# The Emerging role of Digital Libraries in E-learning: A Review of Challenges and O pportunities for Universities

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**Abstract**
Both e-learning and digital libraries are gradually converging to transform the learning environment in many universities. This trend, which is widespread in developed countries, is gradually gaining momentum in sub-Saharan countries such as Kenya. E-learning is recognized as the ultimate convergence of learning and the internet approach to building the knowledge and skills of learners through web-enabled technologies. On the other hand, digital libraries provide technology-based information services and an organized collection of knowledge that is accessible to users via digital or electronic interface technologies to support the learning process. With the emergence of e-learning as a novel avenue to provide course content, digital libraries are viewed as appropriate means to provide supporting learning information services. This paper discusses the potential complementary interaction between library environments and learning environments to create more productive experiences for learners. The paper will also explore strategic and technological issues involved in creating systems that facilitate high-level and effective interaction between future e-learning environments and the digital library world.

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## Introduction

In the recent past, e-learning has emerged as the new frontier in the provision of cost-effective flexible, and innovative learning opportunities to meet the increasing demand for higher education (Mclean, and Sander, 2003). Globally, many institutions have put their teaching and learning activities onto electronic platforms thus introducing virtual learning environments (Joint, 2005). Here in Kenya as of today, e-learning initiatives have been implemented in several universities such as The Catholic University of Eastern Africa, Strathmore University, United State International University, and Kenyatta University. With the emergence of e-learning as a novel avenue to provide course content, digital libraries are viewed as appropriate means to provide supporting teaching and learning information services. Digital libraries provide technology-based information services and an organized collection of knowledge which is stored in digital and electronic formats and accessible to users via digital or electronic interface technologies to support the learning process.

There is a general agreement that a well-designed e-learning system should collect related course materials, and organize them in such ways that the student's interaction with the materials would be meaningful and effective. Secondly, it should present the materials dynamically and flexibly. Thirdly, it should facilitate seamless access to supporting library and information resources to support the teaching process (He, Mao, and Peng, 2004). However, analysis of most of the current learning management systems reveals a lack of direct links with automated library systems, and students have had to either log out of the learning management system to pursue information resources held in the library databases. Worse still the lecturer has to obtain an *Html* or *pdf* document for mounting within the e-learning platform.

In practice, however, students, lecturers, librarians, and ICT people are interested in seamless access to all the resources related to e-learning. For example, lecturers are interested in a seamless link from the course management system to a specific library e-reserve article or being able to add links to broad-ranging repositories for students to search for other similar articles with direct links to full-text versions of relevant articles. Students on the other hand wish to gain easy access to various learning and information resources across the university with contextual advice on searching techniques, together with online help from a virtual reference desk (Charmonman, 2004).

This scenario underlines a need for the next generation of e-learning management systems to provide seamless access to library learning resources that support the learning process. This paper will discuss the need and importance of e-learning and the role of digital libraries in supporting the e-learning process. Secondly paper will explore strategic and technological issues involved in creating systems that facilitate high-level interoperability and seamlessness interaction between future e-learning environments and digital libraries. We start with defining both e-learning and digital libraries. Next, we consider the major issues facing e-learning and show how digital libraries assist in addressing some of the challenges. Finally, we explore some of the

conceptual, technological, and strategic issues that need to be addressed if digital libraries are to effectively play their role in e-learning environments.

**What is e-learning?**

E-learning is becoming an attractive and powerful means of effective internet-enabled instruction (Taha, 2007). E-learning has been defined in several ways. The term e-learning refers to the set of techniques that leverage various Internet and Web technologies to create, enable, deliver, and facilitate lifelong learning. The European Community defines e-learning as the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration (DeSantis, 2003). According to Sharifabadi, (2006) e-learning refers to the use of the internet to access learning materials; interact with the content, instructor, and other learners; obtain support during the learning process, acquire knowledge, construct personal meaning, and grow from the learning experience.

From these definitions, it is clear that e-learning encompasses research and teaching in digital environments. It includes courses that are offered fully online courses that mix face-to-face and online access to instruction and course materials, and courses in which instructors post note materials for students or provide access to online discussion forums on course topics (CISO, 2005; Sloan, 2004).

