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Digital/Electronic Libraries

Digital libraries and electronic publishing have recently become a major new area of development and research. A significant resource of digital libraries has been established with a large number of potential users. However, a great research challenge still remains in developing appropriate facilities to promote world access and use of the growing of digital information (Theng, 1999).

The term "digital library" means many things to many people. There are also many interchangeably used terms with digital libraries. Some among these are: library without walls, information management center, desktop library, networked library, nerve center, and electronic library. The terms "electronic library" and "digital library" are the most widely used.

But still the conceptions of digital/electronic libraries and their uses in relation to teaching and learning are not well developed. This is particularly true in African teacher education institutions where there is insufficient infrastructure for ICTs development. It is well known that Africa's education statistics compare unfavorably with those of other developing regions. Digital libraries thus can serve as important vehicles to improve education outreach and standards across the continent. Digital libraries can bring the library to the user and hence can help to share information among educators easily. They hold material online, on a digital form, and provide advance ways of searching and material retrieval, access and presentation.

There are arguments surrounding the issue of considering electronic libraries as collections (the works included in its catalogue) or as services (the distinct groups of readers that it reaches). Hodgkin (Updated July 2, 2003) draws an analogy between bibliography and biology in order to describe collections and services. As a biological system is defined by 'nature' or genetics on the one hand by its 'nurture' or environment on the other, a library can be viewed as a content collection or as set of services, processes and reader-directed activities. This means that the books are like the library's genetic constitutions, whereas the users, students, researchers and readers are the developmental and environmental factors. Hodgkin then argues that, in building an electronic library, one should think first of the service to be provided and its quality, only second considering the specific content. He then provided seven reasons for taking the service approach as the cornerstone of the electronic library.

These are:

- The electronic library is a service to the whole organization.
- The physical location of the library becomes less important and the most valuable service may be given to users who rarely or never visit the library.
- The electronic library should be available at all times (especially at night or during public holidays).
- Because the library is, or should be available to all at all hours, it will follow that many users will access the library without having direct access to a librarian in person.
- The electronic library is going to be seen by many users as a service and the budget-holders are going to take advantage of the fact that usage or service statistics are much more readily available from an electronic library than from a Gutenberg-style library.
- Since no single publisher can provide the information or the content that any modern organization requires, a good electronic library will be good at integrating the different services that it provides to its users.
- If we see the electronic library as a service which the librarian provides to the whole organization, it is important that the librarian asserts his/her role in defining the content services which are needed by the organization.

This issue of the Newsletter therefore tries to open a forum for the exchange of ideas and experiences in the area of digital libraries in education. It also highlights UNESCO-IICBA's efforts to disseminate knowledge and experiences among African teacher education institutions through the use of its Electronic Libraries.



Conceptions of Digital Libraries

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Introduction

Starting from the last decade digital libraries (DLs) have moved from esoteric interests of a few visionaries to activities that are beginning to rival traditional libraries. According to Arms (2000) the catalysts have been technical such as PCs, the Internet and the World Wide Web. But every discipline that values the dissemination of high quality information has contributed to DLs development. Furthermore, many of the challenges associated with building the new libraries were social, economic or legal rather than technical. Nowadays, research in digital libraries has become a vibrant academic sub-discipline, with computer scientists working alongside economists, scientists, lawyers and librarians.

Although computers and networks are of fundamental importance, they are only the technology. The real story of digital libraries is the interplay of people, organizations, and technology. The economics of information dissemination follows two different models. Some DLs mimic traditional publishing by requiring a form of payment before users may access the collections and use the services. Other DLs use a different economic model in which access to their material is open to all. In the latter case, the costs of creating and distributing the information are born by the producer, not the user of information.

Definitions of Digital Libraries

Many authorities and institutions view DLs from a number of perspectives. Some among these views are presented as follows. Arms (2000) provides an informal definition of a DL as a managed collection of information, with associated services, where the information is stored in digital formats and accessible over a network. Accordingly, a stream of data sent to earth from a satellite is not a digital library. It becomes a digital library collection when organized systematically.

Therefore, a crucial part of the definition is that the information is managed. In general, digital libraries:

- Contain diverse collections of information for use by many different users.
- Range in size from tiny to huge.
- Can use any type of computing equipment and any suitable software.

For Borgman (2003) digital libraries are new forms of information retrieval systems or information systems that support the creation, use, and searching of digital content. As such DLs:

- Are not ends in themselves; rather, they are enabling technologies for digital asset management, electronic commerce, electronic publishing, teaching and learning, and other activities.
- Have become essential foundation for diverse areas and serve as primary means to deliver content for scholarship, commerce, cultural heritage and education.
- Support specific activities in specific contexts--classroom instruction, distance learning, digital asset management, scholarship, virtual museums, and so on.

According to Krowne (2003) the basic, universal goals of DLs are to provide a logically organized, conveniently accessible, and (if possible) easily actionable collection of digitized knowledge in some field or fields for an audience of learners. By "actionable" it means usable or applicable, in which case expert support (from a community) and software tools play important roles.

