Editorial

1 The Interconnected Web: A Paradigm for Managing Digital Preservation
Heather Brown

Dr Anna Kaushik

25 Cross-Institutional Cooperation on a Shared Bit Repository
Eld Zierau and Ulla Bøgvad Kejser

37 Promoting Online Databases/Electronic Resources: A Practical Experience
Pradip Das

49 Evaluation of Indian Institutes of Management Library Websites in India
Dr Margam Madhusudhan and Mr Noushad Ahmed

73 News

For more information log on to http://bookstore.teriin.org/
© The Energy and Resources Institute 2013

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the publishers, TERI Press, The Energy and Resources Institute, New Delhi 110 003, India.

The publisher does not assume any responsibility for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, instructions or ideas contained in the material herein.
Contents

World Digital Libraries
Volume 6, Issue 1 • June 2013

v Editorial

1 The Interconnected Web: A Paradigm for Managing Digital Preservation
Heather Brown

Anna Kaushik

25 Cross-Institutional Cooperation on a Shared Bit Repository
Eld Zierau and Ulla Bøgvad Kejser

37 Promoting Online Databases/Electronic Resources: A Practical Experience
Pradip Das

49 Evaluation of Indian Institutes of Management Library Websites in India
Margam Madhusudhan and Noushad Ahmed

73 News
Editorial

MICHAEL SEADLE
Dean, Faculty of Arts, and Director, Berlin School of Library and Information Science, Germany

Evaluating Risk

Two articles in this issue explicitly address risk, Heather Brown’s “The interconnected Web: A Paradigm for Managing Digital Preservation” and Eld Zierau and Ulla Bøgvad Kejser’s “Cross-institutional Cooperation on a Shared Bit Repository”. It is no accident that both articles discuss long-term digital preservation, where the goal is to reduce the risk that content will not be available in the future. While the other articles do not address risk directly, some judgement about risk is present in almost every aspect of digital libraries. When Margam Madhusudhan and Noushad Ahmed write about the “Evaluation of Indian Institutes of Management Library Websites in India”, the risk is that the evaluation could discover problems that need correction. The article by Pradip Das on “Promoting Online Databases/electronic Resources: A Practical Experience” seems outwardly the least connected to issues of risk, but yet any time a resource needs promoting the implicit risk exists that it will be underutilized. The article by Anna Kaushik “Libraries Perception towards Cloud Computing: A Survey” addresses security issues as one of the most cited barriers to cloud computing, and security has a clear risk component. Risk is everywhere.

In my ethnographic research, I have long had an interest in risk. One of my principal research areas has been copyright, where some form of risk analysis is inescapable any time people want to use protected materials. Unwary users also face the risk of ‘honey pots’ designed to entrap people into downloading protected materials in order to threaten them with legal action. The definition of risk is broad. According to the Stanford Encyclopedia of Philosophy, there are four components to risk; it can be an ‘unwanted event’, the ‘cause of an unwanted event’, the ‘probability of an unwanted event’, or the ‘statistical expectation value of an unwanted event’. In more human terms, risk means that something unpleasant might happen, and that is something that librarians generally prefer to avoid.

Librarians tend as a group to be risk adverse. Nonetheless, librarians also have a history of embracing new technologies as a means of managing large amounts of information — in

effect, accepting the possibility of an unwanted outcome for a greater gain. Libraries automated their catalogues in the 1980s, at a time when many companies still depended heavily on paper, and cloud computing is only one example of how librarians have continued the tradition of taking calculated risks on new technological developments. Users may be more risk averse. Access restrictions offer only one of many examples where users ‘demonstrated risk-averse, satisficing behaviours that avoided potentially time-consuming exploration’. Librarians often have to help users overcome their risk aversion to using new tools and access methods. Users seek the security of knowing that librarians have sanctioned contents and access rights, and that the library’s discovery tools guarantee finding everything of significance for their search.

Risk is inescapable, but not necessarily problematic. Evaluation practices are a necessary risk for websites in order to improve, and without experimenting with cloud computing, libraries cannot find out whether this new form of storage will be a cost-effective alternative to the local form of storage that they already use. In digital archiving any action, however risky, is arguably better than doing nothing. The balance between selection risks, that is, which materials are most in danger of becoming lost over time, and technology risks, which materials may be unreadable because of bit rot damage or format or operating environment changes, shifts back and forth depending on current anxieties.

The long term fact is that both risks are real. Works never archived will likely be lost, and works with bit rot damage may be unrecoverable. The change in emphasis toward organizational issues that Heather Brown discusses comes in part because the risk of format changes was previously overemphasized, and has largely been unrealized. This is indeed an important aspect of risk — overemphasizing the wrong risk is itself one of the real risks that librarians face.

---

The Interconnected Web: A Paradigm for Managing Digital Preservation

Heather Brown
Assistant Director, Artlab Australia and BIM/LIM (Business and Library and Information Management) Project Officer, State Library of South Australia
E-mail: brown.heather@dpc.sa.gov.au

Abstract
Digital preservation management has evolved from an initial emphasis on technological issues to a broader understanding of resourcing and organizational issues. Internationally, the trend has moved to a risk management framework that is common to both digital and physical worlds. There are a number of common ‘high level’ principles and frameworks that intersect both digital and traditional (physical) preservation, and which in turn provide an opportunity to explore an integrated approach to preserving both digital and physical materials. This paper explores the opportunity for such an integrated approach through the paradigm of an interconnected web.

Keywords: Digital preservation, Preservation, Training, Digital preservation policy, Risk management
1 Introduction: The ‘Interconnected Web’

Preservation is about linking the past with the future. I will use an analogy from nature — the web — as a holistic way of better understanding and integrating the preservation of our heritage, both digital and non-digital. This is expressed in a poem titled ‘Web’ by K S Brown.

WEB
The passing eye of time misses nothing.
How still the stars have remained the same,
pathways explored, and many still to come.

The twining threads of a suspended circle of life,
always as fresh as the morning dew on them,
connect to all things.
They hold the measured collection of all activity,
recalled, recounted and re-learnt.

The distant times of other galaxies,
of vibrations to come
will visit the cradle of past activity
preserved by the management of collective knowing,
and add another thread spun,
a wider web, a growing cosmos.

K S Brown, 2012

Robert Penn Warren used the same analogy when he commented, “Every action is like the flick of a spider web. It sends ripples throughout an endlessly woven net of life and time” (Warren, 1946).

Ancient Indian traditions have always acknowledged this interconnectedness. The Vedas comprising all major branches of knowledge approach knowledge and life as being wholly interconnected. Within this framework, every action can be considered not just in terms of itself, but also in terms of its impact on the greater whole. From this time onwards, India’s ancient cultural heritage is extraordinary, and much of this knowledge and heritage is contained within an estimated five million manuscripts held within India and abroad (National Mission for Manuscripts, 2013).

2 The Challenges

Preservation, and particularly digital preservation, is challenging and complex. The environment of the new information paradigm contains a conundrum. On one hand, there are seemingly limitless possibilities in creating new digital information; new items are being created every nanosecond. On the other hand, the capacity to manage long-term preservation of this digital information over time has been comparatively slow to develop (Smith, 2004; Lavoie, 2004).

In this environment, the sheer scale and variety of digital content — both ‘born digital’ and ‘turned digital’ — is overwhelming. Web 2.0 is increasingly dynamic and interconnected, with pages changing as we view them, as each page view can be unique and ‘mashed-up’ from a range of services.

In reflecting these preservation challenges, Australia’s PADI’s website comments: Digital preservation is an area characterized by a high level of uncertainty, in which experimentation and discovery are employed in the search for preservation solutions.… As the nature of the future digital world is unclear, an openness of perspective is important in the implementation of any program, so that it remains adaptable and flexible enough to respond to an ever-changing environment. (PADI, 2011)

To help manage these challenges, nature has provided us with a flexible and adaptable model in the form of a web.

---

1 The PADI website was archived in August 2011. See http://pandora.nla.gov.au/tep/10691
3 The Preservation Web

It is time to take a closer look at the characteristics of the preservation web — the active ‘management of collective knowing’. This broad web nurtures ‘the cradle of past activity’, that is, our cultural heritage. The growing circle that contains all the digital challenges and risks is automatically included within the broader preservation web; the two are profoundly intertwined.

Professor Paul Conway shares the essence of the same interconnected vision, saying, “The fundamental principles of preservation in the digital world are the same as those of the analog world and, in essence, define the priorities for extending the useful life of information resources. These fundamental concepts are longevity, choice, quality, and access” (Conway, 1999) (author’s emphasis).

One of the clearest descriptions of the characteristics of the broader preservation web by the International Federation of Library Associations (IFLA) is as follows:

Preservation includes all the managerial and financial considerations…including storage and accommodation provisions, staffing levels, policies, techniques, and methods involved in preserving library and archival material and the information contained in them. (IFLA, 2008)

To this description, Conway adds, “The essence of preservation management is resource allocation. People, money, and materials must be acquired, organized, and put to work to prevent deterioration or renew the usability of selected groups of materials” (Conway, 1999).

From these perspectives, we can see that the strands of the broad preservation web are numerous and far reaching. There are key strands of management, policies, resourcing, and technical issues. Most significantly, there is no artificial limit to information formats — the ‘twining threads’ of the framework extend across the digital and physical worlds.

This interconnected perspective is a counterpoint to the early approaches to digital preservation management where the emphasis was largely on technological issues and earlier assumptions that ‘digital is different’. Now, an emerging trend in preservation management is to see synergies and interconnections with all areas of preservation (Harvey, 2010; Pearce-Moses, 2006: 7).

Moreover, the shape of the preservation web and its boundaries are constantly changing as the ripples of the new information paradigm are experienced. As Meyer summarizes in a recent ARL report:

Libraries must re-conceptualize preservation as a core function that extends beyond activities within a preservation department. As preservation is advanced through a range of instruments and partnerships, libraries are in the midst of reshaping priorities and reallocating resources to align with new services and conceptions of collections. (Meyer, 2009)

While, like all webs, the preservation web can be strong, it is also susceptible to events that weaken, break, or destroy it. Using a single strand, the entire preservation web can be tested for vulnerabilities using a risk management methodology designed to find and treat the weak points before they lead to unnecessary failure (Bernes, 2007; Clifton, 2005; Ashley-Smith, 1999).

4 Selecting for Digital Preservation

With respect to selection for digital preservation, Conway’s key principle of ‘choice’ is a useful beginning point. It deals with the essence of the ‘cradle of past activity’ that we need to preserve for the future.

The literature on digital preservation highlights complications that may arise in selecting it. During the past decade, discussions about what to preserve have culminated in high-level publications such as UNESCO’s Guidelines...
Digital resources present their own complexities to selection due to the challenges outlined earlier. Apart from the technological challenges — discussed later in the article — most critical are the challenges that impact on the time frame for selecting and building these strands of the web. With digital information, decisions about what to preserve need to happen early in the life cycle; the digital strands selected for the preservation web need to be planned and woven at the beginning. In the words of the UNESCO Guidelines (p. 66), “It may not be possible to wait for evidence of enduring value to emerge before making selection decisions.” Furthermore, selection for digital preservation is an ongoing process of web construction, closely connected to the active use of the digital files (Conway, 1999).

Notwithstanding the differences in timing and the technical challenges faced, from the perspective of the broader preservation web, there remain high-level synergies in selecting for preservation across all formats. From this viewpoint, conceptually the selection of digital heritage is similar to the selection of non-digital or physical heritage. The digital threads are part of the same pattern that is formed around broader collection management policies and priorities, archival appraisal, and significance criteria. In turn, this is reflected in a range of seminal publications such as the UNESCO Guidelines, the DPC Handbook, and Significance 2.0 (UNESCO, 2003; DPC, 2008; Russell and Winkworth, 2009).

Aligning with the broader selection framework has the benefit of a shortcut. It can help determine what is a significant priority early on and alleviates unnecessary time and expensive effort being expended further down the line. In the words of the DPC Handbook: “If the content does not meet your selection policy then responses to questions on the technical format will be irrelevant” (DPC, 2008, Chapter: Decision Tree). Pearce-Moses (2006) adds, “We may want to find some way to capture electronic versions, but they might not be my first choice if I knew those records existed in paper”.

With this broader framework, decisions about what digital resources to preserve can be made holistically. This perspective maximizes the threads of interconnectedness, making way for more informed decisions. For example, it allows us to critically question the value of preserving low-resolution digital images, if we know that good copies exist in other formats out there in the wider web (DPC, 2008; Decision Tree).

5 Technological Issues

Earlier on, much of the international focus of digital preservation was on technological strategies and standards. However, reflecting on the principles and frameworks of the wider web, key resources such as the DPC Handbook (2008) and the Cornell University tutorial Digital Preservation Management: Implementing Short-term Strategies for Long-term Problems (2003) have extended international awareness of the strategic links with resourcing and organizational issues.

In relation to technological strategies, substantial progress has been made in the development and refinement of strategies, such as refreshing, migrating, emulating, and replication. These are augmented by the use of devices such as persistent identifiers, encapsulation, and the development of digital preservation planning tools such as Plato (2013), and emerging new digital preservation systems such as Rosetta (Ex Libris, 2013).

From a risk management perspective, it makes sense to use a combination of strategies or threads within and among organizations to strengthen the web (Dale, 2006). In the words of the DPC Handbook, “It may well be that there will never be a single definitive strategy and a range of strategies appropriate to different categories of digital materials may need to be employed.” Exploring this theme,
the opportunity is ripe for linking technological strategies for digital preservation with other parts of the preservation web. One small example that can be taken as an option within the suite of digital preservation strategies is the option of linking it with microfilm. This has the potential of making the best of both worlds with digital media providing the multidimensional access, as microfilm provides low risk, 500-year preservation platform, and is especially suitable for non-dynamic text-based digital objects (Brown et al., 2011).

5.1 Standards, frameworks, and auditing
Digital preservation strategies become strengthened as they are linked with quality assurance and risk management frameworks. Within these frameworks, they are entwined with Conway’s preservation principles of quality, integrity, and access, as they promote common requirements for quality and make it easier for interconnectedness (collaboration and interoperability) between organizations.

For example, the OAIS Reference model, now an ISO standard (CCSDFS, 2012), epitomizes high level international expertise in digital preservation. It is an interconnected functional model for all the various activities that a trusted digital repository should perform. It is complemented by the Digital Curation Centre (2008) work titled ‘DCC Curation Lifecycle Model’ that provides a distinctive framework of the key stages required for successful curation and preservation of digital data.

Likewise, the specialist quality assurance frameworks for auditing trusted digital repositories are dynamically interlinked. They include the Audit and Certification of Trusted Digital Repositories (CCSDFS, 2011) and DRAMBORA (the Digital Repository Audit Method Based on Risk Assessment) self-check framework (DRAMBORA, 2008).

Many of these higher level standards and frameworks have been developed from the wider web and influenced by other frameworks, such as risk management (e.g., AS/NZS ISO 31000:2009), project management (e.g., PMI 2013), and quality assurance (e.g., AS/NZS ISO 9000:2006). As preservation managers around the world will attest, these broader principles and frameworks are already well embedded in the broader preservation web; the patterns are familiar. They contain Conway’s fundamental principles of longevity, quality, integrity, and access (Conway, 1999).

All this makes interconnecting digital preservation with the broader web much easier. Within the OAIS framework, it is particularly the area of preservation planning that is ripe for building connections with the wider web. This area lies at the heart of the OAIS model. Not surprisingly, the OAIS planning area embeds all of Conway’s key principles in its role of ensuring that the information stored in the system remains accessible to the designated user community over the long term. Its functions include evaluation and selection for preservation, recommending standards and policies, and planning implementing strategies such as migration.

When the preservation planning component within the OAIS framework can be linked with other strategies in the wider preservation web, there is an opportunity to streamline workflows between digital and physical materials. In turn, this is particularly relevant for a country such as India with its vast collection of manuscripts in both digital and physical (original) formats and where high value is often placed on preserving the original manuscript artefact. For example, preservation planning that links the digital and physical worlds can result in streamlined integrated workflows, such as those undertaken in the preservation laboratory at Mumbai University Library Fort Campus, where items are fumigated, digitized, conserved, and re-housed as an integrated process. (Mumbai University, 2013).

A high profile example of preservation planning that aligns the synergies between
digital and traditional preservation management is that of the Library of Congress (LOC) in preservation of the Waldseemuller Map from 1507. This process links the physical and digital by involving conservation, environmental controls and storage, digitizing, and digital preservation of the digitized images (LOC, 2010).

Like the ripples in a spider’s web, a closer connection between all these different threads can result in a strategic programme, with digital and physical items and whole collections being prioritized, conserved, digitized, re-housed, and protected as an integrated programme, thereby maximizing the preservation benefits.

6 Resourcing Issues
Building a long term resourcing infrastructure — finding ongoing funding to sustain digital preservation — is particularly challenging. For example, while it is likely that unit data storage costs will decline over time, the overall volume of data to be stored will continue to grow exponentially, and as digital objects incorporate more features.

Jonas Palm has highlighted the importance of ongoing funding, as investments in digital resources may be wasted “if planning for the future is ignored and no structural funding for maintenance is secured”, (Palm, 2006). Predicting ongoing cost for digital preservation is difficult. Lavoie summarizes the consequences:

We still lack a systematic analysis of digital preservation as an economic activity, and how it can be adequately provisioned with resources over the long-term to ensure that preservation objectives are met in a wide variety of contexts and circumstances. A lack of economically sustainable models for digital preservation activities represents just as real a threat to the long-term persistence of digital materials as the more traditional scourges of media decay and technological obsolescence. (Lavoie, 2008)

Ongoing costs signal the difference between projects and programmes. As Priscilla Caplan explains, “The nature of the funding is important because it shapes the nature of the funded initiative” (Caplan, 2007). Ongoing costs for digital preservation need to be sourced from a variety of areas. Here, again, is where the link with the other areas of preservation can be of strategic importance. It may be possible to re-allocate some priorities within the existing preservation programme; for example, to spend less on binding because more journals are being received electronically. However, cutting threads without an understanding of the implications of the wider web can lead to further damage to the originals; for instance, if services such as basic housekeeping and environmental controls are cut. An understanding of the ripples in the broader web will clearly show that such a narrow approach to solving the problem of funding will actually create significant long-term problems for the originals.