At the same time, a rationale behind the growth of e-learning appears to be the need to switch to the 'constructivist' approach to education characterized by features such as:

- The desire of teachers to empower the learner, for example, in searching for additional course content online.
- The power of future developments such as simulations and virtual world technology to move the focus of distance education from lecturing and memorization to performance examinations in "real life" situations.
- The focus is on promoting generative learning rather than the passive reception of learning in students (Bonk, 2004; Joint, 2005).

**Advantages of E-learning**

The pros and cons of the e-learning paradigm have been the subject of intense discussions. Generally, it is viewed as an appropriate organization of information and communication technologies for advancing student-oriented, active, open, collaborative, and lifelong teaching-learning processes (Bates and Bartolic-Zlomislic, 2000).

To the learner, e-learning:

- fosters interaction and stimulates understanding and the recall of information;
- accommodates different learning styles and fosters learning through a variety of activities;
- fosters self-paced learning;
- convenient for students to access any time, any place;

- reduces travel time and costs;
- encourages browsing information through hyperlinks to sites on the World Wide Web;
- allows students to select learning materials
- provides context-sensitive help.
- develops knowledge of the Internet; and
- encourages students to take responsibility for their learning (Broadbent, 2000; Wang, 2003 Sharifabadi, 2006).

To the instructor, e-learning has several advantages in that it:

- permits instructors to develop materials using the worldwide resources of the Web;
- allows instructors to communicate information more engagingly;
- is convenient for instructors to access any time, any place;
- allows instructors to package essential information for all students to access;
- retains records of discussion;
- generates more personal gratification for instructors through quality student participation;
- reduces travel and accommodation costs associated with training programs (Bates, T. and Bartolic-Zlomislic, 2000; Wang, 2003; Sharifabadi, 2006).

**What are digital libraries?**

Different communities (i.e., computer scientists, library and information scientists, and corporations) participate in digital library efforts and generate varied DL theories, models, and projects. Therefore digital library field contains many different perspectives on what digital libraries are. Consequently, several definitions have been offered for the term 'digital library' (Fox and Urs. 2002). In general terms, a digital library, refers to a collection of digital objects (such as digital text, images, and videos) and a set of associated techniques and services that help to collect, organize, retrieve, and preserve those digital objects for a community of users (Borgman, 1999; 2000).

Sun Microsystems (2002) defines a digital library as: "the electronic extension of functions users typically perform and the resources they access in a traditional library" Therefore, with digital libraries, an individual can:

- Gain bibliographic access to physical books, digital media, journals, and other holdings of libraries worldwide through automated catalogs.
- Access full-text articles and journal databases purchased by the library and those available through open-access journals
- Access special collections such as institutional repositories (E-theses, seminar papers)
- Save search results and conducts additional processing to narrow or qualify results (Sun Microsystems, 2002).

For our purposes, we can define a digital library system portal that comprises digital objects such as bibliographic databases of the full-text journal and other knowledge-based information sources. These objects are organized by classifying them according

to a model which allows the managing and retrieval of information across the internet by various sectors of teaching and learning communities. It provides access to specialized information services including electronic databases, online reference inquiries, interlibrary loans, digitization, and electronic publishing. One of the vital components of a digital library is therefore the capability to create, search, use, store, and preserve local publications and information of national and international interests accessible on a subscription or pay-per-view basis.

In this sense, a digital library is not merely equivalent to a digitized collection with information management tools. It is also a series of activities that bring together collections, services, and people in support of the full life cycle of creation, dissemination, use, and preservation of data, information, and knowledge (Sharifabadi, 2006). Digital Library mediates between diverse and distributed information resources on the one hand and changing the range of user communities on the other. It offers information service in a networked environment in which users can discover, locate, acquire access to and, increasingly, use (Borgman, 1999; 2000; Wang, 2003; Zhou, 2005; Huang and Russell, 2006)

**The role of digital libraries in e-learning environments**

Library resources and services are integral to academia as a primary knowledge resource for both teaching and research (Carl E-Learning Working Group, 2004). As e-learning gains influence, the role of libraries in the models of practice remains unacknowledged This has a potential loss of quality of the academic experience of researchers, teachers, and students (Carl E-Learning Working Group, 2004). The e-learning environment is dynamic and fluid and changes are the norms culturally (Bates and Bartolic-Zlomislic; 2000). This provides new challenges and opportunities for libraries to design and disseminate new services. As libraries create these new services, also need to improve their expertise, abilities, and resources to take a leading role in the new e-learning and course management environment.