According to UNESCO IITE (2003) a digital library must not be seen as merely a digitized collection of information objects plus related management tools, but as an environment bringing together collections, services, and people to support the full cycle of creation, dissemination, discussion, collabora-

tion, use, new authoring, and presentation of data, information, and knowledge. As such the aims of DLs are:

- To help in generating, sharing, and using knowledge so that the communities become more efficient and productive and the benefits of collaboration are maximized.
- To aid existing communities and to facilitate the emergence of new communities of research and education.

Some other conceptions emphasize the organizational or institutional setting for the collection of digital works. A typical example is the operational definition of a DL forwarded by the Digital Library Federation, DLF (USA), in 1999. To DLF, digital



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libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities (in UNESCO-IITE, 2003).

Such diversity of conceptions of DLs leads to different visions for DL frameworks and the corresponding evaluation strategies. Borgman (2003) argues that digital libraries need to be evaluated in the context of specific applications. That means, the methods and metrics for evaluating DLs will vary by whether they are viewed as institutions, as new technologies, or as new services. Emphasizing the importance of DL evaluation, Borgmann further argues that DLs need to be evaluated as systems and as services to determine how useful, usable, and economical they are and whether they achieve reasonable cost-benefit ratios. Such evaluative studies:

- Can provide strategic guidance for the design and deployment of future systems
- Can assist in determining whether DLs address the appropriate social, cultural, and economic problems
- Can assist in determining whether DLs are as maintainable as possible
- Will enable comparison between systems and services
- Can be useful for studying aspects of communication technologies such as interactivity, adoption, use, implementation, and social impacts.

It should be stressed, however, that digital libraries are difficult to evaluate due to their richness, complexity, and variety of uses and users.

Why Digital Libraries?

First and foremost, DLs provide better delivery of information than was possible in the past (Arms, 2000). More specifically, DLs have the following potential benefits.

- *The DL brings the library to the user.* There is a library wherever there is a PC (possibly with a network connection).

- *Computer power is used for searching and browsing.* Computers are particularly useful for reference work that involves repeated leaps from one source of information to another.
- *Information can be shared.* Many DLs are maintained at a single central site, perhaps with a few duplicate copies strategically placed around the world.
- *Information is easier to keep current.* Keeping information current is less laborious when the definitive version is in digital format and stored on a central computer.
- *The information is always available.* The doors of a DL never close; materials are never checked out to other readers, mis-shelved, or stolen. But this does not mean that DLs are perfect.
- *New forms of information become possible.* 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 computer can analyze it. A mathematics library can store mathematical expressions as computer symbols that can be manipulated by means of a program such as Mathematica or Maple.

Good Digital Libraries

According to Ribeiro-Neto and Barbosa (in Theng et al., 1999) digital libraries are becoming more complex systems that include text searching, functionality relating to hypertext, multimedia, the web and highly interactive interfaces. Theng et al also argue that, as digital libraries are more than just web sites, designers of DLs need to provide efficient ways to structure information, and represent them digitally using computers. Therefore, to design good and usable digital libraries, the designer requires knowledge about:

- Who will use them
- What they will be used for
- The work context and environment in which they will be used
- What is technically and logistically feasible

The Institute of Museum and Library Services (IMLS, 2001) developed a framework of guidance for building good digital collections to discuss

issues relating to the implementation and management of networked DLs. This framework is built around indicators of goodness for four types of entities, namely: collections, objects, metadata and projects. For each of these entities IMLS (2001) identified general principles relating to quality. These entities and the corresponding principles are summarized as follows.

1. Collections and Their Principles

A digital collection is more than just an assemblage of objects. It is a selected and organized set of digital materials (objects) along with the metadata that describes them and at least one interface that gives access to them. As such the following principles apply to good collections. A good collection:

- Is created according to an explicit collection development policy that has been agreed upon and documented before digitization begins.
- Should be described so that a user can discover important characteristics of the collection, including scope, format, restrictions on access, ownership, and any information significant for determining the collection's authenticity, integrity and interpretation.
- Should be sustainable over time. In particular, digital collections built with special funding should have a plan for their continued usability beyond the funded period.
- Is broadly available and avoids impediments to use. Collections should be accessible to persons with disabilities, and usable effectively in conjunction with adaptive technologies.
- Respects intellectual property rights. Collection managers should maintain a consistent record of rights-holders and permissions granted for all applicable materials.
- Provides some measurement of use. Counts should be aggregated by period and maintained over time so that comparison can be made.
- Fits into the larger context of interoperability and international digital library initiative. For example, collections of content useful for education in science, math and/or engineering should be usable in the NSDL.