Furthermore, simply trimming here and there will not sustain ongoing programmes; to nurture the web the aim must be to secure high level funding, and the wider the web, the greater the opportunity for additional funding. Colin Webb has described the situation at the National Library of Australia (NLA), where it has been possible to find some funding for ongoing costs by reallocating some priorities across the whole organization, and drawing on skills and commitment already in the organization. In Webb’s view, “this has tended to encourage senior managers to pay close attention to digital preservation programmes, and help embed such programmes in the core business of the library” (Webb, 2004: 45). The real key in embedding ongoing funding is linking with the wider web of organizational policies and strategies. As Caplan sums up, “When the area being funded is a strategic, programmatic goal of the funding organization, one can reasonably expect continued investment” (Caplan, 2007).
7 Organizational Issues

As in the traditions of physical preservation, the organizational infrastructure is equally important in digital preservation. This involves commitment, as reflected through the policies and plans. It means getting ‘buy in’ right from the top. Without this high-level commitment, the strands of the web will break and digital preservation will flounder.

In the words of the recent JISC study, “Any long term access [to digital resources] and future benefit may be heavily dependent on digital preservation strategies being in place and underpinned by relevant policy and procedures” (Charles Beagrie Ltd, 2008).

Policy direction aligns strategies for preserving digital information and applies resources where they are most needed. To maximize the influence of digital preservation, it makes sense to strategically align digital preservation policies with the policy framework of the wider organizational environment that will include core institutional business drivers and strategies. The JISC study sums this up succinctly: “… an institutional [digital] preservation policy… cannot be effective in splendid isolation” (Charles Beagrie Ltd, 2008; Howell, 2006).

An example of an interconnected digital preservation policy is that of the NLA, which clearly states, “The Library’s digital preservation program forms part of its overarching Preservation Program” (NLA, 2013). India is similarly developing its policies and strategies (Katre, 2012). To maximize their effectiveness, these policies will similarly be a part of an integrated policy framework.

7.1 Collaboration

Organizational infrastructure also involves collaboration. Collaboration is a higher level of interconnection — the linking of preservation webs between organizations. As preservation challenges and strategies are similar across collections, collaboration is a way of sharing expertise and strengthening the webs. Formal collaborations are an important way of sharing development costs, harnessing and focusing effort, and attracting resources and support for programmes (UNESCO, 2003).

As with traditional (physical preservation), collaboration has been a firmly woven thread in the digital preservation web from the earliest days, largely due to the scale of the issues and the uncertainty of how to address them (Harvey, 2005: 158). Many of the collaborations in digital preservation have been built on existing networks within the wider web, such as UNESCO. Other collaborations such as the Digital Preservation Coalition (DPC), the International Internet Preservation Consortium, the Open Planets Foundation, and Digital Preservation Europe are focused more specifically on digital preservation. Verheul highlights earlier examples at regional and national levels in the IFLA survey titled Networking for Digital Preservation (Verheul, 2006).

However, as the UNESCO guidelines highlight, collaboration costs (UNESCO, 2003: 64). While alliances are beneficial, they need clarity of roles and responsibilities, and “unambiguous agreements able to be accepted by all parties” to avoid tangled webs (DPC, 2008). Collaborations also need ongoing commitment and nurturing of the interconnections; otherwise, the relationship will be literally left ‘hanging by a thread’. As Webb reflects, “the most effective collaboration programmes seem to have been based on areas of real common interest… and the allocation of sufficient resources to pay attention to the collaborative relationship itself” (Webb, 2004).

7.2 Skills, education, and training

Also part of the organizational infrastructure, this thread of the preservation web is vital to ensure that heritage is preserved for the future. We need staff with a whole new awareness and skill sets in order to build, strengthen, and adapt the strands of this broader web holistically and strategically.
A recent symposium on preservation education, coordinated by the LOC, highlighted the interconnections and the need for change:

We must find effective ways to balance the crucial need for digital preservation and access against the need to address other deteriorating collections. Preventive conservation, innovative training approaches, knowledge of a broad range of materials, and multi-cultural stewardship issues must all play roles. Many models of education and training, however, remain focused on earlier conventions for preservation and conservation. (LOC, 2008: 5)

In the educational arena, recent literature has identified the need for more integrated curricula and training courses that connect both traditional and digital preservation so that new generations of preservation managers have the skills to effectively navigate and interconnect the preservation threads across both worlds (Harvey, 2010; Meyer, 2009: 11).

8 Summary: An interconnected approach to preservation management

In summary, digital preservation management has moved from a narrow path of an initial emphasis on technological issues to broader understanding of resourcing and organizational issues. Internationally, the trend has moved to a risk management framework, a framework that embeds Conway’s familiar concepts of longevity, choice, quality, and access, and which is applicable across the digital and physical worlds.

Effective digital preservation management for now and for the future requires an awareness of the broader social and political framework, together with an awareness of dynamic interrelationships between digital and traditional physical preservation.

For India, with its extraordinary manuscript heritage and digitized collections, there is an opportunity to maximize its digital preservation initiatives by linking with the preservation of the physical originals.

Effective preservation management for India and the whole world requires a holistic understanding of each and every strategy or thread. It requires the ability to flexibly re-align and maximize the interconnections between digital and physical preservation, informed by a risk management perspective.

Ultimately, it requires a profound understanding of the endlessly woven preservation web, so that ‘the cradle of past activity’ will be:

…preserved by the management of collective knowing,
and add another thread spun,
a wider web, a growing cosmos.

It connects us all across time and space.

Acknowledgements

While the opinions expressed in this paper are entirely my own, I would like to acknowledge the following for their professional support:

Mr Andrew Durham, Director, Artlab Australia
Dr HK Kaul, Director, DELNET
Dr Sangeeta Kaul, Network Manager, DELNET
Ms Sue Lewis, Associate Director, State Library of South Australia
Dr Vivek Patkar, Independent Researcher, Mumbai, India
Ms Beth M Robertson, Preservation Manager, State Library of South Australia
Ms Lesley Sharp, Manager ICT Strategy, State Library of South Australia
Mr Alan Smith, Director, State Library of South Australia
The late Professor Arvind C Tikekar, Retired Professor and Head of Department of Library Science, and University Librarian, University of Mumbai
References


Anna Kaushik, PhD.
Deputy Librarian, University of Kota, Kota, Rajasthan
E-mail: drannakaushik@uok.ac.in

Abstract
Cloud computing technology has emerged as a major breakthrough for libraries offering various cloud-based services on web environment, and therefore libraries are adopting this technology for various purposes. In this respect, this study provides perceptions of libraries towards adoption, use, and future perspective of cloud computing technology. The results of this study revealed that most of the libraries were engaged for one year for cloud computing technology, but in future all libraries will be fully equipped with the technology. This technology is used for enhancing library services. Policy/privacy statements are most critical issues for selecting cloud computing vendors. Community and Software as a Services (SaaS) models are widely used for cloud computing. This study will be helpful to find different views and insights of libraries which are connected to the cloud computing technology.

Keywords: Libraries, Cloud computing, Perception, Survey, Amazing technology
1 Introduction

Emergence of web-based technologies opens new paths to spread information rapidly and in variant formats worldwide. Cloud computing technology is a highly scalable and a very efficient computing technology used for clubbing services, and resources through various models on the virtual platforms. Users on the internet can communicate with many servers at the same time. The servers can also exchange information among themselves Hayes (2008). Wikipedia claimed that the concept of cloud computing emerged back to the 1960s when John McCarthy opined, ‘computation may someday be organized as a public utility.’ Chellappa gave the first academic definition of the term Cloud Computing in 1997. Later, in 2007 the term cloud computing came into popularity and was first used in the context when Kevin Kelly opined, ‘eventually we’ll have the inter cloud, the cloud of clouds.’ A good definition of cloud computing is given by Gartner\(^2\) that defines cloud computing as a style of computing where scalable and elastic IT capabilities are provided as a service to multiple customers using internet technologies. NIST (2010) defined cloud computing as a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.\(^3\) Thus, cloud computing is an integration of various computer technologies, including web infrastructure, Web 2.0 and meant other emerging technologies. Cloud computing has a great impact on libraries. Resultant, libraries are adopting cloud computing technology for adding more value into their services and resources and to satisfy the information needs of their respective users with more facilities and flexibilities, such as anywhere and anytime approach to services and resources. There are several examples that set as a paradigm of success of cloud based services, such as OCLC web scale, DuraCloud, Facebook, Amazon, Google-based cloud services, and so on. In spite its qualities, libraries have not completely adopted cloud based services and platforms due to many reasons. Therefore, it is felt that there is a need to carry out a survey on libraries in cloud computing environment in order to identify the issues regarding cloud computing technology and libraries.

2 Method

For executing this study, a survey was conducted using an online questionnaire on various issues connected with libraries and cloud computing, consisting of 11 multiple and single choice questions. This online questionnaire was developed on a free online survey website namely ‘Kwiksurveys’.\(^4\) This online questionnaire was sent to 200 librarians/ in-charge library, deputy librarians and various libraries in India and abroad. In response to above approach, 150 completed questionnaires were received from the different libraries (i.e., academic, public, and special). These questionnaires were analysed from November 4, 2012 to January 4, 2013 using above mentioned online survey tool ‘Kwiksurveys’.

3 Objectives of the Study

The main objectivities of the study are:

- To know how long and why libraries are using cloud computing in their libraries
- To identify the barriers, services, and models of cloud computing connected with libraries

---

\(^1\) http://en.wikipedia.org/wiki/Cloud_computing
\(^2\) http://www.gartner.com/it-glossary/cloud-computing
\(^4\) http://www.kwiksurveys.com/
To get opinions about future development of cloud computing in libraries

4 Literature Review

Cloud computing technology is not a new technology for libraries, but nowadays, this technology has come up with new features and flexibilities as well as environment. Many studies argued to club cloud computing technology into library services and activities in order to get benefits of this amazing technology, and to explore the library services on virtual environment on the web. In this connection, Sultan (2012) argued cloud computing technology in education setting by providing variant aspects that lead education institutions to spread their services and resources on the wide spectrum. Romero (2012) explored the benefits and drawbacks while clubbing cloud computing technology for library automation activities. He also provided guidelines for above purpose. Hofer and Karagiannis (2011) explained cloud computing services by tree taxonomy and comparison. Yang (2012) discussed the cloud computing aspects including its pros and cons compared to library and discovered that cloud computing is both a trend and technology to deliver software and hardware as a service, not as a product. Amazon (Elastic Compute Cloud called Amazon EC2) and other vendors also offer virtual servers for cloud computing and charge customers according to hours, usage, and capacity. Goldner and Brich (2012) inspected the resource sharing phenomena in cloud computing age and suggested that it is real time to think seriously about breaking all the barriers of resources sharing and dramatic changes in technology and formats day by day. Huang and Du (2012) proposed cloud-based services architecture for service chain digital library (SCDL) and resources sharing.

Various studies were focused on the role of librarian in cloud-based scenario and urge to upgrade their knowledge to deliver successful services by using emerging cutting edge technology such as cloud computing. Wale (2011) investigated the trends of advance technology, especially for law libraries movement, towards open access integrated library systems (ILS) and cloud computing technology. Scale (2010) evaluated the role of both cloud computing and web collaboration in imparting information to distance users through libraries. Cohen (2002) stated that librarians are moving towards virtual learning environment (VLE) to link the library services and resources to the users. Rawtani (2012) critically assessed the ways to achieve knowledge management by using cloud computing environment.

Nirmala and Sridaran (2012) surveyed cloud computing issues in depth, at design and implementation levels, and suggested a few solutions for selected issues. Duke et al. (2009) showed that how an academic library collaborated with marketing students to solve the problem of promotion and marketing their reference services. Fernando et al. (2013) surveyed mobile computing related various key issues and discussed different approaches to tackle these issues for the success of mobile computing in future perspectives. Patel et al. (2011) comparatively analysed three types of computing technology, viz., grid computing, cloud computing, and utility computing. Roberts and Himdani (2011) suggested key security measures on the basis of points noticed during reviewing security issues within cloud computing. Yang and Jia (2012) invented data storage auditing methods and a set of protocols for coping the challenges and opportunities related to cloud based services users data storage in cloud computing environment. However, no study was conducted through survey focusing on integration of various issues connected to library services and cloud computing.

5 Results

5.1 Profile of respondents

Figure 1 shows that majority of respondents around 78.6% were librarian/In-charge library. Among them, more than half (69.3%) of the
respondents belong to library profession and remaining 9.3% respondents were not from library and information science area but they were associated with other subjects and working as In-charge of libraries. Second highest, 14% respondents were working as deputy librarian and lowest majority of respondents (7.3%) were assistant librarian.

5.2 Engagement of libraries in cloud computing activities

Out of total 150 libraries, Figure 2 depicted that 37.3% libraries were engaged with cloud computing activities for one year, followed by 24.7% libraries for more than one year, nearly 21.3% for six months, 15.3% for three months, and only 1.3% libraries were using cloud computing for just one month. Hence, most of the libraries are using cloud computing technology since last year or before that. Mavodza (2013) studied the impact of cloud computing on academic library services and stated that the presence of cloud computing technology cannot be avoided in the era of modern information technologies. Hence, libraries are using this technology for putting together user resources and services to store and access information with much flexibility. Mavodza (2013) studied the impact of cloud computing on academic library services and stated that the presence of cloud computing technology cannot be avoided in the era of modern information technologies. Hence, libraries are using this technology for putting together user resources and services to store and access information with much flexibility.

5.3 Most appropriate cloud computing platform/service models for libraries

Several cloud computing service models exist through which cloud based services are delivered to the users. Singh and Veralakshmi (2012) provided a description about the use of cloud computing in libraries at various levels and services, such as platforms-as-a-service (PaaS), infrastructure-as-a-service (IaaS), software as a service (SaaS) to achieve more satisfaction of the users with regard to library services, by using library and information science connected cloud based services as an example. Ahmad et al. (2011) discussed the various Google based cloud computing services for building knowledge management tool in public administration subject, but it mainly focused on Software as a Service (SaaS) service model. Figure 3 demonstrates responses collected regarding most appropriate service models for libraries. It was found that majority of the libraries (44%) used Software as a Services (SaaS) model, 38.7% libraries used Platform as a Services (PaaS) model, 15.3% adopted Infrastructure as a Service (IaaS) model, and about 1.3% and 0.7% libraries used the Storage as a Services (STaaS) and Desktop as a Services (DaaS) models, respectively, but Security as a Services (SEaaS), Test environment as a Services (TEaaS) and API as a Services (APIaaS) were not found
appropriate service models for libraries. This means that large number of libraries use SaaS, PaaS, and IaaS models in contrast to other service models.

5.4 Reasons for using cloud computing in libraries

Figure 4 analysed the reasons for using cloud computing in libraries. Around 38% libraries used cloud computing for increasing the efficiencies of library services, 22.7% used it for making change in service deliveries, 20% used it to attract users, 16.7% for cost saving, and almost 2.7% used cloud computing for resources optimization. Similarly, Goldner (2010) defined that how cloud computing is different from other computing technologies. He described that cloud computing technology can benefit libraries in three main areas, i.e., technology, data, and

5.5 Barriers in adopting cloud computing in libraries

Figure 5 depicts the barriers encountered during adoption of cloud computing technology in the libraries. The most critical barrier was found to be security issues (12.9%), followed by reliability and legal issues (12.9%). Feuerlicht et al. (2011), also examined the status of different barriers in

![Figure 3: Appropriate cloud computing service models for libraries](image-url)

![Figure 4: Reasons for using cloud computing in libraries](image-url)

![Figure 5: Barrier in adopting cloud computing in libraries](image-url)
cloud computing adoption. Aside these two, five other important barriers were also identified, viz., dependence on external issues (10.8%), performance issues (10.2%), bandwidth issues (9.9%), lack of relevant issues (9.6%), loss of control (9.2%), and high cost (8.7%). Almost 3.3% have not heard about the cloud computing technology.

5.6 Types of cloud-based services currently used by the libraries

Cloud computing offers various cloud-based services on the web. Figure 6 demonstrates various types of cloud based services used by the different libraries.

Jordan’s study (2011) urged to combine the cloud computing technology with library services by giving examples of Online Computer Library Centre (OCLC) cloud based services. From figure 6 it can be seen that majority of libraries are using DuraCloud (11.3%), followed by Dropbox (10.4%), YouTube (9.7%), OCLC cloud (8.9%), Amazon cloud (8.7%), and Google related cloud services (8.5%), respectively. Apart from these services, social networking websites such as Flickr (7.8%), Facebook (7.5%), and Twitter (6.8%) are also used by the libraries for connecting the users with their services. Other cloud based services like V cloud/VM ware, Nebula, and Open Nebula are least used by libraries. DuraCloud services offer very popular and tested open source software, viz., Dspace and Fedora, which are extensively used in building digital library.

5.7 Library Services Governing through Cloud Computing Tools and Technologies

Figure 7 clearly shows that maximum libraries (12%) use cloud computing technology for building digital library as many cloud based software are available on Internet for this purpose. Studies by Pandya (2012), and Bansode and Pujar (2012) claimed that DuraCloud is used for building digital libraries. Besides this, 11.6% libraries use cloud computing technology for marketing, 11.5% for library automation, 11.4% for collaboration and communication respectively, and 11.3% libraries use this technology for storage, 10.6% libraries clubbed cataloguing and 9.3% clubbed resources with cloud computing technology. Very few libraries (5.5%) used cloud computing for news and updates and 5.1% use it to maintain statistics. This means that largest number of libraries use cloud based services for developing digital library and for marketing purpose.

5.8 Most appropriate cloud computing deployment model for libraries

Figure 8 shows the various deployment models used in cloud based services. A large number of libraries used Infrastructure as a Service (IaaS) (11.7%), followed by Platform as a Service (PaaS) (11.4%), Database as a Service (DaaS) (11.2%), Software as a Service (SaaS) (11.1%), and Cloud Management and Monitoring (11%)

![Figure 6: Cloud-based services used by libraries](image-url)
Libraries (43.3%) relied on community cloud deployment model developed by a specific community. About 26% libraries said that hybrid cloud deployment model is appropriate for their respective libraries. A marginal difference was noted in two deployment models namely private (16%) and public (14.7%), whilst no interest was observed for federated clouds form various vendors.

5.9 Most appropriate key characteristics for cloud computing vendor selection

Selection of appropriate cloud computing services for a library is a typical task owing to various hidden charges, characteristics, policies, terms, and conditions of vendors. In this respect, Truitt (2009) discussed the issue of ownership of data in cloud computing environment. Therefore, it is necessary to ask a question about key characteristics for selecting cloud based service vendors. Figure 9 depicts that majority of the libraries (44%) were concerned with policy/privacy statements which is an essential part of reliable cloud-based service adoption. Around 20% mentioned physical location of the cloud as a point for vendor selection, 18% considered number of clients, and 14.7% and 10% libraries considered reputation and company size, respectively, for selecting cloud vendors.