Among other things components, e-learning platforms are expected to integrate third-party commercial information services, embed library resources in course management systems, provide easy access to virtual reference services, and bibliographic tools that permit an easy search of online library catalogues as well as training modules to assist in information seeking (Mclean and sanders, 2003). However, analysis of most learning management systems such as Blackboard reveals a lack of links with library systems, and both students and lecturers have to either log out of the learning management system to pursue reading resources held in the print library or an electronic database repository. This approach means that the learning activity is relatively static and there is no opportunity to move between information resources and the learning activity in runtime mode.

In contrast, library systems and e-learning systems actually, need to interact in a rich variety of ways. Resources must be integrated such that a single login will provide access to all course components, as well as direct links to learning resources such as e-journals, e-books, and other reference sources. With the increasing significance of e-

learning digital libraries play a critical role in its success. The implementation of e-learning is facing several issues which can be viewed as pedagogic, economic, organizational and quality issues include faces several issues. The establishment of digital libraries is part of the solution to these persistent issues.

*Pedagogical role*
E-learning embodies a change towards social constructivism with a greater student responsibility concerning the learning path and the role of the teacher shifting to that of a guide(de Beeck, 2002). E-learning is based on self-motivated discovery on the part of students which presumes the existence of large collections of information resources that provide a rich variety of ideas and diverse viewpoints to the student. As we have documents available in electronic format it is possible to make electronic annotations right in the text and discuss them in an online forum. Going digital means that students now have access to enriched interactive digital multimedia resources, (Carl E-Learning Working Group, 2004).

Through digital libraries, new information literacy skills are introduced which provide more possibilities for interaction with learning resources. Students can acquire skills for what is called media literacy, i.e. the ability to communicate competently in all old and new media, as well as to access, analyze and evaluate the value of images, words, and sounds which are such an important part of our contemporary media culture.

With an emphasis on student responsibility for learning and electronic resources abundantly available on the Internet and in e-libraries, issues such as the selection of resources based on their content (and hence the quality of learning and learning result) assume a critical dimension. The link with scientific research is made easier and pushes us toward one global scientific information and a knowledge-sharing community. The digital library provides a common information and communication platform where students may publish their assignments on the web or may have direct access to research project results.

*Promoting economic value in education*
E-learning allows addressing global learning markets. Digital libraries enable institutions to reach new even global markets and a new generation of learners with learning information resources Higher education is no longer restricted to on-campus students but includes professionals as lifelong learners. Digital libraries engender a new relationship between universities, authors, publishers, and librarians which can effectively respond to the new market orientation (Mamlik and Jain, 2006. For example, teachers at universities, who are expert researchers as well, are willing to share their research results in digital publications and universities are willing to provide course information for free, e.g. the course resources on the e-learning platform. It also facilitates the reuse and repurposing of digital content for perpetual use with an element of cost-saving.

*Responding to the need for organizational change*

E-learning forces change into the educational settings, away from traditional lectures towards virtual learning environments, Students want a one-stop-shop, one learning portal, where they may find all resources and support for their learning activities. Digital libraries facilitate access while at the same time addressing copyright issues when it comes to the use of electronic material from the library in e-learning settings. Digital libraries mediate partnerships in the virtual learning environments composed of teachers, and learners to create a virtual learning community. Digital libraries facilitate a viable integration of traditional print-based collections with the much demanded electronic resources and a transition to virtual libraries.

