicators provide library managers with a standard and manageable method of measuring the library's performance as well as allowing benchmarking the best practice and comparison between libraries.

In many cases, the results of performance measurement are needed for management decision making: For example, the investment for a new digital library hardware or software; choice of digital library content needed by clients; system design choices,[10] etc. Performance measures can also help assessment of demand for the set of services being offered, satisfaction levels, etc.

Performance indicators are not universal or absolute; they must be developed in context and not in isolation. They must be firmly rooted within strategic management objectives and planning framework.

A digital library has many similarities with a traditional, physical library; but it also has many differences. Buttenfield[11] distinguishes evaluation procedures in a physical library from those in a digital library. She views evaluation within a framework of system design and resource deployment. In addition to an evaluation strategy where evaluation data are collected throughout the system life cycle, she includes a second strategy where the evaluation methods themselves are evaluated. This evaluation approach, followed in the Alexandria Digital Library (USA), involves evaluation of the user reactions to the interface, functionality and content, as well as the study approach itself.[12]

A National Commission on Libraries and Information Science was setup in United States in 1994 to consider the general issues about measurement of performance of library electronic media and services[13] and its final report was submitted in 1996.[14] This Commission considered various difficulties in the measurement of these media and services that present significant challenges for libraries and information services.

Standard statistical methodology, definitions, structures, and categories for describing digital media resources and services are essential for library management and planning. To manage the changes resulting from electronic and networking technologies, standard measures and descriptive statistics need to be formulated.

Young[15] has formulated a combination of different approaches for measurement of information technology-based media and services in libraries. These are:

♦ Transaction-based measures: Here interactive sessions, downloads, hits, etc., are counted, recorded and measured using sampling or by analysing logbooks of transactions

♦ Time-based measures: Here the available service hours, session lengths/ durations, system/service peak levels, etc., are measured

♦ Cost-based measures: Measures here are based on costs/expenditure for telecommunications, equipment, staff, training, maintenance, etc.

♦ User-based measures: Here user activities, anticipated demand, simultaneous users, group-use, user-satisfaction, etc., are measured.

5. EQUINOX PROJECT

EQUINOX was a two-year research and development project funded under the European Commission's Framework programme. It was led by the Centre for Research in Library & Information Management (CERLIM) at the Manchester Metropolitan University and involved partners from the UK, Ireland, Germany, Sweden and Spain.[16] Its primary foci were to achieve consensus on a core set of performance indicators for electronic library services and to develop a software-based decision-support tool for library managers. It emphasised the need for libraries to develop and utilize performance measures for new networked, electronic environment, alongside traditional measures, by developing a set of performance indicators for electronic library services with an emphasis on information

access and delivery, costs and user satisfaction.

Existing sets of performance measures and indicators, for example ISO 11620 (1998), PROLIB-PI[7] and the IFLA Handbook,[18] tend to include measures mainly for traditional library services. There is, therefore, a pressing need for a set of performance indicators that cover the new electronic services that are becoming an increasingly important part of many libraries' collections. Used alongside the performance indicators for traditional services, the new set for digital library must enable library managers to gather information on all their library's services including the digital resources. Keeping this view an initial set of performance indicators for electronic services was developed during the first stage of the EQUINOX project.

EQUINOX project finalised a set of electronic library performance indicators[16] to enhance and complement the indicators for traditional library services presented in ISO 11620. Some of the performance indicators for digital libraries developed under this project are listed below:

❏ Percentage of the target population reached by electronic library services

❏ Number of sessions on each electronic library service per member of the target population

❏ Number of remote sessions on electronic library services per member of the target population to be served

❏ Number of documents and entries (records) viewed per session for each electronic library service

❏ Cost per session for each electronic library service

❏ Cost per document or entry (record) viewed for each electronic library service

❏ Library computer work-station use rate

❏ Number of library computer workstation hours available per member of the population to be served

❏ Rejected sessions as a percentage of total attempted sessions

❏ Percentage of total acquisitions expenditure spent on acquisition of electronic library services

❏ Number of attendances at formal electronic library service training lessons per member of the population to be served

❏ Library staff developing, managing and providing ELS and user training as a percentage of total library staff

❏ User satisfaction with electronic library services.

However, great care is needed when using any performance indicator to make comparisons between libraries. Indicators that are based on the target population particularly need to be carefully constructed, because each library has its own user population, its own operational environment, and its own set of objectives.

6. PERFORMANCE MEASUREMENT DIFFICULTIES

US National Commission on Libraries and Information Science (NCLIS) considered the various difficulties in the measurement of the electronic media and services. A few of these difficulties are listed below: [14]

❏ Difficulties in developing standard definitions for electronic media and services related to costs/expenditures of:
  • System/server hardware
  • Communications services
  • Software-operating systems
  • Training and education
  • Facility upgrades/maintenance
  • Content/resource development
  • Programme planning/management/ staffing

❏ Difficulties in developing standard measures of the impact of activities between/among libraries due to differing infrastructure/services/clientele;

❏ Lack of standard quantitative measures for electronic multimedia works or objects; and

❏ Difficulties in formulating measures of performance of complex telecommunication infrastructure technologies.

7. CONCLUSION

The world is witnessing a dramatically changing scenario involving incorporation of digital media in the library systems and making the same accessible globally through the use of telecommunication and web technology. Increasing demands form civil society for access to more and more information, transparent governance and lower transaction costs are also accelerating the ushering-in of an digital libraries era. Electronic library services are thus going to assume increasing importance in times to come. High investments required to establish and run a digital library, and pressure on them to generate revenues through the services, naturally put pressure on them to achieve their achieve their objectives in cost-effective ways.

For a system of performance indicators to be operational successfully, there has to be a spirit of professionalism, an elaborate system of record keeping. In India, however, most libraries do not maintain systematic records of circulation, reference services rendered, etc. Thus, libraries have to under go a cultural metamorphosis.

In India, so far no standard method has been reported for evaluating how this important section of library services is performing and whether value for money is being achieved.[19]

Although a number of flagship programmes of building performance indicators of digital library have been initiated in USA and in European countries, there is a need for the Indian library professionals to take an early lead in building performance indicators in the Indian context keeping the peculiarities of rural urban divide, etc., into account.

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