5.10 Perception towards future use of cloud computing in libraries

Sasikala (2011) described the future implications of cloud computing technology in different sectors such as higher education, IT sectors (Government and private), industries, and other organizations. She said that these organizations will benefit in multi-dimensional ways such as cost reduction, increased storage capacity, high automation, flexibility, and more mobility. Also, IT will be allowed to shift focus. While asking about the perception towards future use of cloud computing technology in the libraries, very interesting responses were received from libraries (Figure10). Almost 33.3% libraries, i.e., more than quarter but less than half, said that cloud computing will be used fully in future, whereas 28% libraries responded as rarely, and 21% libraries partially agreed with the future use of cloud computing in the libraries. About 19.2% libraries could not decide or are not sure about the use of cloud computing in libraries in future.
5.11 Steps needed to augment cloud computing in libraries

Figure 11 shows steps preferred by various libraries to augment cloud computing in libraries. Almost 52.7% libraries selected “all the above” option that combined three options, viz., appropriate infrastructure development, change in organization culture, and core competency development of LIS professionals. Liu and Cai (2013) proposed strategies for systems librarians towards shifting to the cloud computing and suggested that systems librarians must upgrade their knowledge and skills to meet the new demands of the changing technologies. It is interesting to note that around 10.7%, 8.1%, and 16% libraries selected appropriate infrastructure development, change in organization culture, and core competency development of LIS professionals respectively for augmentation of cloud computing in libraries. Apart from this, 12.7% libraries chose “none of the above” option.

6 Discussions

It can be seen from figure 1 that majority of respondents are librarians who are associated with library and information science profession and working in their respective libraries including academic, special, and public libraries. Majority of the librarians belong to academic libraries from India. Figure 2 showed that libraries are keen in adopting and using cutting edge technologies such as cloud computing in order to enhance their services effectively and to satisfy the information needs with much flexibility. It is needed that these libraries should set a paradigm for other libraries so that libraries which are not yet engaged with cloud computing can adopt cloud computing in their library services. Many service models emerged in cloud computing, but few were used in libraries because of lack of fully technical skills in LIS professionals. Hence, there is scope for LIS professionals to develop their technical skills in full manner, do diligent study of this technology and its other interfaces before using it in the library, and search possibilities to use other service models for library services on regular basis. It is clear from figure 4 that majority of libraries use cloud computing to increase their efficiency in services. This practice is very helpful to deliver effective services in libraries. Figure 5 depicted that only three barriers, i.e., security, reliability, and legal are the main barriers, among ten barriers mentioned in this study, for adopting cloud computing in libraries.
libraries. These results showed that libraries have not yet overcome these barriers. Therefore, it is real time for libraries to think seriously and take necessary action to cope these barriers up to maximum level. As seen from figure 6 that majority of libraries are using DuraCloud, Dropbox, and Facebook cloud-based services compared to other incorporated cloud-based services. Three cloud-based services have proved their significance and library and information science community greatly became familiar with these tools. Branch (2012) also discussed the benefits of workflows of cloud computing by using an example of Ex Libris. Thus, enough opportunities are available for cloud-based service providers to prove their significance in terms of delivery other library services in cloud-based environment with lot many flexibilities. On other the hand, role of LIS professionals become more critical with the advent of cutting edge technologies to make successful delivery of library services. Therefore, it is suggested that LIS professionals should well verse themselves in technical knowledge of these types of cutting edge technologies such as cloud computing and others. As seen from figure 7, majority of library use cloud computing technology for developing digital library and marketing purpose that are very essential tools for imparting information, and attracting and connecting to target audience. But very few libraries used cloud computing for news and updates, to maintain statistics, and others. However, there is wide scope available for libraries to club other library services with cloud computing for effective disseminating of library services with no cost. Figure 8 shows that most of the libraries used community and hybrid based deployment models indicating a community power that may help in achieving common goals for a specific group. A mixture of two or more cloud-based services including public, private, and others were also used by libraries. As seen from figure 9 that most of libraries first look for terms and conditions provided by cloud computing vendor rather than other vendor characteristics while making use of cloud-based services. It is clear from figure 10 that most of the libraries agreed that cloud computing will be used fully in the libraries in future, it means that cloud computing in libraries will provide more flexibilities and connect the library services extensively in future. Aleshin (2012) urged to pay proper attention towards adopting cloud computing services in the libraries, thus making the cloud libraries in real sense. Therefore, it is the prime duty of the cloud service vendors to generate new cloud-based services for libraries with trustworthiness and ease of use. On the other hand, libraries also look for more possibilities to use cloud computing technology into their services. It is clear from figure 11 that majority of libraries opted combination of three steps, viz., appropriate infrastructure development, change in organization culture, and core competency development of LIS professionals to augment cloud computing in libraries. Sasikala (2013) discussed various issues associated with cloud computing technology and said that cloud computing is a huge leap towards green computing and sustainable computing with an enormous bright future. Hence, it is suggested that libraries should critically examine the factors for augmenting cloud computing in order to include this technology in libraries with full swing.

7 Conclusion
This study provides various aspects such as generalization, adoption, effectiveness, and future possibilities of cloud computing within different libraries. Perceptions received from variant libraries against questions asked for this study showed that most of the libraries are interested in using cloud-based services for enhancing their library services by using various service models. Still issues related to privacy, legal, and security have not resolved fully within libraries that act as barriers for exploring reliable and trustworthy cloud-based services through various libraries. Hence, it is time for libraries to
think seriously about overcoming these barriers and to establish cloud-based library services with full reliability. It is suggested that a well-defined SLA covering security, legal, and reliability issues should be clearly and fairly framed as per requirement of libraries and should be signed by libraries prior adopting and becoming part of cloud computing. However, role of LIS professionals is more critical in providing successful delivery of library services to their users on the cloud computing environment as this technology is changing drastically. Therefore, it is suggested that LIS professionals should develop their technical skills and competencies towards cloud computing technology and strengthen the service area as per user’s needs in order to deliver effective cloud-based library services with many flexibilities as per changing scenario of cloud computing environment in future perspective.

References


Cross-Institutional Cooperation on a Shared Bit Repository

Eld Zierau  
The Royal Library of Denmark, PO Box 2149, DK – 1016 Copenhagen K  
E-mail: elzi@kb.dk

Ulla Bøgvad Kejser  
The Royal Library of Denmark, PO Box 2149, DK – 1016 Copenhagen K  
E-mail: ubk@kb.dk

Abstract
This paper explores how independent institutions, such as archives and libraries, can cooperate on managing a shared bit repository with bit preservation in order to use their resources for preservation in a more cost-effective way. It uses the OAIS Reference Model to provide a framework for systematically analysing the technical and organizational requirements of institutions for a remote bit repository. Instead of viewing a bit repository simply as Archival Storage for the institutions’ repositories, we argue for viewing it as consisting of a subset of functions from all entities defined by the OAIS Reference Model. The work is motivated by and used in a current Danish feasibility study for establishing a national bit repository. The study revealed that depending on their missions and the collections they hold, the institutions have varying requirements, such as for bit safety, accessibility, and confidentiality. This study further revealed that requirements for the level of bit safety must be supplemented by risk analysis, which needs to involve elements of the architecture; for example, the number of copies and how independence between the copies is ensured. The paper describes bit repository architecture and its strengths in being flexible in order to offer differentiated services with respect to, among other things, bit safety and cost. Furthermore, the challenges in formulating various aspects, such as risk requirements, are described.

Keywords: OAIS Reference Model, Bit preservation, Preservation level, Risk analysis, Bit repository
1 Introduction

There is a growing awareness that operation and management of digital preservation systems require ongoing resources and highly specialized knowledge. As a result, institutions seek ways of outsourcing or sharing the responsibility for these activities in order to use their resources for digital preservation in a more cost-effective way, and potentially benefit from economies of scale. One obvious area to explore in this context is bit preservation, because the requirements for ensuring that bits remain intact and accessible are relatively well understood compared to functional (logical) preservation, i.e., ensuring that the bits remain understandable and usable. In practice there are already organizations that offer bit preservation services; for example, OCLC Digital Archive\(^1\) and Iron Mountain.\(^2\) Other examples of organizations that offer bit preservation solutions, but also some functional preservation, are Kopal\(^3\) and LOCKSS.\(^4\)

Along these lines, the Danish Ministry of Culture has funded a project to investigate the feasibility of a joint bit repository for the national archives, libraries, and museums in Denmark. The project is driven by The Danish National Archives, The Royal Library, and The State and University Library, which are also envisioned to be the stakeholders of the bit repository, together with other institutions with long-term preservation needs. The aim is to design a common system that will provide secure and large-scale means of ingesting, storing, auditing, and accessing bits, while the participating institutions retain responsibilities related to the logic of the content. Thus, institutions will remain in charge of all structuring and packaging of data and metadata, and for selecting appropriate preservation strategies. This is, for example, modelled in a Fedora\(^5\) based system at The State and University Library, which however still needs bit preservation for its objects.

At first glance, setting requirements for a shared bit repository may seem to be a simple question of setting up common interfaces at the ingest-storage and storage-access operations. However, an analysis of the stakeholders’ requirements revealed that one of the challenges in setting up a common bit repository is that the institutions have substantially different requirements when it comes to preserving bits. The requirements differ according to their mission and the collections (data sources) they hold, as well as national and international legislation, such as copyright laws, and archive and personal data protection acts. Examples are requirements for specific hardware in order to protect data or lower costs, and requirements for fast online access, while others may be stored on off-line media. Collections may also vary with respect to their perceived value. Digitally born e-books may for example have a higher value than digital copies of printed books, because the latter may be re-digitized if the digital copies are damaged or lost (Rieger, 2008: 42). Therefore, institutions may also be willing to accept a lower bit safety level for the collection of digitized books. These service levels could be documented within the metadata standard PREMIS, which has an entity termed “preservation level” for describing possible preservation services and the context in which these apply (PREMIS, 2012: 33–38). There are many challenges to meet differentiated requirements in one system. For example, can confidential data, even if encrypted, be stored together with other data, such as web data, which will be processed for statistics?

Another example is how to allow and make secure deletion or overwriting of data from one

---

1 Online Computer Library Center (OCLC) Digital Archive http://www.oclc.org/digitalarchive/default.htm
2 Iron Mountain http://www.ironmountain.com/digital/vfs/
3 Kopal Long-Term Digital Information Archive http://kopal.langzeitarchivierung.de/
4 Lots of Copies Keep Stuff Safe (LOCKSS) http://www.lockss.org/lockss/Home
5 Fedora http://fedora-commons.org/
source, in case it is stored together with data from another source that must remain unaltered at all times.

This paper provides a systematic framework for analysing these rather complex requirements using the OAIS Reference Model (CCSDS, 2012). We propose the usage of an OAIS-style view to describe the interfaces between participating institutions and the bit repository. This analysis highlights that you cannot equate the functionality of a bit repository with that of the OAIS functional entity Archival Storage. It shows that subsets of functions from all OAIS functional entities are required, which is why we denote it; a shared bit repository' instead of just a storage facility. The paper then presents the architecture for a Danish national bit repository which must support multiple institutions with differentiated services; for example, bit integrity, confidentiality, accessibility, and data processing. This includes a description of the challenges in specifying requirements, as in bit safety. Finally, we discuss and conclude the results and point to future work.

2 Analysis of Requirements Based on the OAIS Model

The Danish institutions strive to be OAIS compliant, and it is therefore an important requirement that the bit repository is OAIS compliant as well. The OAIS Model has proven useful for discussing issues related to long-term preservation and for analysing repository systems. As illustrated in figure 1, OAIS is structured around six main functional entities — Ingest, Archival Storage, Data Management, Administration, Preservation Planning, and Access; each of these consists of a series of functions.

Section 6 ‘Archive Interoperability’ in the OAIS standard discusses cooperation among multiple OAIS archives. It includes an example of how the functional entities Archival Storage and Data Management can be shared by standardizing the interfaces ingest-storage and access-storage operations where MANAGEMENT is set in charge of agreements made between the archives. A similar design would immediately seem to be an appropriate concept for analysing requirements for a shared bit repository. However, more functions than the above mentioned interfaces and those described under Archival Storage need to come into play. Archival Storage receives storage requests and AIPs from Ingest, and selects media, prepares volumes, and returns a storage confirmation, including an identifier. Archival Storage also conforms to special levels of service or security measures. However, these operations within Archival Storage depend on input from other functional entities: Ingest may indicate the required data utilization frequency (media type) via the storage request. Administration provides storage management policies and disaster recovery policies, and via Preservation Planning, it also provides recommendations on system evolution and media migration. Likewise,
Data Management is indirectly required for managing identifiers (tokens), and possibly audit trail. This shows that Archival Storage is actually interrelated with a subset of functions from all functional entities in OAIS.

We therefore propose to perceive the bit repository as a subset of a full OAIS. We propose to view the bit repository (BR) as embedded within the Archival Storage functional entity of each of the institutions’ repositories (IR) as illustrated in figure 2. We denote this OAIS-style view as the IR-BR model. We will show that the IR-BR model will help in analysing the interfaces and describe the interoperability between multiple institutions’ repositories and the bit repository, and determine which of the two layers the requirements belong to.

It is important to notice that IR-Archival Storage does not assume that an IR-AIP is stored as one digital object. As illustrated in figure 3, an IR-AIP produced from an IR-SIP can consist of more digital objects, i.e., BR-SIPs. Each BR-SIP could, for instance, be representations of file components, metadata, etc. It is the responsibility of the IR-Data Management to keep track of the relations between the stored...
BR-SIPs and their identification information for eventual access.

In order to analyse the IR-BR model in OAIS terms, we need to look more closely at the interfaces between IR-Ingest and BR-Ingest, and IR-Access and BR-Access, and how these influence the way the OAIS functional entities are broken down into functions. The flow between these interfaces is illustrated in Figure 4.

IR-Ingest functions are all executed within the IR. However, when an IR-AIP is transferred to IR-Archival Storage, i.e., ingested in the BR, it takes a slightly different path in the OAIS-style view than if the BR was just Archival Storage. Here, it runs via the BR-Ingest functions before it ends in BR-Archival Storage. Likewise, the receipt for accepted data and completed storage is returned to the IR, as the BR acts as an OAIS-compliant bit Archival Storage. Thus, IR-Ingest receives the storage confirmation from BR-Ingest. Note that BR-Ingest/Generate AIP function is relatively simple since there is no logic attached to the BR-SIP except for identification information and possible audit trail documentation (i.e., no representation information is needed since we only look at bit streams regardless of their interpretations).

Similarly, in IR-Access, all functions involved are executed within the IR, except again at the interface between IR-Access and BR-Access. Thus the IR-Access/Generate DIP function does not retrieve the IR-AIP directly, but goes via the BR-Access function. Corresponding functions are run at the BR level.

Data Management functions are administrated within the IR and the BR, respectively. If the institution wants information from the BR-Data Management to be part of the IR-Data Management, for example, audit trail information, then this information must pass through BR-MANAGEMENT.

Likewise, Administration functions are managed within the IR and the BR. However, there is one exception for IR-Administration, namely, the receipt of reports on operational statistics from IR-Archival Storage/Manage Storage Hierarchy function, which under IR-Ingest and IR-Access, goes via the BR. Furthermore, as already described, the requirements for storage management and disaster recovery policies set up by BR-Administration are coordinated with IR-Administration via MANAGEMENT.

Preservation Planning is split between the IR and the BR. IR-Preservation Planning, among other things, covers the function Monitor Technology regarding data format migration, while media migration is placed in the BR-

![Figure 4](image-url)
Preservation Planning/Monitor Technology function. Note that this also means that all activities related to functional preservation are solely up to the IR.

Looking at the detailed aspects of sharing a BR, the BR-\textit{Ingest} must be able to receive BR-\textit{SIPs} from different IRs. Furthermore, the individual IRs must be able to query BR-\textit{SIPs} as a BR-\textit{DIP} at a later stage, which means that the BR-\textit{SIPs} must, as a minimum, contain the bits to be stored, an identification of the data source, and a unique identifier within the IR. Note that these requirements may also be needed for a single IR, if it preserves more data sources. As a result the BR-\textit{Ingest/Receive Submission} function is required to distinguish which disjunctive sources the BR-\textit{SIPs} comes from, and the associated requirements for storing the digital object.

Generally speaking, all requirements which institutions may have are based on directions from IR-\textit{MANAGEMENT} and dealt with by IR-\textit{Administration}. From the BR perspective, IR-\textit{Administration} represents BR-\textit{MANAGEMENT}. Thus, it is at the interface between IR-\textit{Administration} and BR-\textit{Administration} that the mapping of the requirements for the BR takes place.

3 Requirements for the Architecture for a National Bit Repository

In this section, we describe how the OAIS Model has impacted the architecture of the shared national bit repository (DK-BR). However, in order to understand the context, we will start with a short description of the most important requirements for a DK-BR. Next we describe the overall architecture and argue for the choices made based on experiences. Seen in this context, we describe relevant issues pointed out by the OAIS analysis. Additionally, we will describe the remaining challenges in expressing requirements for bit safety in general, and determining the right abstraction level.

3.1 Requirements

The DK-BR architecture is based on an analysis of stakeholders’ requirements, the OAIS analysis, the partners’ own experiences with running bit preservation systems, and on looking at similar international institutions.

Existing Danish bit repositories like the one used for web archiving as well as the DK-BR all build on general considerations for active bit preservation, i.e., the number of copies, the degree of independence between copies, and the audit frequency of bit integrity (Rosenthal, 2010). The audit frequency denotes the frequency of ongoing checksum control, which requires at least three checksums for the stored data in order to compare and, if differences are detected, identify by voting which copy is erroneous and should be replaced (Christensen, 2005).

From the requirements analysis, it was clear that a very flexible architecture was needed in order to meet varied requirements at different costs. For example, there were requirements for different levels of bit safety, where the number of copies had direct influence on cost. The same applies for other requirements, such as access, where there were expensive requirements for having a copy stored on a distributed platform in order to enable processing for statistics on web data; for example, for linguistic analysis for researchers. This processing was required within the BR, since the large quantity of data makes it economically infeasible and technically hard to execute it outside the BR. Another example is that The Danish National Archives has one copy of data offline on optical media (DVD) because of infrequent access requirements and because this media is relatively cheap and useful for securing data confidentiality.

Note also that requirements may conflict; e.g., requirements for confidentiality and bit safety. While more copies increase bit safety, the risk of compromising confidentiality rises as well.
3.2 A Flexible architecture to meet various requirements

The architecture for the DK-BR has similarities to systems such as LOCKSS and DuraCloud. However, the DK-BR differs especially and has its strengths in the way it meets differentiated requirements for bit safety and costs. A further strength is that it avoids having a central master index for the BR contents, which minimizes the risk of single-point-of-failure. The overall DK-BR architecture is illustrated in figure 5.