*Promoting quality of e-learning outcomes*

Quality is one of the most important issues nowadays in e-learning. Concerns include the quality of learning materials and accreditation of e-learning programs (Garret, 2002). The digital library's greatest contribution is in the enhancement and increased value of the learning process that results from the combination of digitally delivered content with learning support and services (George, 2005). A linkage has been demonstrated between such an investment and improvement in quality, efficiency, and achievement in university education (Carl E-Learning Working Group, 2004). Therefore the digital library is an instrument of education contributing to the intellectual development of the student.

There is a greater concern for issues such as the standardization of (reusable) learning materials to accreditation of e-learning programs. Through digital libraries, e-learning can only benefit from a large library of learning materials (including e-documents) when these resources may easily be retrieved. Digital libraries provide a mechanism for selecting and providing access to quality information. Through digital information literacy programs learners are empowered to selective use of internet-based resources.

*Other advantages of digital libraries*

Several authors (Sumner, et al, 2003; Magara, 2002; Mutula, 2002; McDonald and Kebbell, 2004; Jain, 2006; Rosenberg, 2006; Kavulya, 2007) have written on the advantages of digital libraries. These advantages make the creation of digital libraries a strategic method to improve the effectiveness of learning of e-learning programmes in Kenya:

1. The doors of the digital library never close; digital libraries are available on a 24/07 basis from anywhere in the world, offering flexible arrangements for students, researchers, scholars, and the community. Materials are never checked out to other readers, miss-shelved, or stolen; they are never in an off-campus warehouse. The scope of the collections expands beyond the walls of the library. With an internet link, participants in e-learning can access local as well as global information,

2. Much important information needs to be brought up to date continually. In digital libraries, it is easy to keep information current. In contrast, information Printed materials are awkward to update since the entire document must be reprinted and all copies of the old version must be tracked down and replaced.

Keeping information current is much less of a problem when the original version is in digital format and stored on a central computer.

3. Digital libraries can be widespread and accessed as full text from any location or workstation. Digital information can easily be shared and therefore is available to everybody which is a great improvement on print libraries, which require expensive duplication of material in different locations. Information is readily available from offices, telecentres, laboratories, and homes without creating a need to travel long distances to physical libraries.

4. New forms of information become available on several subjects from a variety of sources such as libraries, electronic publishers, and business organizations and in multimedia formats. Most of what is stored in a conventional library are printed on paper, yet print is not always the best way to record and disseminate information. A database may be the best way to store census data so that it can be analyzed by the computer; satellite data can also be rendered in many different ways.

**Integrating digital Libraries in e-learning: Key issues facing Kenyan universities.**

To address the library needs of online learning students, Universities across Africa need concrete measures to promote digital libraries. Some of the possible measures are outlined below.

*The need to creation of digital library collections and institutional repositories*
Digital content for university students should include journals, textbooks, theses, newspapers, encyclopedias, magazines, maps, and multimedia resources that are relevant to the curriculum Wang, 2003). Efforts should be made to purchase native digital content such as e-books, e-journals, and e-databases. The local publishing industry needs to embrace e-publishing. This is the only way locally generated content can be made available in digital format. Local university libraries can contribute to teaching and research content through the creation of institutional repositories. These are digital collections that capture and preserve the intellectual output of the university community such as research reports, thesis, course notes, and seminar proceedings (Hockx-Yu, 2004).

*Developing digital library services*
The e-library could support e-learning courses with a bundle of networked e-information services Apart from potential library e-services the following services should be considered a priority:

- Developing a special portal for course-related learning objects that are to be retrieved from the library digital collections (e.g. e-journals, textual databases, open access, etc.),
- Virtual reference service to answer the information needs of the e-learners (i.e. e-learning liaison librarian),

- Providing e-literacy sessions to help e-learners in the scholarly use of the web and distributed e-resources,
- Hyperlinking the e-courses with the library e-reference resources such as e-books and e-journals as well as with the web-based open-access resources,
- Acquisition of core e-collections specifically those recommended by e-learning initiative,
- Promotion of library e-services to the virtual e-learning community,
- Prompt document delivery and outreach services via electronic transmission,
- Digitalization of textbooks and other learning resources to create re-usable learning objects; and (Taha, 2007; Sumner, et al, 2003).