The replica units form the basic storage for data. Each replica unit consists of a specific media and infrastructure, giving it specific characteristics which are used when an agreement of service levels (SLA) is defined for a BR-user. A replica unit is defined as a representation of a copy of data that can be seen and analysed as an individual unit at the abstract level. To achieve independence between copies, the replica units have no knowledge of each other. The depicted replica units are only example illustrations of replica units representing different characteristics in the form of media and physical locations and thus, implicitly, their costs. Other characteristics could relate to the media (e.g., non-magnetic, throughput rate, and bit error), organization, etc. The replica units can internally perform preservation actions, such as media migrations, as long as they still fulfil the specified characteristics.

The client applications handle user-related functions, such as ingest, access, management information, and corrective actions, whereas services for example can be, the bit integrity audits (checksum checks) and monitoring. Client applications and services are configured to serve the individual SLAs. More information can be found in Jurik et al. (2012) or on http://BitRepository.org.

Finally, the coordination layer coordinates communication between user applications and replica units. Its main functionality can be seen as being a data-bus for the communication.

![Figure 5: Overall Architecture of the DK-BR](image-url)
The architecture is flexible to meet different SLAs for users by offering different combinations of replica units that best serve the user’s requirements. The architecture supports representation of different replica units which can be combined to meet special requirements; for example, for access speed, or processing, or to meet cost requirements, or to prevent specific risks. In other words, the selection of replica units to an SLA is based on an analysis of the individual replica unit characteristics and the combination of replica unit characteristics’ ability to match the user’s requirements. For example, the distance between replica units will influence the risk of two copies being destroyed at the same time. The diversity can be in many aspects — technological (hardware and software, online and offline media, optical and magnetic media, employment of different storage techniques, and using different vendors), geographical, organizational, or data related (check sums based on different checksum algorithms, different characteristics expressing policies of read only storage, or no processing). Such considerations were used in the existing bit repository for Danish web material in Netarkivet (Christensen, 2005), but not as broadly as in the DK-BR.

Another difference is that a replica unit may only contain a representation of a copy of the data in the form of a derived checksum. Storing a checksum does not make sense on its own, but it can provide one voter in a storage solution with bit integrity checks, but with fewer copies, and thus more economical. In a risk assessment of the archival part of the Netarkivet, economy was an argument for having only two replica units with full copies and one with a derived checksum to obtain three voters. It is however important to consider where the derived checksum is stored. This was evident from an assessment of the Netarkivet using DRAMBORA, a tool for internal audit of digital repositories (DCC and DPE, 2007).

It revealed that the checksum copy was positioned at the same physical location as one of the replica units, which meant that a fire or explosion could result in the loss of two out of three voters.

The architecture avoids single-point-of-failure by avoiding a central master index of the contents of the BR. Instead, it is based on cached information which can be updated or verified by information from the replica units. Thus, there is no single point that is indispensable in the calculation of a master index. The architecture also avoids single-point-of-failure by having duplicated parallel instances of coordination layers and user applications, although this is not depicted in figure 5. It also meets requirements to scalability and uptime since they are designed to be replaceable.

Other risk preventing actions are taken into account, including risk preventing actions from standards required for the Danish institutions, called DS 484, which correspond to ISO/IEC 27001:2005 (ISO/IEC, 2005). This involves, for example, restricted access to the physical servers, and separation of production and test environments.

3.3 OAIS View

Taking an OAIS view, all requirements from the IRs are, in practice, administrated by BR-Administration, and translated into specific requirements for the different OAIS functions. Thus, specific requirements for Archival Storage, such as selection of storage media, throughput rate, and bit error rate, are handled in BR-Administration by specifying a SLA defining appropriate combinations of replica units and their characteristics.

BR-Ingest and BR-Access only operate on handling data in the form of bit sequences, leaving these functions close to the OAIS Archival Storage functions ‘Receive Data’ and ‘Provide Data’. However, BR-Ingest must provide BR-Data Management with unique identification
of bit sequences and the source to which the bit streams belong.

The more complex aspect of *Data Management* is the audit trail. In the DK-BR architecture, audit trails will mainly be provided by individual replica units, and it must be considered in a final design — whether, for instance, information about media migration must adhere to AIPs, or be part of the system management information. Additionally, requirements for how replica units must preserve audit trails must be stated.

As argued earlier, the BR-*Preservation Planning* will take place within the BR. In the DK-BR architecture with several independent replica units, it actually takes place within each replica unit, which leaves technology watch for media to the individual replica unit. In order to assure bit safety, the institutions have to rely on documentation from the BR-*Administration* regarding ID’s, check sums, and possibly, audit trails, i.e., it will be reported via BR-*Administration* information to the IR-*Administration*, and passed to the IR-*Preservation Planning*, where actions may be initiated in case of alerts. Since IR-*Preservation Planning* cannot directly require that a replica unit, for example, performs media migration, the IR may instead change to another replica unit within the BR, which better fulfils its requirements. It is also noteworthy that requirements from IR-*Preservation Planning* may influence other requirements for the BR, such as requirements for file format migration. The reason is that such a migration on large data volumes can require large CPU power for processing directly on the stored data, since capacity limits, such as bandwidth, can make it practically impossible to do it outside the repository via access and re-ingest.

The organization of DK-BR will influence the implementation of BR-*Administration* and the reporting functions needed via or in parallel with the client applications, but it is not yet decided how this organization will look for the DK-BR.

### 3.4 Special requirements specification and specification level

Requirements for bit safety, confidentiality, political, and economical requirements are hard to express explicitly without involving elements within the architecture. There are many challenges in specifying and controlling such requirements, which means that there will always be an element of trust between the IR and the BR.

It is generally challenging to express risks by quantitative elements because it can result in an oversimplified view. The requirements for bit safety are especially hard to express due to the lack of scientific ways to measure, verify, and control this (Rosenthal, 2010). As part of the work with the DK-BR architecture, we tried to design a risk model. At the replica unit level, risks are indicated in terms of replica unit characteristics which are made as explicit as possible. At the BR level, risks are indicated in terms of the combinations and variations between replica units in order to express the independence between copies/replica units. Also, the number of copies and the bit audit frequency must be taken into account. The final risk model could either be based on statistics or by simulations, as it was done for the Netarkivet (Christensen, 2005). Additionally, aspects such as single-point-of-failure and aspects from the Audit and Certification of Trustworthy Digital Repositories checklist (ISO 16363, 2012) should be incorporated. This work was not finalized within the pre-study, but a number of related challenges were identified.

The level of abstraction specifying requirements can also be a challenge. When Netarkivet had a hardware migration after five years in production, it appeared that the original requirements were too specific, including exact location of a replica unit, and which specific Operating System to use. The original idea was to require independence between replica units — in the form of distance and different operating systems.
systems (OS) — but this was not put in as requirements, and not in terms of exact distances between replica units and how much the two Operating Systems must differ. Consequently, an abstraction level must be made which avoids dependencies of the ongoing evolution, or requirements should be regularly adjusted to match present time.

4 Discussion
Our analysis of OAIS highlights that you cannot equate the functionality of a BR with that of the OAIS functional entity Archival Storage, and this led to the IR-BR model. While there is no conflict in viewing the BR as a subset of an OAIS archive, the OAIS-style view, where the BR is embedded in IR-Archival Storage, may be subject to discussion. The reason is that some of the functions which communicate across the interfaces between the IR and the BR have to be redefined in order to take into account the fact that the data and information flow takes a different path. However, the OAIS standard states that actual implementations may break out functionality differently; thus, in our opinion, we did not compromise the OAIS concept by these redefinitions.

The IR-BR model was useful for identifying interfaces, and for understanding the flow of data and documentation between IR and BR. In particular, the model helped to understand how the audit trail should be managed. It also showed that we need to consider the nature of the digital object identifiers. Envisioning having a BR for the next 100 years or more, it may not be feasible to have historic information related to the source, such as information relating to a no longer existing institution, hidden in the identifiers (Zierau and Johansen, 2008). Therefore, it should be considered to have UUIDs for digital objects in the BR, along with the data source and identifier given by the IR.

If we look at other variants of preservation system like LOCKSS or Kopal, the split between their system and the customers is placed differently compared to the one presented in this paper. LOCKSS, for example, also includes some functional preservation, whereas we looked at a BR without any knowledge of the digital objects apart from identification and audit trails. Kopal is also described in terms of OAIS, but leaves validation and packaging outside the OAIS repository. The question is whether our IR-BR model can be used on these cases as well. It has not been part of our work to attempt this, but we would expect that the same model could help identifying locations of functionality, interfaces, and services, as we have done for a BR in this paper.

Although the DK-BR has a flexible architecture, the final possibilities for making SLAs with users will depend on the number and variation of replica units that are implemented within the DK-BR. Furthermore, the way which various requirements contradict others, especially looking at confidentiality, integrity, and costs, can mean limits on the possibilities. No matter how well the requirements are expressed, the success of separating bit preservation and sharing or outsourcing these activities will depend on the ability of the BR to demonstrate trustworthiness. Thus, specification of requirements should be extended by audit and certification initiatives, such as the Audit and Certification of Trustworthy Digital Repositories, which extends to the OAIS standard.

Furthermore, without sanctions or escalation procedures, it is not possible to enforce that the requirements are met.

5 Conclusions and Future Work
We conclude that it is helpful for institutions setting up differentiated requirements for a shared bit repository to view it as a subset of a full OAIS. In this sense, the bit repository becomes a repository within the institutions’ repositories, as described in the IR-BR model. This analysis helped reveal locations of functionality and set up the requirements. Besides, we found that requirements must specify
how audit trails within the BR are managed and possibly sent to the IR. Also, we found that BR must provide BR-SIP identification and source information.

For the DK-BR we found that there are significant differences in requirements for different data sources. In order to make it economically beneficial to share such a BR, it is important to look for similarities in order to find the areas where economic gains can be achieved, and define architecture that meets differentiated requirements.

In the work with the DK-BR architecture, we found that there is still a need for applying a risk model in order to express issues, such as bit safety and confidentiality, as explicit requirements. However, whether they are expressed via a risk model or directly, the abstraction level of the parameters or requirements must be done with care in order to ensure the bit preservation, and avoid complicating evolution through factors such as migration or organizational changes over time. Both risk model and abstraction level for requirements specification could be subjects for further studies.

When expressing requirements for a BR, there will always be an element of trust involved, even if they are expressed via a risk model or other means. Therefore, future work will include articulation of requirements and BR specifications in relation to certification and audit initiatives. This will also contribute towards allowing balancing of the requirements against the costs.

Acknowledgements
Fruitful information and discussions have come from The Royal Library’s involvement in the Danish feasibility study for a national bit repository. Also, valuable input from discussions with Andreas Rauber from Vienna University of Technology has contributed to the paper.

References


Promoting Online Databases/Electronic Resources: A Practical Experience

Pradip Das
Deputy Librarian, SVKM’s Narsee Monjee Institute of Management Studies, Mukesh Patel School of Technology Management and Engineering, Vile Parle (West), Mumbai – 400056, India
E-mail: pradipbhadreswardas@gmail.com; pradip_das_55@rediffmail.com

Abstract
Online Databases/Electronic resources (E-resources) are becoming increasingly essential for libraries of all types and sizes. The paper is from the practical experience at SVKM’s NMIMS (A Deemed to be University), Mumbai. Highlighting the advantages of e-resources, this paper addresses the promotion of electronic information in the group of institutions of SVKM. A few suggestions are also put forward for promoting Online Databases/E-resources in library which include creating motivation, use of blackboard, newsletter, orientation programmes, OPAC, institutional website, etc.

Keywords: E-resources, Online databases, E-publishing
1 Introduction

The explosion of e-journals and other online resources has created many challenges for libraries. Use of general search engines is increasing, and the relevance of the library to users is being questioned. Social Media Link is playing a vital role in society. Libraries are not going away from the Social Media link. Thus, now-a-days libraries do need to focus on emerging trends, tech or otherwise, to be nimble and viable. Libraries need better marketing strategies for making the user crazy to use the resources available in the library and to reinvigorate the brand. Libraries need to serve all users. Libraries offer the users materials and access of their liking. Librarians can be guides, counsellors, and teachers. It is said that “to promote E-resources, librarians must inform and educate users through electronic resource promotion”. In our country now-a-days, librarians promote their electronic resources in a variety of ways. Promoting electronic resources is now a necessary task for librarians and libraries. To be successful in promoting Online Databases/E-resources, librarians should properly and systematically study their available Online Databases/E-resources. They must first understand what such an undertaking entails. This may include conducting user studies, working creatively and collaboratively, and using many lines of communication to disseminate the message.

Now-a-days, users would find daunting array of resources that might include hundreds of databases and thousands of electronic journals. Online Databases/E-resources have enabled libraries to improve services in a variety of ways. Since 5 years SVKM’s NMIMS group libraries are spending a large share of their budgets to acquire or gain access to Online Databases/E-resources from publishers and vendors. We have subscribed 31 Online Databases/E-resources (a list is given in Appendix 1 as we present to the users). We have thus taken some actions to promote the Online Databases/E-resources.

2 Advantages of E-resources

The major advantages of e-resources are:

- Technical support available electronically and via telephone
- Resource available 24/7
- Remote access to authorized users
- Platform independent
- Stable and durable URLs for electronic journals
- Training/instruction alternatives for limited port resources
- No limits to fair use of information (e.g., printing, emailing)
- Adequate system response (speed, downtimes, etc.)
- Assurance of easy and permanent access to archival electronic material

3 Promoting Online Databases/E-resources

There are a number of different ways by which users can be attracted. Best practices from our organization show a large number of such options that have been elaborated upon in the following sections.

3.1 Orientation programme

Lori Neilson, firm librarian at Parsons Behle Latimer in Salt Lake City, has found frequent vendor training a valuable promotional tool. “Having our reps come on a weekly basis to work with our attorneys and paralegals really helps promote electronic services,” she says.

Showing users how they will benefit from the resources—or what’s in it for them—adds significant mileage to electronic resource promotion. As users understand the payback they will receive from a resource, they are more likely to remember it and use it.

Following the above idea, we are giving formal trainings to all users, either led by vendors or librarians. Trainings give us a double dose of promotion: once to announce the training and
Once during the training. We have seen that orientation is very popular among students and helps the library get back some of its heavy investment in online databases/e-resources.

The programmes aim to cover:
- How to search information through Internet
- How to see the information from library webpage and Online Databases/E-resources available with us
- What are the facilities users can get from the available databases/e-resources
- Books and databases/e-resources alert to users to inform them about the new documents
- The keys (Users ID and Password) to search the e-resources databases

3.2 Rethinking about a collection strategy
We have made a survey on users’ interest and as per their interest we are providing reading material as well as Online Databases/E-resources. We have eased our library accessibility. We are trying to make collection as per their requirement.

3.3 Developing motivation
Motivating users is an important Human Resources skill of a librarian. Leadership quality and good presentation skill of the librarian may help to motivate the users. We have taken the following steps for motivating the users:
- We are motivating our students to use the available Online Databases/E-resources as much as possible. For that we are having refresher orientation programme on the use of Online Databases/E-resources and their content. We are telling users about the advantages of the use of Online Databases/E-resources in the orientation programme. In the orientation librarian’s behaviour should be calm towards the students.
- We also have an orientation programme for the faculties and request them to give students day to day assignments which require text materials as well as reference books that need to be extensively studied from the e-resources.
- Emotional attachment (that every user feels comfortable and happy to come to library due the cooperativeness of library staff), hope for the acceptance to all.
- We have also proposed to have some kind of appreciation to users. In this method we will give award to the ten most potential users of Online Databases/E-resources.

3.4 Displaying on flaps
In our group of libraries we have made flaps which are being displayed in front of the library gate. Students are getting first-hand view from those flaps and coming with their query about the use and other access details to librarian.

3.5 Distribution of brochure
We have made an E-resource Brochure and User Manual to be kept with librarian and at the time of class room orientation we are distributing it to all 1st year students. The brochure has complete information about all the E-resources subscribed by SVKM & NMIMS Institutions. It includes details about the information available in each E-resource. It also describes the Libsys OPAC (Online Public Access Catalogue)

3.6 OPAC
Users/readers can access library OPAC (Online Public Access Catalogue) through URL given to them. Users have to put their User ID and Password to get access to OPAC. The students are given the Student No. as Users ID and faculties/staffs can put their employee code as User ID. We have given details about how to access in OPAC. Users can search by their search term/keyword and follow the instructions. There are basic, advance and additional search options. Users can also browse the documents by:
- Author
- Title
- Subject, etc.
There is an option for logged in school. An alphabetical list of periodicals is available. Users can browse by clicking on the particular title. Details of issue/volume can be browsed by clicking the particular title of the journal and users can easily access the same. Users can also see list of all the books and periodicals added in last one month. Here users can find the following options:

- **Check Out**: Users can get the list of books due on his/her name
- **History**: The list of books referred by the users from the library may be traced out since last one year
- **Reservation**: Can get list of reservations they made.
- **Recommendation**: Users can recommend the books online for library which are not there in our collection.

### 3.7 Users ID and password information

During a particular time interval we used to change the User ID and Password wherever possible. For that, we are preparing a table of details which is kept available with the librarian. The librarians are giving the service as demanded by the users. Librarian also sends the same information to all faculty, class representatives, and students’ representatives periodically. The periodic interval is kept as one month. Every month we are sending the information as “Quick References to Users Name and Password to all Online Databases/E-resources” (Appendix 2: only the sample table is given)

### 3.8 Facilitating through blackboard

We have given the details of available Online Databases/E-resources in our integrated learning system “blackboard”. In blackboard we also put the syllabus, question papers, schedule, etc. Through Blackboard students also can get detailed information about the online lectures, video lectures, etc. Blackboard can be accessed by the users from their desk (even at home) through their respective Users ID and password. We have given the link of all the Online Databases/E-resources in the blackboard. It gives them facilities to access certain Online Databases/E-resources which are not restricted to in campus only.

### 3.9 Arranging presentation from the respective e-resources provider/database vendor

Often users lie outside the library’s grasp. They do not read the library newsletter or blog. They do not visit the home page. They do not go to library trainings or seek help at the reference desk. How does a library promote electronic resources to the elusive user? Getting outside the library box and into theirs is essential. We can take help outside of our library to promote e-resources to faculty. We have approached our Dean and the Faculty Development Committee to jointly sponsor presentation on electronic resources. A regular presentation made a part of our regular series of faculty events could be a better idea to promote electronic resources. We can have at least two such presentation. At first we can see how many users were there. In the second presentation we can have presentation to faculty members who were unable to attend.

We are arranging full scale presentation as and when we are getting new databases. Even for refreshing on the same renewal databases we are arranging the presentation from the supplier. This is giving a good impact to users. The turn up of users is also remarkable as vendor would inform us more and more information regarding the Online Databases/E-resources.

### 3.10 Newsletter

Newsletters, for example, are already a popular mode of communication and promotion in libraries across the country. We got a remarkable response from the publication in newsletter. In that we have highlighted the availability and facilities of Online Databases/E-resources in our library.
3.11 Promoting through institutional home page

In our Institutional home page, in the section of the library home page we provide all the information of availability of Online Databases/E-resources. It provides both, a functional and a promotional element with regard to Online Databases/E-resources. We have even attached the links wherever possible. It will give the user to see the brief content of the available Online Databases/E-resources in our library.

3.12 Proactive reference and the knowledgeable librarian

Daily reference interactions provide abundant promotional opportunities. A good idea to promote it is to tell the users about Online Databases/E-resources when dealing with them. It has been found if you repeatedly tell the users about something, they will at least try to see the same. When they will see the same, if their required information is available in the Online Databases/E-resources, they will obviously be addicted to those Online Databases/E-resources as we can see in case of Social Network addiction. As Anderson suggests, informed librarians are essential for reference-based promotion. In today’s climate of ever-increasing electronic resources, however, it becomes a constant battle for reference librarians to keep updated.

One librarian can be designated to keep the rest informed. Librarian should attempt to stay as informed as possible through online discussion forums, blogs, promotional materials, vendor contacts, and regular use of our e-resources. When the librarian would learn things that would be of value to reference and faculty services librarians, he should pass them on through e-mails or brief trainings. As we all stay more informed, we are better able to help our patrons and promote our e-resources.

3.13 Effective timing

Effective timing of electronic resource promotion also takes advantage of events for which users already feel some interest. Linking such events to electronic resources creates an interest in the electronic resource itself. Promoting one of your e-resource every couple of weeks is a good idea. We promote Gartner online when students are getting ready for exams and IEL online when they’re writing seminar papers. Users who got benefits will pass the information for possible help with final exams or seminar papers and this creates immediate interest.

4 Various Ways to Promote the Use of E-resources

- Invite experts for a specified period giving them local hospitality, office space, and computing facility for encouraging the users.
- Arrange lectures or seek technical support during his/her stay at the host institute.
- Welcome other LIS professionals in Mumbai to interact with the expert at the host institute during his/her stay to make the use of e-resource more interesting as well as interacting with the other users.
- Some libraries, however, have jettisoned the traditional newsletter for the increasingly popular blog as a means of promoting electronic resources. “One of the reasons we started the ‘Law Dawg Blawg’ was because we needed a better way to promote e-resources,” says Diane Murley, reference/web services librarian and a main contributor to Southern Illinois University Law Library’s blog. “Using the blog works better than the library’s white board easel or the law school’s newsletter because we can use as much space as we need to describe the resource, and we can include links. The blog is searchable, so researchers can find an e-resource recommendation, research tip, or other posting when they need it.”
- Reference interactions: It can provide countless opportunities to show practical benefits. Users come with particular questions of importance to them and many of these can be answered through the use of electronic
resources. At time of giving services the reference librarian may take the opportunity to point out which e-resource the reference librarian would use to answer the question. While answering a reference enquiry with an electronic resource naturally demonstrates resource’s benefit. The librarians can also point out other benefits that might not be so obvious to the user. If reference librarian can make the users understood about the free services of electronic resources, it may get a chance to be popular.

- Another technique for creating memorable e-resource promotion is to link electronic resources to something of interest to the user. Many libraries organize their electronic resources by subject area alphabetically. Organization by subject capitalizes on users’ interests. When students write seminar papers they are drawn to a subject area of interest in a way that they would not be to an unfamiliar electronic resource. Once inside the subject page, users find e-resources they may not have known about or cared about previously, but that now are of interest. Libraries could create a Web page about these events with links to relevant information contained in electronic resources. As users examine information that interests them, they will also become familiar with what e-resources are available and the type of information they contain.

5 My Suggestion to Promote the Online Databases/E-Resources in Library

From the experience of our group of Institutions we have found some important points which can promote the Online Databases/E-resources:

- Communicating about the latest availability of Online Databases/E-resources to the users often and everywhere. This can be done through the library e-resources in newsletter, blogs, formal trainings, and through library’s home page.

- We can take advantage of daily reference interaction. We have to dedicate one library professional who will regularly inform the users about the newest e-resource and its facilities. We can have an evaluation system for e-resources. There must be a provision for proper evaluation of the users’ feedback about the e-resources. For this we can get the help of Library Committee (Librarian and HODs of all the branches of studies).

- We must allocate suitable/adequate grant for modernization of library which should have latest WiFi connection and that must be of sufficient number.

- We can have ‘creative repetition’ in such a way that users will feel that the information on e-resources is new one. It may be just like “old wine in new bottle”. A regularly organized user awareness and training programme is the key to promote the Online Databases/E-resources. While most librarians already promote their electronic resources to some degree, many have found that their approach is only mildly successful. Librarian should try to hit their users over the heads. Repetition is certainly essential when dealing with a busy user group. However, presenting the same message through the same medium may annoy rather than inform. Creative repetition suggests the use of various methods to get across the same message. In other words, we have to keep hitting our users over the heads, but with different objects and at different angles.

- As we have distributed the E-resource Brochure and User manual, we can include a reference tip in each issue of our newsletter if separate brochure distribution is not possible.

- Outgoing nature of library staffs may also help in this regard. We have to go beyond library services. We may publish some newsletters or bulletins that interest the users. In that newsletters or bulletins we can discuss about the Online Databases/E-resources.
Regular classroom orientation on the use of Online Databases/E-resources is the best option to promote. In that we have to discuss about the benefits of Online Databases/E-resources. We have to show users how they will be benefitted from using the Online Databases/E-resources.

Faculty cooperation: We can request the faculties to give the users/students such assignments which require extensive study from e-resources.

Librarian should take the initiative to convince the authorities to allocate suitable/adequate grant for subscribing Online Databases/E-resources as well as for library modernization.

Librarians must organize free full text online search facility from various publishers when there is a question of budgetary allotment.

Library staff must be trained to increase awareness of e-resources available in library among users through Intranet and Internet. For this librarian has to play the major role. Librarian can educate one staff and that staff may educate the other under the supervision of librarian.

As soon as there is a new addition to Online Databases/E-resources into libraries, the user orientation programmes should be implemented immediately.

Budgetary resources should be increased gradually for strengthening digital resources in libraries.

Finally, the library should conduct regular evaluations and assessments to determine the effectiveness of the digital resources (Online Databases/E-resources) in meeting information needs of the users.

6 Conclusion
The most unfortunate part for librarians is that even if they buy electronic resources, users do not just come and use them effectively. Like any product, electronic resources must be promoted for its effective usage and also number of librarians should be increased across the country. As we implement these ideas and others, users will be better informed about the available Online Databases/E-resources; effective electronic resource usage will increase. A good time sense and faculty cooperation will prove to be the best way to promote Online Databases/E-resources in a library.

References


Appendix A1: Online Databases/E-resources are available in our library

*E-books: Pearson e-books Perpetual Access Membership*

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject</th>
<th>No. of accessible titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Civil Engineering</td>
<td>48</td>
</tr>
<tr>
<td>2</td>
<td>Computer Science and IT</td>
<td>186</td>
</tr>
<tr>
<td>3</td>
<td>Electrical and Electronic Telecommunication</td>
<td>58</td>
</tr>
<tr>
<td>4</td>
<td>Mechanical Engineering</td>
<td>26</td>
</tr>
<tr>
<td>5</td>
<td>Physics</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>Chemistry</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>Mathematics</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>Bio Science</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>361</strong></td>
</tr>
</tbody>
</table>

*E-library Access Membership: All Subjects*

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject</th>
<th>No. of accessible titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>All Subjects</td>
<td>70,000</td>
</tr>
</tbody>
</table>

With the existing publishers newly added titles from:
- Ashgate Publishing Group
- Brill Academic Publisher
- Harvard University Press
- Johns Hopkins University
- Oxford University Press
- University of Chicago Press
McGraw-Hill E-books: Access Engineering (14 major areas of engineering)
Total no. of e-books accessible to MPSTME ≈ 70,375 Titles

E-Journal
In addition to hard copy of journal subscription, we have access to the following e-journals’ databases:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Title of Databases</th>
<th>No. of Subjects</th>
<th>Coverage</th>
<th>No. of Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Proquest</td>
<td>160</td>
<td>Peer Reviewed journals, Report, Economic Intelligent Unit, Dissertation and Thesis, SSRN Papers, Annual Reports/Case Study</td>
<td>682+ more than 30,000 full text.</td>
</tr>
<tr>
<td>2.</td>
<td>EBSCO</td>
<td></td>
<td></td>
<td>More than 15,000</td>
</tr>
<tr>
<td>3.</td>
<td>JSTOR</td>
<td>3 Broader Subject</td>
<td>Humanities, Social Science, and Science</td>
<td>1,000</td>
</tr>
<tr>
<td>4.</td>
<td>Elsevier Science Direct</td>
<td>2 + 1</td>
<td>Engineering and Computer + Pharmaceutical</td>
<td>275 full text journals on Computer and Engineering and 93 full text on Pharmacology</td>
</tr>
<tr>
<td>5.</td>
<td>IEEE/IEL Online</td>
<td>3</td>
<td>Electrical Engineering, Computer Science, IT and Electronics: Articles + Conference Proceedings, and Technical Standards. From 1893</td>
<td>2 Million articles From 12,000 Publications</td>
</tr>
<tr>
<td>8.</td>
<td>ASME (American Society of Mechanical Engineers)</td>
<td>1</td>
<td>Mechanical Engineering</td>
<td>More than 1,000 Journals and conference proceedings</td>
</tr>
<tr>
<td>9.</td>
<td>J-Gate</td>
<td>All Engs.</td>
<td>All branches of Engineering</td>
<td>27,482 E-Journals</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Title of Databases</td>
<td>No. of Subjects</td>
<td>Coverage</td>
<td>No. of Coverage</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------------------</td>
<td>----------------</td>
<td>-----------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>11.</td>
<td>Capitaline</td>
<td>1</td>
<td>Market Research</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>ISI Emerging Markets (EMIS)</td>
<td>1</td>
<td>Market Research</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>CEIC Data</td>
<td>22 Countries</td>
<td>Statistical Data</td>
<td>4,24,000 data series</td>
</tr>
<tr>
<td>17.</td>
<td>MvXenius</td>
<td>1</td>
<td>Market Research</td>
<td>9,000 listed and unlisted companies under 200 sectors</td>
</tr>
<tr>
<td>18.</td>
<td>TAM</td>
<td>1</td>
<td>Media Research</td>
<td>8150 TV Homes</td>
</tr>
<tr>
<td>19.</td>
<td>Manupatra</td>
<td>1</td>
<td>Law</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>WestLaw India</td>
<td>1</td>
<td>Law</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Gartner</td>
<td>3</td>
<td>IT, Computer Science, Electronics</td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>CRISIL</td>
<td>1</td>
<td>Market Research</td>
<td>69 Industries</td>
</tr>
<tr>
<td>23.</td>
<td>Cabell’s Directory</td>
<td>All engs.</td>
<td>Research and Development</td>
<td>4,000 Journals</td>
</tr>
<tr>
<td>25.</td>
<td>ASCE</td>
<td>1</td>
<td>CIVIL 34 Journals + Backtitle from 1983.</td>
<td>34 Journals</td>
</tr>
<tr>
<td>26.</td>
<td>TVADINDX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>E-library</td>
<td>7</td>
<td>Most of the branches of Engineering</td>
<td>70,000 titles</td>
</tr>
<tr>
<td>29.</td>
<td>McGraw-Hill</td>
<td>14</td>
<td>All Engineering</td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>Frost and Sullivan</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>LexisNexis</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sr. No. 1 to 10 and 25 ➔ Electronic/Engineering Journal Database.
Sr. No. 11 to 17 ➔ Company Database
Sr. No. 18, 26, 31 ➔ Marketing Database
Sr. No. 19 to 20 ➔ Law Database
Sr. No. 21 ➔ IT Info Database
Sr. No. 22  ➔  Research Database  
Sr. No. 23  ➔  Directory  
Sr. No. 24  ➔  Case Studies Database  
Sr. No. 27-29  ➔  E-books

Total no. of e-journals accessible to users ≈ 25034

**Appendix 2: Quick Reference to Username and Password of Online Databases Subscribed by other Institutions of SVKMs**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Database</th>
<th>School</th>
<th>URL</th>
<th>User Name</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Online Public Access Catalogue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Libsys OPAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electronic Journal Databases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>ProQuest Central</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>JSTOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Science Direct</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>IEEE (AICTE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4a.</td>
<td>IEL Online</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Springer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>ASME (AICTE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>J-Gate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Science Direct</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>ASTMDL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Bentham Science Publishers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Company Databases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>CMIE-Prowess 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Capital Market</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>ISI Emerging Markets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>CEIC Database</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>MvXenius</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Law Databases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Manupatra</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>West Law</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>TVADINDX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Database</td>
<td>School</td>
<td>URL</td>
<td>User Name</td>
<td>Password</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------</td>
<td>-------------</td>
<td>-----------</td>
<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td>19.</td>
<td>Television Audience Measurement (TAM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Gartner Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>E-library</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>Pearson E-book</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>McGraw-Hill Research Database</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>CRISIL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>Frost and Sullivan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>LexisNexis Directory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>Cabell’s Directory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>EBSCO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>ASME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>ASCE (Full)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>ASCE (AICTE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: All these databases can be accessed through Blackboard also.
Evaluation of Indian Institutes of Management Library Websites in India

Margam Madhusudhan, PhD.
Assistant Professor, Department of Library and Information Science, University of Delhi, Delhi – 110007, India; E-mail: madhumargam@gmail.com

Noushad Ahmed
Librarian, Ambedkar Institute of Advanced Communication, Technology and Research (AIACT&R), Geeta Colony, Delhi – 110031; E-mail: ahmed_noshad@yahoo.com

Abstract
This study evaluates multimedia, content, and user-interface features of select library websites of Indian Institutes of Management (IIMs) in India and uses a mixed-method approach that combines both quantitative and qualitative analyses of IIM library websites evaluation with the help of a specially designed checklist. The various features of the websites of six IIM libraries — IIM-Ahmedabad, IIM-Bangalore, IIM-Calcutta, IIM-Indore, IIM-Kozhikode, and IIM-Lucknow — are evaluated. The qualitative part of the checklist contains 11 features pertaining to the homepages of the IIM library websites, which serves as a recording device for descriptive data and quantitative. The quantitative part of checklist contains 135 dichotomous questions relating to various evaluation aspects of multimedia, content, and user-interface features. A quantitative five-point rating scale was designed to provide a meaningful numerical rating for each individual feature of the IIM library websites and rank them based on features.

This paper attempts to show that study websites are lagging behind in exploiting the full potential of the multimedia features — particularly, audio and video features — as well as instructional tools, currency, and Web/Library 2.0 features. Findings show that many of the study IIM library websites in India are ranked above average mainly providing general information of the library and their services. The study website with the highest score is for IIM-Lucknow with 65.92 per cent (89 out of 135) and the least scored study website belongs to IIM-Bangalore with 42.96 per cent (58/135). These findings open the door to librarians to explore the possibilities of communication, promotion, text responses, and catalogue access via mobile technology with the help of library websites. It is hoped that study libraries will attend to this lacunae and soon develop more interactive and up-to-date dynamic content, Web 2.0 and Web 3.0-based features, instant messaging (IM) reference services, virtual library tours, floor maps, online library calendar, FAQs, bulletin boards, discussion forums, Listserve, web counter, effective searching features, etc.

Keywords: Library Websites, Evaluation, IIM libraries, India
1 Introduction

The library is only one of many institutions that is changing in the face of technological advances. With its wealth of data and information-sharing capabilities, the web is a natural complement to traditional library services. Libraries of various Indian Institutes of Management (IIMs) in India have extensive experience in providing web-based library services and a great deal of effort has been invested in transforming useful information and services into web access. They have dynamically created websites and ensured frequent improvements on the design, content, and layout of the websites, due to “huge competition from commercial information providers such as Google, Amazon and other similar products” (Detlor and Lewis, 2006). Additionally, the information-seeking behaviour of users has also been changing so rapidly (Raju and Harinarayana, 2010). Since the users of IIM library websites are primarily post-graduate students and faculty of institutions of higher learning, the IIM library websites are providing access to valuable electronic resources (e-resources) for management education and research purpose to their target audience. The users are allowed to access the library’s e-resources across the network in a manner that is independent of location or time. As a result of these developments, IIMs have been in a more privileged position to set up websites than other types of libraries in India. Their presence on the web implies the desire of IIMs to provide better and more services to their web generation users. Although many resources have been committed to create and maintain IIM library websites, there have been little efforts in evaluating these sites. The challenge of evaluating resources is as old as information itself and the web brings new and sometimes complicated twists to the process. A review of literature has shown that at present IIM library websites either exclusively use quantitative analyses or use qualitative methods. There is lack of a mixed-method approach for IIM library websites evaluation and integration of the results. However, so far in-depth studies relating to evaluation of these websites have not been undertaken except for content evaluation on the basis of limited evaluation criteria. Traditional evaluation criteria endorsed and applied by librarians over the years are not sufficient for the evaluation of today’s hypermedia website environment. There are many other criteria, which can be used to evaluate the management library websites.

2 Review of Related Literature

 Evaluations of the content and usability of websites have been conducted over the years and for many domains. However, most of them are exclusively quantitative and pertain to academic libraries. For instance, Csir (1996) evaluated websites that covered only seven criteria, namely, accuracy, currency, relevancy, structure, presentation, maintenance, and other features. Clausen (1999) developed an evaluation form for Danish academic libraries with 40 criteria clubbed into six categories. These were: (i) design and structure, (ii) quality of information, (iii) links and navigation, (iv) aesthetic impression, (v) miscellaneous, and (vi) general assessment. A noteworthy study by Clyde (1999) analysed the contents of the websites of 50 public and school library websites. Kirkwood (2000) examines 75 sites, focusing on five general aspects of the sites — organization, terminology, instructional elements, and integration of resources across formats, and annotations. Lee and Teh (2001) developed a comprehensive evaluation checklist more pertinent to the content and design of academic library websites in Malaysia. The qualitative part was limited to 12 items, which are: (i) general information of the library, (ii) library OPACs, (iii) links to other internet resources, (iv) interactive services, (v) internal electronic database services, (vi) external electronic database services,
(vii) languages used in website, (viii) technical services, (ix) instructional supports, (x) other important features, (xi) loading time of images, and (xii) marketing techniques. In the quantitative part was limited to eighty-nine aspects of content, structure and navigation, pertaining to accountability for content, accuracy, authority and design control, currency, instructional support, marketing, objectivity, reliability of links and information.