*Preservation and digital archiving*

Beyond the creation of electronic collections, there is a need for preservation and archiving to ensure continued access to digital materials for as long as necessary. This is necessitated by the proliferation of vast amounts of digital data and the rapidly changing hardware and software which have to be constantly upgraded and superseded (Jones and Beagrie, 2002). The key objectives of preservation and archiving are to maintain the repository without being damaged, lost, or maliciously altered (Wheatley, 2004). All these objectives should be achieved in the long term.

*Copyright and rights management*

The copyright issue (together with copy charges, interlibrary lending, and exchange) is certainly one of the major problems when it comes to the use of electronic material from the library in e-learning settings (Chowdhury and Chowdhury, 1999). This is an issue that may curtail universities in Kenya in their efforts to create and use digital collections. This is due to the weak regulatory framework in the region and the unclear global copyright law on digital information. With the transition from print to digital information, there are fresh questions on the application of copyright laws in a digital environment.

There is a need for changes in the current copyright law to protect the interests of owners of intellectual property but facilitate efficient user access to digital items (Jayaprakash and Venkatramana, 2006). Particularly, there have been calls for the revision of procedures and policies under copyright law to allow libraries to pursue their key objective of acquiring and facilitating digital information unhindered (IFLA, 2001). One noticeable trend is the use of contractual agreements entities within the information chain such as libraries and suppliers of electronic information

*Standards and systems interoperability*

There is a growing awareness of the need for the interoperation of repositories of digital library content with systems supporting e-learning and teaching (Digital Library Federation, 2004). Lack of interoperation makes it difficult to locate individual resources within the systems in which they are described, reuse existing descriptive metadata, understand technical formats, and cope with access management systems. To interoperate digital libraries and e-learning platforms architecture must be designed incorporate industry standards, formats, and protocols

used in the information industry (Mamlik and Jain, 2006). Digital libraries and e-learning objects should be described in a standardized way for easy retrieval and reusability. Until relatively recently, there has been almost no attention on a consensual, international scale to creating technical standards for managing learning objects and processes (Mclean, and Sander, 2003). However standard practices are required for digitization, rights management, preservation, metadata encoding, and other key digital library processes. This will ensure consistent discovery across distributed repositories.

*Provision of digital library infrastructure*
Digital libraries depend on ICT infrastructure to facilitate distributed processing, high-speed networks, information processing, storage and retrieval, user interfaces, geographical distribution, security, high-quality presentation, and perpetual availability of digital information (Chowdhury and Chowdhury, 1999). For digital libraries to be functional there is a need for university libraries to use information and communication technology as a strategy of choice in achieving information service objectives. The development and maintenance of digital libraries call for an investment of considerable financial resources in digitization equipment, and computer servers, development of information retrieval capabilities via network infrastructure, purchase of electronic information resources, and retraining of library staff on digital library management skills.

Fast and seamless access to systems and information requires robust middleware to support authentication and authorization across a range of systems and services. There is also a need for better interfaces among systems, flexible, open-source tools for specific functions, and stable and comprehensive portal technologies. There is a need for metasearch engines that are capable of simultaneously searching multiple systems, and aggregating retrieved metadata (Digital Library Federation, 2004).

*Information literacy skills and digital librarian competencies*
There is a wide consensus that e-learning should be underpinned by information skills (CILIP, 2004; Andreatta, 2005). To ensure that digital libraries are fully utilized, there is, a need to develop learning and education as a lifelong process through information literacy programmes. In a digital library environment, end-users are expected to interact directly with computers to fulfill their information needs. They should therefore acquire skills to create structure, locate, search and use materials in digital formats (Wang, 2003; Macgregor, 2005; CILIP, 2004; Andreatta, 2005).

A digital library is not merely technology in support of the full life cycle of creation, dissemination, use, and preservation of data, information, and knowledge (Sharifabadi, 2006). The digital environment requires a variety of new skills on the part of librarians to enable them to establish digital libraries and provide user services effectively and efficiently. Particularly, library personnel is expected to meet the challenge of providing information literacy skills by harnessing and applying the information in concrete situations. According to Bawden (2005), apart from the traditional skills of information organization, the LIS professional is expected to be

firmly grounded in ICT-related competencies such as core hardware and software skills, web design, internet searching, and evaluation of electronic information.