A similar study was conducted by Smith (2001) which developed criteria for the evaluation of government websites with the help of previous studies of Eschenfelder et al. (1997). The said criteria were divided into two groups: (i) Information content criteria (orientation to website, content, currency, metadata: facilitates retrieval, navigation, services, accuracy, privacy, and external recognition (ways in which the value of the site is recognised by users, wider Internet community), and (ii) ease of use criteria. Osorio (2001) identified trends in the design and content of home pages for websites of science and engineering libraries. The checklist covers design characteristics and hypertext links. Santorio (2002) designed comprehensive criteria for evaluating the quality of library websites. The checklist was in three sections which first examined the library’s internal Internet resources, i.e., (i) how the library presents its services; (ii) the provision of electronic catalogues known as OPACs, and (iii) the availability of full-text resources. The second area of evaluation covers library links to external websites. Finally, it looks at website graphics display and technical functions.

Dragulanescu (2002) proposed some basic criteria to evaluate website quality. The checklist covers accuracy, authority, coverage, currentness, density, interactivity, objectivity, and promptness. Tan and Tung (2003) developed website evaluation criteria using the Repertory Grid Technique, which covers 14 meta-categories: graphics usage, text usage, content/information, updates, layout/space usage, presentation of information, headlines, categorization of information, navigation, colour use, visual appearance, advertisements/pop-ups/animation, downloading time, and establishing website’s identity. Sasikala (2003) developed evaluation criteria in terms of structure and content to check the validity of information, coverage, currency, appropriateness, links, and structure of the website. In 2004, Clyde (2004) revisited the sites she examined in 1996 and 1999 to identify the changes in school library websites. The longitudinal analysis identified that offering electronic resources, searching library OPAC, and links to other OPACs were some of the key changes found in school library websites Clyde (2004). In a similar study by Jurkowski (2004) focused on the content of school library websites. The study suggested that links to web resources, policies, mission statements, library news, and print journal lists should be made available in all school library websites. Yates (2005) mentions in his study that accessibility and usability are the yardsticks to examine the inhibitors and methods of evaluating the sites.

The design, usability, and functionality of the website are critical if libraries are to continue providing essential services to their patrons in a timely and efficient manner Carol (2005). Sieverts et al. (2005) investigated websites for a range of facilities including presence of a search engine, accessibility, and method of displaying information. Ease of use was considered the most important criterion. The survey found that most libraries offer access to online databases via their websites. Michalec (2006) highlights the design and content of art library websites in the USA. The checklist includes address, telephone number, hours of operations, about the library resources, mission statement, descriptions of services, subject resources, library online catalog, subscription databases and journals, current links, and updated access of websites.

Poll (2007) discusses the quality of a library website with different aspects, such as contents,
language, structure, design, navigation, and accessibility. In a similar study by Raju and Harinarayana (2008), 30 library websites of top science universities around the world were studied for their design features with special reference to usability. Various parameters such as optimizing user experience, link back to Homepage, colour link behaviour, navigability, and multimedia features have been studied for the websites. Hasan and Abuelrub (2008) propose general criteria for evaluating the quality of any website. The dimensions of the criteria are content quality, design quality, organization quality, and user-friendly quality. These dimensions, together with their comprehensive indicators and checklist, can be used by web designers and developers to create quality websites to improve the electronic service and then the image of any organization on the Internet.

Mustafa and Al-Zoua’bi (2008) identified 23 website usability evaluations of Jordanian academic websites and classified them into five categories: (i) content, organization, and readability; (ii) navigation and links; (iii) user-interface design; (iv) performance and effectiveness; and (v) educational information. Kumar et al. (2009) evaluated the contents and usability of six IIM library websites. The checklist covers general information available on the website, information about library collection, services, non-book materials and e-resources, links, search, and retrieval interface. Surprisingly, this checklist pays no attention to qualitative aspects, multimedia features, other content-related features, web/library 2.0 features, accuracy, relevancy, organization, structure, coverage, intended audience, links, maintenance, usability features, and quantitative ranking of IIM library websites.

Raju and Harinarayana (2010) performed a content analysis of 135 Indian university library websites. The study examines 46 variables (content features) divided into five categories: (i) library general information, (ii) library services information, (iii) library resources information, (iv) Web 2.0 features, and (v) other content-related features. Konnur, Rajani, and Madhusudhan (2010) evaluated the content and quality of academic library websites in five areas: (i) currency, accuracy, and relevance; (ii) organization and structure; (iii) presentation; (iv) maintenance; and (v) different features of the library website. Savina Kirilova (2010) evaluated the content and design of academic library websites of Bulgaria is carried out on the basis of their function, design, originality, professionalism, and efficiency. The quantitative analysis includes areas such as basic information about the library (address, contact information, opening hours, history); access to the electronic resources (OPAC, other electronic information); guides to Internet resources (free access or subscribe databases); and synchronous and asynchronous online reference services (e-mail, web forms, chat sessions, audio and video conferencing). Tsai, Chou, and Lai (2010) developed relevant criteria for assessing national park websites. The website quality evaluation criteria include navigation, speed, links, relevancy, richness, currency, attractiveness, security, personalization, and responsiveness.

Furthermore, previous studies have identified relatively new and second generation websites and offered suggestions on how to build websites to achieve best results in Web 2.0 features and also to find out those Web 2.0 features which have been integrated in IIM library websites. Maness (2006) addressed issues related to how Web 2.0 technologies such as asynchronous messaging and streaming media, blogs, wikis, social networks, tagging, RSS feeds, and mash-ups might intimate changes in how libraries provide access to their collections. Studies Boeninger; Fichter (2006) have looked at the use of Wikis as a knowledge base for libraries. Harinarayana, Kumbar, and Pradeep (2007) have studied the application of RSS in 30 libraries. Nguyen (2008) reports that among Web 2.0 technologies, utilized by Australasian university libraries, RSS was the most widely applied technology while instant messaging was the least used technology.
On the other hand, the presence of Web 2.0 applications was found to be associated with the overall quality, and in particular, service quality of library websites Chua and Goha (2010). Very recently, a survey of the application of new generation web technology, social media, and Web 2.0 features among the technological university library websites in south India has been reported by Preedip and Kumar (2011). This study found that by using current web development technologies and deploying for mainstream web information services is not widespread as web information services are yet to take off widely in academic libraries. Thus, a majority of university libraries are found to be working in the conventional library settings and the diffusion rate of web information services is relatively low.

Further, Raju and Harinarayana (2010) developed a comprehensive checklist based on the previous checklists. The evaluation approach taken in this study is similar to that of Lee and Teh (2001); Kumar et al. (2009); Raju and Harinarayana (2010); Konnur, Rajani, and Madhusudhan (2010), and Madhusudhan (2012) with major modifications.

2.1 Indian Institutes of Management


3 Objectives of the Study and Methodology

The main objective of this study is to evaluate the websites of IIM libraries in India, in particular to:
- Determine the different features of IIM library websites in India
- Identify the criteria for the evaluation of library websites under study
- Evaluate the study websites with the help of specially designed criteria for verification of validity, reliability, and usefulness
- Compare the different features of IIM library websites under study and rank them based on features

The present study is confined to six IIM library websites in India, i.e., those of IIM-Ahmedabad, IIM-Bangalore, IIM-Calcutta, IIM-Indore, IIM-Kozhikode, and IIM-Lucknow. The selection of the sample was done on the basis of a functional library website facility provided to their respective users at the time of the study. The study aims to evaluate study websites with the help of qualitative and quantitative features manually and investigate how study libraries are adopting multimedia, content, and user-interface features in their library websites making them more user-friendly. Table 1 presents the list of IIM library websites in India with their Universal Resource Locators (URLs).

<table>
<thead>
<tr>
<th>Table 1: IIM library websites in India</th>
<th>URL of the Library</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIM-Ahmedabad (IIM-A), Vikram Sarabhai Library</td>
<td><a href="http://www.iimahd.ernet.in/library/">http://www.iimahd.ernet.in/library/</a></td>
</tr>
<tr>
<td>IIM-Bangalore (IIM-B), Library</td>
<td><a href="http://www.iimb.ernet.in/library">http://www.iimb.ernet.in/library</a></td>
</tr>
<tr>
<td>IIM-Calcutta (IIM-C) B C Roy Memorial Library</td>
<td><a href="http://library.iimc.ac.in/">http://library.iimc.ac.in/</a></td>
</tr>
<tr>
<td>IIM-Indore (IIM-I), Library</td>
<td><a href="http://www.iimidr.ac.in/iimi/pages/institute/iimi-library.php">http://www.iimidr.ac.in/iimi/pages/institute/iimi-library.php</a></td>
</tr>
<tr>
<td>IIM-Kozhikode (IIM-K), Library and Information Centre</td>
<td><a href="http://www.iimk.ac.in/libportal/index.htm">http://www.iimk.ac.in/libportal/index.htm</a></td>
</tr>
<tr>
<td>IIM-Lucknow (IIM-L), Gyanodaya Library: The Learning Resource Centre</td>
<td><a href="http://www.iiml.ac.in/library.html">http://www.iiml.ac.in/library.html</a></td>
</tr>
</tbody>
</table>
A structured checklist was designed keeping in view of the stated objectives and literature available so as to examine the various qualitative and quantitative features of study library websites. This list comprises 135 dichotomous and open-ended questions, categorized into four main parts, preceded by a Rating Table — Part-I: Technical Description (11 descriptive questions), Part-II: Multimedia Features (18 questions), Part-III: Content (89 questions), and Part-IV: User Interface (28 questions).

4 Data Analysis and Interpretation
The data analysis phase took place from 20 January 2012 to 20 February 2012. Qualitative and quantitative responses were culled out from the evaluation checklist. Each time a cell (i.e., specific feature in the checklist) was checked (marked “√”), one point was assigned to the respective feature of the IIM library website concerned. The score for a system is the total number of cells checked for that library website. Each part has a set of related questions and the responses of the each part and their sub-parts were analysed with the help of Tables III, IV, and V, followed by interpretation of data.

4.1 Qualitative evaluation
The qualitative part of the checklist contains 11 features pertaining to IIM library websites, which serves as a recording device for descriptive data. For the most part, this information is obtained from the homepage of the website (Table 2).

Table 2: Qualitative Evaluation of IIM Library Websites

<table>
<thead>
<tr>
<th>Technical description</th>
<th>IIM-A</th>
<th>IIM-B</th>
<th>IIM-C</th>
<th>IIM-I</th>
<th>IIM-K</th>
<th>IIM-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Name of the IIM</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>2. E-mail</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>3. Fax No.</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>4. Phone No.</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>5. Address</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>6. Type/Genre</td>
<td>ac</td>
<td>ac</td>
<td>ac</td>
<td>ac</td>
<td>ac</td>
<td>ac</td>
</tr>
<tr>
<td>7. Language of site</td>
<td>English</td>
<td>English</td>
<td>English</td>
<td>English</td>
<td>English</td>
<td>English</td>
</tr>
<tr>
<td>9. Browser and Level Required</td>
<td>IE 6.0 and above</td>
<td>IE 6.0 and above</td>
<td>IE 6.0 and above</td>
<td>IE 6.0 and above</td>
<td>IE 6.0 and above</td>
<td>IE 6.0 and above</td>
</tr>
<tr>
<td>10. Language of Site Contents</td>
<td>English</td>
<td>English</td>
<td>English</td>
<td>English</td>
<td>English</td>
<td>English</td>
</tr>
<tr>
<td>11. Other</td>
<td>Scrolling News and Notices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total scores (Max.11) 10/11 (90.90%)  9/11 (81.81%)  9/11 (81.81%)  9/11 (81.81%)  11/11 (100%)  10/11 (90.90%)

Notes: ac = Academic; IIM-A: IIM-Ahmedabad; IIM-B: IIM-Bangalore; IIM-C: IIM-Calcutta; IIM-I: IIM-Indore; IIM-K: IIM-Kozhikode; IIM-L: IIM-Lucknow

World Digital Libraries 6(1): 49–72
main page of all the study websites. Additionally, fax numbers of libraries were also found in 50 per cent of the study websites. Other common features such as academic network, software plug-ins, type of browser, and language of the site are found in all of the study websites. While examining the study websites, the investigator found that streaming and VLC media player features were found in two study websites (IIM-Kozhikode and IIM-L). Today, with the help of the Internet IIM library websites are able to receive not only text or picture messages, but also sound and video clippings. In the study websites, this technology is used to broadcast video lectures as well as host interviews with companies for placement purposes using an Interactive Video Conferencing Lab in IIM-Lucknow.1 Interestingly, scrolling news and notice was found in only one website, i.e., IIM-Kozhikode.

The qualitative analysis part of the checklist does not give any numerical value. Therefore, these values are not considered for final ranking of evaluation of IIM library study websites. However, it is valuable to know the details of the sites for browsing and contacting them for further details.

4.2 Quantitative Evaluation

The quantitative part of checklist contains 135 dichotomous questions to evaluate the websites based on a number of criteria: (i) evaluation of multimedia features such as audio, video, animation features, and graphics/icons/images; (ii) evaluation of content which include general features, library services, library resources, other content related features, Web/Library 2.0 features, currency, accuracy, relevance, organization, structure, coverage, intended audience, links and maintenance, etc., and; (iii) evaluation of the user interface which is related to navigation, searching, advance search technique features, and informative feedback and support of study websites to gather data.

4.2.1 Multimedia features

The complex interactive environment of the Internet hosts a variety of media through which information is communicated. If multimedia features are effective and impressive, users are automatically tempted to use the sites. Hence, it can be stated, ‘the more the multimedia features the better the site will be except the problem of increased size of the site’. However, for purposes of evaluation, 18 multimedia features relating to audio, video, animation, and graphics/icons/images of study websites were identified. The corresponding responses are tabulated in Table 3.

Table 3 reveals that audio files, including music, are an important part of study websites. Of the six websites, only two websites offer audio features. An increasing amount of visual content features is seen these days in many library websites. The study found that only 33.33 per cent of the study websites provided this type of content. Other features such as video icons, description of external video files, and file size of external video files are important considerations which had been incorporated in the 2 out of 6 websites.

Animation refers to a stimulated motion picture depicting movement of drawn objects and makes the website more attractive and useful. Four of the six websites incorporated the animation features. This data clearly indicates that the study websites are very good in animation features. On the other hand, it consumes large space and takes more time to download the features in their homepages.

Graphical features are visual representations of information and present complex information quickly and clearly in the form of signs, buttons, maps, etc. Interestingly, all of the study websites incorporated these features according to content. Surprisingly, none of the study websites offered an indication of file size for external image.

Looking at the total multimedia features of the study websites (Table 3), only two study websites (IIM-Kozhikode and IIM-Lucknow)
Table 3: Multimedia features of IIM library websites

<table>
<thead>
<tr>
<th>S.No</th>
<th>Multimedia features of IIM library websites</th>
<th>Indian Institute of Management library websites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Audio features/ contents</td>
<td>IIM-A</td>
</tr>
<tr>
<td>1.</td>
<td>Are audio features/contents available on the site?</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Are auditory icons clearly labeled?</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Is the textual description of external audio files provided?</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Is the file size of external audio files indicated?</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Video features/ contents</strong></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Are video features/contents available on the site?</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Are video icons clearly labeled?</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Is the description of external video files provided?</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Is the file size of external video files indicated?</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Animation features/ contents</strong></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Are animation features available on the site?</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Is animation used to substrate website content?</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Is animation appropriate to the website?</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Does animation enhance website design?</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Is animation not a distraction to the user?</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Graphics/icon/ images features</strong></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Do the graphics illustrate content?</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Are graphics appropriate to the information content?</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Are icons and other graphical representations used consistently throughout the site?</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Is a textual description of external images provided?</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Is an indication of file size offered for external image?</td>
<td></td>
</tr>
<tr>
<td><strong>Total scores (Max. 18)</strong></td>
<td>09/18</td>
<td>04/18</td>
</tr>
<tr>
<td></td>
<td>(50%)</td>
<td>(22.22%)</td>
</tr>
</tbody>
</table>

Notes: IIM-A: IIM-Ahmedabad; IIM-B: IIM-Bangalore; IIM-C: IIM-Calcutta; IIM-I: IIM-Indore; IIM-K: IIM-Kozhikode; IIM-L: IIM-Lucknow
got highest score, i.e., 94.4 per cent, respectively, followed by IIM-Ahmedabad and IIM-Calcutta (50 per cent), and IIM-Bangalore and IIM-Indore (22.2 per cent). The findings of this part matches with another study conducted by Raju and Harinarayana (2008) which shows that library websites are yet to exploit the advantages of multimedia (interactivity features). It is found from the survey that only 30 per cent of the websites contain video contents. However, this is not the final assessment. The final assessment should take into account all the features of the websites. Therefore, the scores obtained in this table are consolidated with the scores of other tables (means transferred to total score and ranking of IIM library websites in India — Table 6, 1a).

### 4.2.2 Content analysis and evaluation

"Content is the primary consideration in evaluating any referencing source and the quality of the library website is determined mainly by its content. The quality of information relies on the how the information is being managed" (Konnur, Rajani, and Madhusudhan, 2010). Keeping this fact in view, content analysis and evaluation features were carried out more comprehensively with highest points of 89 in the Part-III of the checklist, in the process, the validity and usefulness of the criteria for evaluation of the content of IIM library websites could be established. The content analysis and evaluation of study websites is presented in Table 4.

General information features help users to know the basic information about the library,

<table>
<thead>
<tr>
<th>Table 4: Content features and evaluation</th>
<th>IIM-A</th>
<th>IIM-B</th>
<th>IIM-C</th>
<th>IIM-I</th>
<th>IIM-K</th>
<th>IIM-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>General features</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Contact Information</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2. Opening hours</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3. Staff directory</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Library rules</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5. News and events</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Mission statement</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>7. FAQs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>8. Annual reports</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>9. Floor map</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>10. Newsletter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>11. Web counter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>12. Library history</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>13. Library committee</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Photo gallery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>15. Other information</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Library services offered via website</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Inter library loan/ Document delivery service</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>17. Online instructional tutorials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Citation style guides and tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4: Content features and evaluation

<table>
<thead>
<tr>
<th>Content features and Evaluation</th>
<th>IIM-A</th>
<th>IIM-B</th>
<th>IIM-C</th>
<th>IIM-I</th>
<th>IIM-K</th>
<th>IIM-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. Information literacy</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>20. Plagiarism</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>21. Web search guides/ tips</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>22. New arrival list</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Newspaper clippings</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>24. Photocopying</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>25. Ask a librarian service via e-mail</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>26. Ask a librarian service via online form</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Ask a librarian service via chat (IM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Other services</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Library resources found in the site</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>29. Links to e-journals</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>30. Bibliographic databases</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>31. Subject guides</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>32. Web-based OPAC</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>33. Web based Union Catalogue</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>34. Special collections</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>35. Links to open access resources</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>36. Links to other Web reference sites</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>37. Links to e-books</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>38. Links to institutional repository</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>39. Links to back volumes</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Links to search engines</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Link for library Consortia (e.g., INDEST-AICTE/UGC-Infonet Digital Library Consortia)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>42. Other library resources</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Other content related features</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>43. Book recommendation</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Web master e-mail address</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Link to librarian’s personal homepage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Privacy statement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. Library promotional materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. Library services for faculty</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. Book reviews and other web resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

World Digital Libraries 6(1): 49-72
Table 4: Content features and evaluation

<table>
<thead>
<tr>
<th>Content features and Evaluation</th>
<th>IIM-A</th>
<th>IIM-B</th>
<th>IIM-C</th>
<th>IIM-I</th>
<th>IIM-K</th>
<th>IIM-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>50. Links to subject specialists</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. Remote access information</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52. Information for disabled users</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53. Job opportunities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Web/Library 2.0 features</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54. RSS feeds</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55. Blogs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56. Wikis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57. Social networking sites (Facebook, My Space, Orkut, Twitter, etc.)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58. Social bookmarking and tagging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59. File sharing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60. Image sharing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61. Calendaring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62. Video sharing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63. Collaborative authoring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64. Podcasts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Currency, accuracy, and relevance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65. All the hyperlinks retrieving in the web page?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>66. All the hyperlinks appropriate and relevant for an online reference desk?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>67. Copyright status is clearly stated?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>68. Are dates of update provided on the Home page?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>69. Does each page of site include information about the date of the last update?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>70. Is there any official logo of the organization present on the site?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>71. There are no spelling or grammatical errors found in the website?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Organization and Structure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72. Is the site accessible from different web browsers?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>73. All images/icons/graphics presents when the web page loads?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Table 4: Content features and evaluation

<table>
<thead>
<tr>
<th>Content features and Evaluation</th>
<th>IIM-A</th>
<th>IIM-B</th>
<th>IIM-C</th>
<th>IIM-I</th>
<th>IIM-K</th>
<th>IIM-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>74. Is the content organized according to alphabetical, numerical, chronological, subject etc?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>75. Is the principle of arrangement obvious to the users?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>76. Is the organizational scheme appropriate to the resource?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>77. Is the table of contents or site map present at the sites home page?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>78. Does the site not require proprietary software or password to access the information?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Coverage and Intended audience

| 79. Does actual coverage coincide with the intended mission? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 80. Is the scope and coverage aligned to the need of users? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 81. Is coverage of subject matter exhaustive? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 82. Is there a statement of intended audience is mentioned in the site? Example: Students/Corporate/Enterprisers/Others | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 83. Is the terminology used familiar to the intended audience? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 84. Visitor numbers are mentioned? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Links and Maintenance

| 85. Are the links described in an appropriate way? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 86. Are links clearly labeled? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 87. Are internal links reliable? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 88. Responsibility of the site display is given? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 89. Facility of feedback/comment to the library is available? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

**Total scores (Max. 89)**

<table>
<thead>
<tr>
<th>IIM-A</th>
<th>IIM-B</th>
<th>IIM-C</th>
<th>IIM-I</th>
<th>IIM-K</th>
<th>IIM-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>47/89</td>
<td>36/89</td>
<td>42/89</td>
<td>34/89</td>
<td>46/89</td>
<td>48/89</td>
</tr>
<tr>
<td>(52.80%)</td>
<td>(40.45%)</td>
<td>(47.19%)</td>
<td>(38.20%)</td>
<td>(51.68%)</td>
<td>(53.93%)</td>
</tr>
</tbody>
</table>

Notes: IIM-A: IIM-Ahmedabad; IIM-B: IIM-Bangalore; IIM-C: IIM-Calcutta; IIM-I: IIM-Indore; IIM-K: IIM-Kozhikode; IIM-L: IIM-Lucknow
contact information, working hours, library rules, services, staff, mission statement, and other features offered by the libraries.

Table 4 reveals that contact information and library history were common features of all study websites. On the other hand, there was one library that provided the FAQs (IIM-Kozhikode), annual reports, newsletters, web counter, and library committee features. Other important features such as opening hours of the library (83.33 per cent), floor map (66.66 per cent), and links for staff directory, news and events, and photo gallery features were found in 33.33 per cent of the study websites.

The library rules and mission statement is added in order to provide comprehensive resources and services in support of the research, teaching, and learning needs of the library community and also contents and design of their websites in line with their missions. Only half of the study websites incorporated these features. The findings of this study too correlate with the findings of Jurkowski (2004) and recommend that features such as mission statement, library rules, and library news should be made available in all types of library websites. Library conferences found under other information in only one study website, i.e., IIM-Ahmedabad.

Library services offered via IIM websites vary in form and content, depending on the nature of the institution, its mission, size, and programmes offered. They serve as a window to the World Wide Web.

Table 4 shows that Inter library loan/ document delivery service, plagiarism, and photocopying services were common services found in all the study websites. On the contrary, none of the study websites offered online instructional tutorials, citation style guides, information literacy, web search guides/ tips, newspaper clippings, and Ask-a-Librarian through IM Chat.

It is worth noting that 2 of the 6 libraries provided facilities for Ask-a-Librarian through e-mail and one library through online form.

Another feature of library services was new arrival list found in few study websites (33.33 per cent). Other services such as indexing and abstracting, bibliography and database search services (IIM-Ahmedabad), book requisition, important notifications and photocopying from other libraries (IIM-Calcutta), membership forms and book indent form (IIM-Kozhikode), current contents of periodical, current additions of books and reports, and selective dissemination of information (IIM-Lucknow) were found in many study websites (66.66 per cent).

Library resources in IIM websites varies from one IIM library website to another from simple to complex ones, depending on the existing type of resources, its accessibility and environment. IIM library websites were customized for easy access to the large variety of e-resources and library consortia-based e-resources.

Table 4 reveals that e-journals, e-books, and consortia-based e-resources were common library resources and found in all the study websites. On the contrary, subject guides were uncommon and not found in any of the study websites. Five libraries offered links to bibliographic databases to help students and research scholars in exploring, finding, and organizing their academic/research related articles.

Connecting the web to the Online Public Access Catalogue (OPAC) is a natural and unavoidable goal for libraries today. The OPACs have improved significantly over the years and currently library resources are made accessible remotely through a web-based OPAC via a graphical browser Madhusudhan and Shalini (2011). It is worth noting that 5 of the 6 libraries that provided access to their OPACs through Web interface; however, three of them provided intranet access only. Four libraries provided links to special collections, such as rare journal collections, whereas, two libraries provided links to Union Catalogue of Information and Library Network (INFLIBNET), and also links to other web reference sites and links to institutional repositories.
Only one library (IIM-Kozhikode) provided links to open access resources, back volumes, and search engines. Interestingly, the World Bank e-library, hand books, project reports, theses, micro documents, and access to ACM digital library were some of the notable other library resources found in 66.66 per cent of study websites.

Other content-related features include book recommendation, Web master e-mail address, privacy statement, job opportunities, etc., which enable the website to be more informative and useful to their clientele. One out of the six libraries had incorporated features such as book reviews, Web master e-mail address, and remote access information. on the contrary, a link to the librarian’s personal homepage, library promotional materials, subject specialists, information for disabled users, and job opportunities were uncommon features and not found in any of the study websites.

Table 4 reveals that half of the study websites provided privacy statements, followed by book recommendation feature (33.33 per cent), and library services for faculty (33.33 per cent). Library websites are changing in their content and structure, with the introduction of Web 2.0 features and have integrated it into library websites, such as Really Simple Syndication (RSS) feeds, blogs, Wikis, user tagging sites, instant messaging (IM), social networking sites, etc., to improve the quality of the content.

Table 4 depicts that RSS feeds and social networking sites were the two Web 2.0 tools found in IIM library websites. Of which, one library (IIM-Ahmedabad) implemented RSS feeds for altering users about library news and Facebook for publicizing their library services. The Web 2.0 mantra allows users to be involved in the continuous process of change, providing feedback, and critical evaluation. These bottom–up approaches could inspire and encourage library staff everywhere, but implementing Web 2.0 features in study IIM websites were very meagre.

According to Konnur, Rajani, and Madhusudan (2010), “Currency refers to the timeliness of information and an important consideration of use of information.” A top-ranking criterion is that the date of last update should always be present in home and subpages of the website, otherwise the volume of the audience will dwindle because of obsolete information. None of the study websites provided the last revision of date on any subpages of their websites; however, one study homepage had a last revision date.

The presentation of hypertext links, how a link is defined and included in the text help the users to access the right information. It is noted from Table 4 that all the hyperlinks were relevant, and appropriate to needs of online reference desk in all of the websites. However, it was noted at the time of evaluation that in some libraries, the links were not checked regularly to ensure that they are still active.

Konnur, Rajani, and Madhusudhan (2010), write: “Copyright in relation to electronic information is a complex area and its general considerations are beyond the scope of this research work. However, one consideration in terms of evaluation is the availability of copyright information.” The user may want to re-use textual or graphical materials, such as in a publication or presentation. However, as a basic rule, any information, which is published via the Internet, will be covered by copyright, including images and the text of Web pages. It is therefore useful if the authors or webmasters provide a statement of the copyright ownership of materials and details of how materials should be cited in a publication or attributed to an author, as well as the individual who should be contacted where copyright permission is required. Copyright status and official name or logo of the IIM was clearly found in all of the study websites.

Accuracy generally refers to the correctness of the source of information. In many respects, the need to determine accuracy underpins the whole process of evaluation; it is often the reason for
looking critically at any information, relevance being an important part of the evaluation process. Interestingly, no spelling errors or grammatical errors were found in any of the study websites.

Organization is an important factor which should be done in such a fashion that each webpage will be independent of the other, but at the same time, proper linking must be maintained so that the user has the provision to come back again to any one of the earlier pages. Websites are built around basic structural themes that both form and reinforce a user’s mental models of how the information is organized. There are three essential structures that can be used to build a website. The first, the hierarchical structure, makes it easier for a firm to keep track of the files that compose a website. Unfortunately, this design approach places a higher emphasis on the convenience of the website’s provider than on its users, who are firm’s current or potentially future clients. In other words, it involves organizing content and pages in a tree of site menus and submenus off the home page. This hierarchy of content subdivisions should not become a navigational straitjacket for the user who wants to jump from one area of the site to another. Most site navigation interfaces provide global navigation links that allow users to jump from one major site area to another without being forced to back up to a central home page or submenu.

The simplest and most familiar way to organize information is to place it in a linear sequence, where each page in the sequence may have links to one or more pages of digressions, parenthetical information, or information on other websites. The principal of arrangement obvious to the users in this study was taken based on site’s structural themes in mind, i.e., hierarchical, linear, and randomly interlinked combination of the two styles.

Interestingly, all the websites were accessed from different web browsers. Other common features were found in all websites: loading image files on home pages, content organized according to principle of arrangement obvious to the users, and appropriate organizational schemes to their resources. Half of the study websites provided table of contents or site map and access the information without any proprietary software or password.

Coverage of available information in websites is a greater concern for users. Table 4 summarizes that coverage coincides with the intended mission and coverage of the subject matter exhaustive was common and found in all the study websites.

The intended audience is a key factor in evaluating the information found on the site. Information needs to be at the level that the user can understand and assimilate. It has been observed from Table 4 that the statement of intended audience and terminology used on the sites was familiar to intended audience and this was found in all the study websites. However, from an examination of the information within the site, it is apparent that it is likely to appeal to a much wider audience, but none of the study websites had provided the visitor’s information, which was used to track number of unique visitors to the website and informs the number of hits during a specified time period, and indicates the site’s popularity.

Maintenance of the library website is an ongoing process and a tedious job for the webmaster. A factor to be considered is the currency of all hyperlinks. Few sites incorporated a policy regarding the updating process. Interestingly, links described clearly, proper site display, reliable internal links were common features found in all the study websites.

In fact, the most exciting and useful feature of the website is the implementation of feedback form, the librarian plays an active role in the library patron relationship. The suggestions should be an integral part of the website development, especially in the initial stages as it helps in correcting the design, as the suggestions are the views and reactions of the end users.
“Web-based forms, which are effective tools for library user interaction and communication” (Ahmed, 2002). Interestingly, all the study websites had provided the facility of feedback/comment to the library for users to express their views, suggestions, and comments.

The third part of the checklist (Table 4) indicates that none of the study websites scored more than 53.94 per cent based on features. The highest scored site is that of IIM-Lucknow with 53.93 per cent and the least scored site is for IIM-Indore with 38.20 per cent. However, this is not the final assessment. The final assessment should take into account of all the features of the websites. Therefore, the scores obtained in this table are consolidated with the other scores (means transferred to Table 6 under 1b column).

4.2.3 User interface

User interface is the area in which criteria for Internet-based information sources differ most from other sources. This is the fourth and last part of the evaluation checklist. The evaluator of the study had evaluated 28 check points with regard to usability, searching, and informative feedback and support aspects.

A user interface is the system by which users interact with a machine. The user interface includes hardware (physical) and software (logical) components. User interfaces exist for various systems, and provide a means of input (allowing the users to manipulate a system) and output (allowing the system to indicate the effects of the users’ manipulation). It has been observed from Table 5 that navigational aids

<table>
<thead>
<tr>
<th>Table 5: User interface features</th>
</tr>
</thead>
<tbody>
<tr>
<td>User interface</td>
</tr>
<tr>
<td>1. Are navigational aids clearly labelled?</td>
</tr>
<tr>
<td>2. Every page includes a way to turn the home page for the site?</td>
</tr>
<tr>
<td>3. Are types of information e.g., text, symbols, graphics, etc., clearly distinguished from each other?</td>
</tr>
<tr>
<td><strong>Usability features</strong></td>
</tr>
<tr>
<td>4. Aesthetic appearance is visually appealing not cluttered or busy?</td>
</tr>
<tr>
<td>5. Does it have consistent page headings and associated links for easy page recognition?</td>
</tr>
<tr>
<td>6. Is it easy to use all functions provided by the system?</td>
</tr>
<tr>
<td>7. Is it easy to assess the use of the website to achieve the desired task?</td>
</tr>
</tbody>
</table>
Table 5: User interface features

<table>
<thead>
<tr>
<th>User interface</th>
<th>IIM-A</th>
<th>IIM-B</th>
<th>IIM-C</th>
<th>IIM-I</th>
<th>IIM-K</th>
<th>IIM-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Web pages load faster?</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Searching features</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Is there any search feature or search engine present?</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>10. Keyword Search</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>11. Exact match Search</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>12. Weighted Search</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Federated Search</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Boolean Operators</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Truncation Search</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Adjacent Operators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Are there various options for searching on their home pages like A-Z list, or a general 'search'</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>18. Is the format display of search results understandable?</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>19. Can the user manipulate search results?</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>20. Do search instructions clearly indicate what to do?</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Informative feedback and support</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>21. Are status messages present to indicate what the system is doing or has done?</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>22. Does the system inform the user if errors occur?</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>23. Does the system allow the user to correct errors?</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>24. Is a help feature present?</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>25. Is it clear how to access and exit the help facility?</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>26. When using the help features does the system explain actions in the context of what the user is currently doing?</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>
were clearly labelled; every page included a way to turn the home page and information; e.g., text, symbols, graphics, etc., were clearly distinguished from each other were found in all the study websites.

Usability is a quality attribute that assesses how easy user interfaces are to use. The word usability also refers to the methods for improving ease-of-use during the design process. Table 5 indicates that all the study websites were aesthetically designed and visually appealing with consistent page headings, faster page loadings, easy to use navigation that helped achieve the desired tasks.

Searching is a rich and developing area in study websites and search feature within websites was common in all the study websites. There are many types of search features in practice, but the present checklist provided only seven search options.

Table 5 shows that keyword searching, exact match searching, and Boolean operators were common search techniques in all the study websites. In contrary, none of the study websites had provided weighted searching, truncation, and adjacent operators. Further, the most advanced and latest search feature, i.e., federated search was found in two study websites. Some of the common search features, such as A–Z list for advance searching, manipulate search results, and clear search instructions were found in all the study websites.

The informative feedback and support features are last category under user interface and provide eight checkpoints related to system status messages, error information, correcting errors, help, access and exit in help facility, system explanation, and clear instructions in throughout the site. Table 5 clearly indicates that all the study websites provided features related to informative feedback and support.

Table 5 clearly indicates that the study websites were scored more points in this part. The highest scored sites are IIM-Ahmedabad and IIM-Calcutta with 89.28 per cent each and the least scored site is IIM-Bangalore with 64.28 per cent. However, this is not the final assessment.

The informative feedback and support features are last category under user interface and provide eight checkpoints related to system status messages, error information, correcting errors, help, access and exit in help facility, system explanation, and clear instructions in throughout the site. Table 5 clearly indicates that all the study websites provided features related to informative feedback and support.

Table 5 clearly indicates that the study websites were scored more points in this part. The highest scored sites are IIM-Ahmedabad and IIM-Calcutta with 89.28 per cent each and the least scored site is IIM-Bangalore with 64.28 per cent. However, this is not the final assessment.

The final assessment should take into account all the features of the websites. Therefore, the scores obtained in this table are consolidated with other tables (means transferred to total score and ranking of IIM library websites in India, i.e., Table 6, 1c).

4.3 Total Score, rating scale and ranking of study Websites

The total score of the study IIM library websites is presented in Table 6 on the basis of previous respective Tables 3, 4, and 5.

A quantitative five-point rating scale was designed to determine the evaluation checklist.