In the past, the library field in Kenya has been characterized by inadequate or outdated skills among the staff, which render library personnel inadequately prepared to function in the present dynamic electronic information environment (Rosenberg, 2005). Saracevic and Dalbello (2001). have argued that modern LIS training courses should address the fundamental issues in digital library development such as digital library collections, information services and access to digital libraries, technical skills, and infrastructure, social and economic issues, skills for fundraising, consortium activities, negotiating with authors, publishers, and suppliers, and managing development projects to enhance the library services.

*The need for collaborative efforts between E-learning stakeholders*

Digital libraries' projects can only succeed through the collaboration between different stakeholders such as those who create information and the people who use it and their needs. To achieve this goal there will have to be close collaboration among e-learning experts, IT managers, librarians, faculty members, and university administrators of e-learning initiatives. The library communities are largely unfamiliar with e-learning. In turn, those implementing e-learning programmes are often unaware of relevant work happening in library automation, digital libraries, and related areas (Mclean and Lynch, 2004). There is a need for greater awareness among the various players in both e-learning and digital library development of the issues of integration and greater engagement between digital library and course management communities (Montoya, Ruiz, and Giraldo;2004). There is a need to work together to create appropriate digital library services, and standards for interoperability. and maintaining digital asset repositories.

*The need for a national digital library strategy and framework*

The establishment of digital libraries is a gigantic undertaking and many writers have advised that to succeed there is a need for a government-backed national digital library strategy (Carnaby, 2005). Chen (2004) has observed that the spectacular success of digital libraries in the USA can be attributed to Federal Government policy commitment to implementing the concept. This led to projects such as the Digital Library Initiative (1994-1998) which focused on advancing the means to collect, store and organize information in digital forms and make it available for searching and retrieval and research into various issues relating to digital libraries such infrastructure.

The Kenyan government can facilitate the establishment of digital libraries by fostering the necessary political, legal, and institutional conditions under which the information sector and particularly information services institutions like digital libraries can thrive. A lead organization such as the KENET should be identified or a consortium of stakeholders should be formed to spearhead the creation of a national digital library This includes developing digital information service policies, developing viable ICT infrastructure, and legislating on issues such as intellectual property rights,

privacy and free flow of the necessary content and knowledge. The national digital library strategy should provide an integrated framework for existing and future initiatives to encourage the uptake and effective use of ICT for economic, social, and cultural gains. It should also provide an interoperable, standards-based framework where digital libraries can be created.

**Conclusion and recommendations**

This paper has explored the potential of digital libraries to offer resources to support e-learning. Learning platforms, content management systems, and e-library firms all attempt to source, structure, and deliver various kinds of academic information directly to faculty and students. The main emphasis of the paper is that digital libraries should be integrated into a seamless network of e-learning content management systems. Following this discussion, we can conclude that although university libraries have traditionally been engaged in collecting, processing, and distributing information and knowledge resources, manual-based information systems cannot sufficiently provide relevant and timely information in e-learning environments. Transition to digital libraries offers new and potentially unlimited ways to enhance information access and can provide a faster method of accessing information to support the teaching and learning activities.

The paper has presented both technical, policy, and strategic issues that need to be addressed if digital libraries are to be effectively integrated into the e-learning ecosystem. Key among these is the need for the creation of carefully selected e-content that is relevant to higher learning. This can be achieved through the digitalization of existing collection purchases of native digital objects such as e-books, e-journals, e-cases models, etc. There is also a need to address copyright and intellectual rights issues and develop and deploy industry standards to promote systems interoperability The provision of digital library infrastructure is still in infancy, especially in developing countries such as Kenya and so are information literacy skills and digital librarian competencies. Without developing these elements digital libraries cannot take root in the country. The most important issues are collaborative efforts and a national digital library strategy and framework. Collaboration between the players in both the digital library and e-learning worlds will promote a better understanding development of standards and areas and interoperability. A national strategy for the digital library will guide the deployment of resources and identify and provide ways of overcoming obstacles in integrating the digital library and e-learning worlds.

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