Table 5: User interface features

<table>
<thead>
<tr>
<th>User interface</th>
<th>IIM-A</th>
<th>IIM-B</th>
<th>IIM-C</th>
<th>IIM-I</th>
<th>IIM-K</th>
<th>IIM-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>27. Do instructions clearly promotes and indicate what to do?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>28. Are instructions consistently worded throughout the site?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Total scores (Max. 28)</td>
<td>25/28</td>
<td>18/28</td>
<td>25/28</td>
<td>23/28</td>
<td>24/28</td>
<td>24/28</td>
</tr>
<tr>
<td></td>
<td>(89.28%)</td>
<td>(64.28%)</td>
<td>(89.28%)</td>
<td>(82.14%)</td>
<td>(85.71%)</td>
<td>(85.71%)</td>
</tr>
</tbody>
</table>

Notes: IIM-A: IIM-Ahmedabad; IIM-B: IIM-Bangalore; IIM-C: IIM-Calcutta; IIM-I: IIM-Indore; IIM-K: IIM-Kozhikode; IIM-L: IIM-Lucknow
whether or not it effectively served its intended dual purpose, i.e., to provide a meaningful numerical rating for each individual feature of the IIM library website and to aid in distinguishing quality among IIM library websites with similar information content. Its purpose is best served when comparing and ranking the IIM library websites with similar purpose, scope and content to rank from ‘excellent’ to ‘needs improvement’. The five-point rating scale was fixed equally based on the maximum score of 135 quantitative evaluation points. The range for the rating scale was as follows:

- **Excellent**: 109 – 135
- **Above Average**: 82 – 108
- **Average**: 55 – 81
- **Below Average**: 28 – 54
- **Needs Improvement**: 01 – 27

A cursory glance at the Table 6 reveals that out of 6, none of the study website had ranked ‘Excellent’. All the study websites were ranked with ‘Above Average’ or ‘Average’, of which IIM-Lucknow got the highest total score of 89 out of 135 (65.92 per cent), followed by IIM-Kozhikode with 87 score (64.44 per cent). Interestingly, IIM-Bangalore got the lowest total score with 58 (42.96 per cent). It is generally true that the IIM libraries ranking higher on the website comparison tend to have a specific team dedicated to either web issues or technology issues, whereas lower ranked libraries tend to have fewer personnel dedicated to web issues. The rating system proved to be an efficient and effective means of representing data collected in each part of the instrument. The ranking table was especially helpful in bringing together all of the individual scores and then in generating a final composite rating. The system performed extremely well in accomplishing its original two goals: (i) to provide quantitative indicators of quality, and (ii) to serve as a means of justification for qualitative data.

## 5 Conclusion

The study examined the qualitative and quantitative features of multimedia, content, and user interface of IIM library websites in India. The qualitative findings of the study indicate that scrolling news and notices and streaming features are too meagre, visual content features, and external file size of the images are not appearing on the study websites.

The quantitative findings clearly show that links to staff directory, news and events, and photo gallery features are found rarely on the study websites in general features. Online instructional

### Table 6: Total score and ranking of IIM library websites in India

<table>
<thead>
<tr>
<th>IIM Library Websites</th>
<th>Multimedia (1a, Table 3) Out of 18</th>
<th>Content (1b, Table 4) Out of 89</th>
<th>User Interface (1c, Table 5) Out of 28</th>
<th>Total Score (Max.135) (1a+1b+1c)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIM-L</td>
<td>17</td>
<td>48</td>
<td>24</td>
<td>89</td>
<td>Above Average</td>
</tr>
<tr>
<td>IIM-K</td>
<td>17</td>
<td>46</td>
<td>24</td>
<td>87</td>
<td>Above Average</td>
</tr>
<tr>
<td>IIM-A</td>
<td>09</td>
<td>47</td>
<td>25</td>
<td>81</td>
<td>Average</td>
</tr>
<tr>
<td>IIM-C</td>
<td>09</td>
<td>42</td>
<td>25</td>
<td>76</td>
<td>Average</td>
</tr>
<tr>
<td>IIM-I</td>
<td>04</td>
<td>34</td>
<td>23</td>
<td>61</td>
<td>Average</td>
</tr>
<tr>
<td>IIM-B</td>
<td>04</td>
<td>36</td>
<td>18</td>
<td>58</td>
<td>Average</td>
</tr>
</tbody>
</table>

Notes: IIM-A: IIM-Ahmedabad; IIM-B: IIM-Bangalore; IIM-C: IIM-Calcutta; IIM-I: IIM-Indore; IIM-K: IIM-Kozhikode; IIM-L: IIM-Lucknow
tutorials, citation style guides, web search guides/tips, ask-a-librarian through IM chat, online subject guides, and information literacy are uncommon features under library services. And link to librarian’s personal homepage, library promotional materials, links to subject specialists, information for disabled users, and job opportunities are unseen features in other content related features of the study library websites. Currency, web counter, and some searching features are not up to the mark in user interface.

The study has also revealed that IIM websites in India are lagging behind in exploring the Web 2.0 tools for library services, which are effective tools for publishing content and exploring the potential for communication, promotion, text responses, and catalogue access via mobile technology with the help of the library websites. Librarians are always attempting and exploring innovative ideas for better utilization of library resources and to provide better services to their users. It is hoped that libraries at the IIM institutions will attend to the lacunae and soon develop a fully functional, interactive, dynamic content web portal with Web 2.0 technologies, because academic community would expect information professionals as one of several professions vying for leadership in the information age to organize and present information in a way that best fits the users attention and knowledge.

Based on the findings, the study websites have not come up to expectations as virtual expressions of the quality levels of the IIM libraries. The study suggests that every effort should be made on a consistent basis to update the library websites frequently and provide the last revision of the site and pages in the websites. Incorporate the web counter to help in customizing the site and getting high or low traffic of the site and also improve searching features. This will certainly entice users to library websites and user-focused gateways to rich, quality content. Hence, it is essential for these libraries to implement manual and automated periodic evaluation of their websites. Such a kind of evaluation will give fool proof evaluation that critically reflects the defects of every website and reflect with changes in user behaviour, technology, and information resources.

The major limitation of the study was sample size, i.e., only six functional IIM library websites were evaluated. Another limitation of the study was that the online evaluation of these websites was not undertaken. The third limitation of the study was IIM Calcutta and Indore providing e-resources through intranet only and evaluated accordingly. More importantly, it should be noted that the evaluation of website features are very much a subjective process and is not intended to defame or discredit any study of the IIM library website. These findings open the door for improvement of the IIM library websites’ study and model for new IIM library websites development in India.

References


Further Reading


NEW RELEASES

Sustainable Urban Planning
ISBN: 9788179933244
Price: ₹950.00

Afforestation in India: Dimensions of Evaluation
ISBN: 9788179934630
Price: ₹445.00

Ensuring Sustainability in Forestry: Certification of Forests
ISBN: 9788179934951
Price: ₹995.00

Recombinant DNA Technology
ISBN: 9788179933206
Price: ₹595.00

Textbook of Immunology
ISBN: 9788179933800
Price: ₹595.00

Biodiversity: Communities and Climate Change
ISBN: 9788179934425
Price: ₹895.00

Molecular Biology and Biotechnology: Basic Experimental Protocols
ISBN: 9788179933794
Price: ₹695.00

Microbial Genetics
ISBN: 9788179933237
Price: ₹550.00

TERI Energy Data Directory & Yearbook 2012-13
ISBN: 9788179935200
Price: ₹1995.00

The Energy and Resources Institute
Attn: TERI Press
Darbari Seth Block
IHC Complex, Lodhi Road
New Delhi - 110 003

E-mail: teripress@teri.res.in
Tel.: 2468 2100 or 4150 4900
Fax: 2468 2144 or 2468 2145
India +91 Delhi (0) 11
Web: http://bookstore.teriin.org

To purchase the book, visit our online bookstore at http://bookstore.teriin.org or send us your demand draft or cheque in favour of TERI, payable at New Delhi.
**Children’s Green library**

The green building sector reached another important first with the opening of the world’s first green library for children in Singapore. The Central Public Library in Singapore, called My Tree House, was recently awarded the Building and Construction Authority’s (BCA), Green Mark Platinum Award. The BCA, a government agency in Singapore, falls under the umbrella of the Ministry of National Development and aims to champion the development of an excellent built environment for Singapore.

My Tree House was developed by Singapore-based City Developments Limited (CDL) in conjunction with the National Library Board. The library achieved the title for the developers’ incorporation of LED lighting, refurbished bookshelves and use of sustainable carpeting materials. As its name suggests, the library contains a tree house, the canopy of which has been made from 3,000 recycled plastic bottles.


**Milestone in Digital Library Project**

Collaboration between the British library and the Qatar National Library — this was a landmark project for the Qatar UK 2013 Year of Culture — through which both Qataris and Britons had the opportunity to celebrate their shared history. To date, the project has processed over 85,000 pages of unique archive material which illustrates the Gulf region’s rich history. Similar projects are under way in Holland, France, and Turkey but Britain’s close historical ties with the region provides a rich archive for future historians to study with 475,000 pages from the India Office Records and 25,000 pages of the
News

medieval Arabic manuscripts digitized and made accessible online for the first time. The Qatar Foundation is leading the way in promoting a library culture to preserve the nation’s heritage and to encourage the pursuit of education for all its citizens. Its recent announcement of the introduction of a new master’s degree in library and information studies further illustrates this aim. The programme, at UCL Qatar, will equip students with a thorough and comprehensive understanding of this subject matter.


Northeast India’s First Online Digital Library Opened

Northeast India’s first digital library with around 15,000 e-books and journals was opened. This digital library project is the brainchild of former president Dr A P J Abdul Kalam. The library will make available rare and copyright-free books online. The Centre for Development of Advanced Computing (C-DAC) of the union ministry of communication and information technology helped in setting up the library. The library will operate from the Birchandra State Central Library — the oldest library in the region — which was set up in 1896 in Agartala, the capital of Tripura. The books and journals would be digitized so that they are accessible Online via a searchable online database. Besides English, rare books in Bengali and tribal language Kokborok will also be available in the digital library.


Mahatma Gandhi Heritage Portal Launched

Hon’ble Prime Minister of India, Dr Manmohan Singh said, “The Gandhi Heritage Portal is a technology-driven initiative aimed at making information on him accessible all over the world on an electronic platform”, while launching a portal, dedicated to writings, works, and manuscripts of Gandhi, at his residence in Delhi. He listed out National Manuscripts Mission, Digital Library of India, variorum on Tagore and this portal as some of the important steps taken by his government. The portal has 5 lakh pages of authentic and verified information and is expected to have over 15 lakh pages.


e-libraries to Be Set up in Haryana Villages

The Haryana government is planning to set up e-libraries in 50 villages of Sirsa district at the cost of Re 1 crore. The e-libraries will be set up under the Backward Regions Grant Fund Scheme of the Haryana government. The work of setting up e-libraries in these villages would soon commence and it would be completed by the end of August. Sub-divisional Officer (Ellenabad), Prabhjot Singh, has been appointed as nodal officer for the work. In villages that are near the Punjab and Haryana border, 1,000 books in Hindi, Punjabi, and English would be kept in these e-libraries. The e-libraries that are near Rajasthan border would have Hindi and English books. Apart from this, audio-video CDs and DVDs would be available in every e-library and computers will be linked with internet in every e-library so that the readers can read various books and magazines and check the encyclopedia.


Bill Gates Foundation to Upgrade Two Patna Libraries

The Bill and Melinda Gates Foundation decided to upgrade two public libraries in Bihar by 2015 under the banner of its Global Libraries (GL) programme. One of them is Gate Public Library in the state capital while the other is to be chosen
between Shree Krishna Seva Sadan, Munger, and Bihar Hitaishi Pustkalay, Patna City. The main objective of the programme is to ensure the availability of critical information and state-of-the-art knowledge resources for the libraries in Bihar. Another focus area of this project is to forge partnership with relevant and potential partners from government and private sectors to add value to this project.


National Digital Repository for Schools Launched

Mr M M Pallam Raju, Minister, Human Resource Development launched an initiative to bring together digital resources for various subjects in different languages in schools. The National Repository of Open Education Resources, prepared by NCERT, is a digital resource of collection of documents, audio-visuals, interactive objects etc., which are mapped to the concepts, thus enabling access to a library from which teachers can choose appropriate resource. The Minister also launched an ICT curricula for the schools and said once the initiatives are rolled out, the curriculum would help train teachers on a large scale to benefit from ICT.


IFLA World Library and Information Congress

National Committee of the International Federation of Library Associations and Institutions (IFLA) and World Library and Information Congress (WLIC), jointly organized the 79th IFLA WLIC 2013 in Singapore from 17–23 August 2013.

The theme of the conference was ‘Future Libraries: Infinite Possibilities’ providing valuable opportunities to share insights and shape policies that address global challenges affecting our local communities.

Libraries and information centres have the power to be a positive force for change on multiple fronts. Libraries empower individuals with the resources to be lifelong learners, while engaging families and communities in collaborative reading and learning pursuits. To touch the minds and hearts of communities, librarians, and information professionals must be connected to the local communities they serve, providing services that are relevant to local needs, and connect citizens to the world’s knowledge and creativity.

Libraries are at the landmark of technological developments that are revolutionizing information access and use in this era. Information has never been more conveniently available on so many devices and in many formats to provide a myriad of learning experiences. At the same time, this information deluge presents new challenges to processing, sense-making, and ethical use. Hence, libraries and information professionals have a vital role to play in harnessing the infinite possibilities that today’s technologies offer for information access and service delivery.

Source: http://conference.ifla.org/past/2013/ifla79.htm
World Digital Libraries is an international peer-reviewed biannual journal. The journal seeks quality research papers that present original theoretical approaches. It also seeks experimental case studies related to digital library developments, maintenance, and dissemination of digital information focusing on research and integration of knowledge at the interface of resources and development. The journal will, therefore, keep readers abreast with the current developments and contain articles, reviews, current developments, and case studies, encompassing the following areas.

- Theoretical and methodological issues that relate to the interrelationships among electronic resources management, digital preservation, multiple access, multilinguality, copyright issues, and security aspects.
- Theoretical approaches as well as experimental case studies related to digital library development and maintenance.
- Initiatives towards digitization through lucid case studies.
- Current developments across the globe.
- Dialogues between the scientific community and society at large.

Articles should examine concepts, analyses, and case studies of important issues in the field. Book reviews should be of recent publications in the field, to be reviewed by an independent reviewer. Commentaries should discuss critical issues in the field.

Submissions
Authors are requested to send a soft copy (in Microsoft Word format) of their contribution to the editor, either in a CD or as an e-mail attachment.

All submissions will be peer-reviewed using the criteria of originality, accuracy, and quality of contribution in these fields.

Presentation of manuscripts
Articles must be original, in English, and should not exceed 8000 words. The main text should be double-spaced with headings and subheadings clearly indicated in the text. All tables, figures, and equations should be numbered in Arabic numerals and clearly cited in the text. All measurements should be in metric (SI) units. The manuscript should be arranged in the order given below.

- Short title (10 words is the desired maximum length), subtitle (if desired)
- Author’s name, affiliation, full postal address, and e-mail, telephone, and fax numbers (respective affiliations and addresses for co-authors should be clearly indicated)
- Abstract (not exceeding 200 words)
- Main body of the text, suitably divided under headings
- Acknowledgements, if any
- References
- Appendices (each on a separate sheet)
- Tables (each on a separate sheet)
- Figures (each on a separate sheet)

Shorter items
The following shorter items are also welcome and must be typed in the same way as major articles.

- Commentaries (research notes and short communications) and case studies (maximum 5000 words)
- Book reviews (maximum 1200 words)

In-house style: references
In the text, the surname of the author(s) followed by the year of publication of the reference should be given, for example, (Hall 1993). In case of several publications by the one author or by a group of author(s) in one year, use notations ‘1993a’, ‘1993b’, and so on. Up to three authors can be mentioned in text references; more than three authors should be limited to the first three authors’ names followed by ‘et al’. References must be listed alphabetically at the end of the
paper (double spaced) and should conform to the following style.

For journals
Davis G R. 1990
Energy for planet earth
*Scientific American* 263(3): 55–62

For books
Carmichael J B and Strzepek K M. 1987
*Industrial Water Use and Treatment Practices*

For chapters of edited books
Sintak Y. 1992
Models and projections of energy use in the Soviet Union
In *International Energy Economics*, pp. 1–53
edited by T Steiner

For grey literature
Togeby M and Jacobsen U. 1996
How conflicting goals concerning environment and transport influence the policy process?
Paper presented at the *Conference on Transport, Energy and Environment*, 3–4 October, Helsingor, Denmark

WBCSD (World Business Council for Sustainable Development) and UNEP (United Nations Environment Programme). 1998
*Industry, fresh water, and sustainable development*
Details available at <www.gm-unccd.org/FIELD/Private/WBCSD/freshwater.pdf>, last accessed on 9 January 2004

Footnotes
Authors are requested to use as few footnotes as possible, and keep their length to the minimum. Footnotes should be indicated in the text by superior Arabic numerals, which run consecutively through the paper. They should be grouped in order of appearance at the bottom of the concerned page in numerical order and must be double-spaced.

Accepted manuscripts
On acceptance, contributors are requested to provide the editor the final version of the article in soft and hard copy. Please observe the following instructions.
- Tables, figures, illustrations, should be on separate sheets.
- Retain a back-up disc for reference and safety.

Proofs
One set of proofs will be sent to the author before publication, which should be returned promptly within 48 hours of receipt. Authors are urged to check the proofs carefully as late corrections cannot be accepted.

Offprints
Apart from one free copy of the journal to the authors, 10 free offprints will be supplied to the first author. Further offprints and copies of the journal can be purchased at a reasonable cost, if ordered when sending the final copy of the article, or when returning the proofs.

Copyright
The responsibility for the contents of the paper rests with the authors, not with the editor or the publisher. Contributions are accepted for refereeing on the understanding that they have been submitted only to this journal and not to any other journal. Only when each author signs and submits the CTA (Copyright Transfer Agreement) can TERI Press publish the article. This CTA enables TERI Press to protect the copyright material for the authors, but does not affect the authors’ proprietary rights. The CTA covers the exclusive rights to reproduce and distribute the articles, including reprints, photographic reproductions, or any other reproductions of similar nature and translations, and includes the right to adapt the article for use in conjunction with computer systems and programmes, including reproduction or publication in machine-readable form and incorporation into retrieval systems. Authors are responsible for obtaining, from the copyright holder, permission to reproduce any figures for which copyright exists.
Editorial

1 The Interconnected Web: A Paradigm for Managing Digital Preservation
   Heather Brown

   Dr Anna Kaushik

25 Cross-Institutional Cooperation on a Shared Bit Repository
   Eld Zierau and Ulla Bøgvad Kejser

37 Promoting Online Databases/Electronic Resources: A Practical Experience
   Pradip Das

49 Evaluation of Indian Institutes of Management Library Websites in India
   Dr Margam Madhusudhan and Mr Noushad Ahmed

73 News