2. Objects and Their Principles

Two kinds of digital objects can be identified: those produced as surrogates for information objects that exist in some analog format (e.g. as books, manuscripts, museum artifacts, audio or video tapes, etc.), and those that are born digital, that is, that are produced originally in machine-readable form (scientific databases, sensory data, digital photographs, etc.). The framework recognizes collections as consisting of objects although it argues that no hard and fast line can be drawn between objects and collections. Principles applying to good objects are listed below. A good object:

- Will be produced in a way that ensures it supports collection principles.
- Is persistent. That is, it will remain accessible over time despite changing technologies.
- Is digitized in a format that supports intended current and likely future use or that support the development of access copies that support those uses.. Consequently, a good object is exchangeable across platforms, broadly accessible, and will either be digitized according to a recognized standard or best practice or deviate from standards and practices only for well documented reasons.
- Will be named with a persistent, unique identifier that conforms to a well-documented scheme. It will not be named with reference to its absolute filename or address (e.g. as with URLs and other Internet addresses) as filenames and addresses have a tendency to change. Rather, the filename's location will be resolvable with reference to its identifier.
- Can be authenticated in at least two senses. First, a user should be able to determine the object's origins, structure, and development history (version, etc.). Second, a user should be able to determine that the object is what it purports to be.
- Will have and be associated with metadata. All good objects will have descriptive and administra-

tive metadata. Some will have metadata that supplies information about their external relationships to other objects (e.g. the structured metadata that determines how page images from a digitally reformatted book relate to one another in some sequence).

3. Metadata and Its principles

Metadata is "data about data" or "information about information". There are three basic kinds of metadata: (i) **content**, which relates to what the object contains or is about, and is intrinsic to an information object; (ii) **context**, which indicates the who, what, where, and how aspects associated with the object's creation and is extrinsic to an information object; (iii) **structure**, which relates to the formal set of associations within or among individual information objects and can be intrinsic or extrinsic. These metadata types are also known as descriptive, administrative and structural, respectively. The following are the principles applying to good metadata. Good metadata:

- Should be appropriate to the materials in the collection, users of the collection, and intended, current and likely use of the digital object.
- Supports interoperability.
- Uses standard controlled vocabularies to reflect the what, where, when and who of the content.
- Includes a clear statement on the conditions and terms of use for the digital object.
- Records are objects themselves and therefore should have the qualities of good objects, including archivability, persistence, unique identification, etc. Good metadata should be authoritative and verifiable.
- Supports the long-term management of objects in collections.

4. Projects and Their Principles

Projects are initiatives of finite duration, designed to accomplish a specific goal. If the intent is for the collection to be maintained after the end of the project period, plans must be made for incorporating collection maintenance into the normal operating procedures of the responsible institution. Moreover, a good project:

- Has a substantial design component.
- Has an evaluation plan.
- Produces a project report.

Good digital library designers should also bear in mind that users have great difficulty using even the relatively basic Online Public Access Catalogues (OPACs). These difficulties, according to Theng et al. (1999), in part caused by the conflation of a number of problems:

- Difficulty of learning to use any new piece of software
- Difficulty for a non-expert to learn the organization of information in a library
- Difficulty of learning the particular details of organization in an unfamiliar library
- Difficulty of using Boolean search operators for many users

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Integrated Learning Environments

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1. The Virtual Learning Environment and Its Interaction with the Managed Learning Environment

Major changes are happening across the education community, affecting all aspects of learning, teaching, and administration activities. These present opportunities for huge benefits to colleges and universities from new learning environments and management technologies.

To discuss the involvement of digital libraries in the process of education, a model of learning environments is required. A JISC model of a Managed Learning Environment (MLE) and a Virtual Learning Environment (VLE) [MLEB02, MLEJIS, MLEVLE, VLREQ, VLEGRE, VLEPED] will be used here. JISC has described an MLE as follows:

"MLE is the taking advantage of the potential of new technology based learning environments to integrate information systems around the learner. These learners may be working in different modes at different times, on campus, off campus, part time or full time. To support this, information systems will need to be student centered and fully accessible from multiple locations. They will need to be integrated at multiple levels, ensuring interoperability between administrative and financial systems, learning support and learning environments and between collaborating institutions".

Using such a definition, educational institutions need to, first, rethink their educational and organizational processes as an essential part of MLE development, and second, make student-centered approaches central to that development. All MLE development should combine two processes: the design and implementation of appropriate secure and robust technical systems, and the enabling of effective educational and organizational integration towards an improved student experience. Of course, rather than being auto-

matically or necessarily aligned, these two processes often operate with varying degrees of separation and lack of integration.

A VLE [MLEVLE, JISCMLE, VLREQ] consists of the components through which learners and tutors participate in online interactions of various kinds, including online learning. The principal functions that the complete VLE needs to deliver are:

- Controlled access to curriculum that has been mapped to elements (or "chunks") that can be separately assessed and recorded. (Computer Curricula 2001, <http://www.acm.org/sigcse/cc2001/>, the new curriculum for computing developed by the Associate for Computing Machinery, ACM, and IEEE-CS, is a fresh document waiting for the application of such an approach.)
- Tracking student activity and achievement against these elements using simple processes for course administration and student tracking that make it possible for tutors to define and set up a course with accompanying materials and activities to direct, guide and monitor learner progress.
- Support of online learning, including access to learning resources,

assessment, and guidance. The learning resources may vary from self-developed to professionally authored and purchased materials that can be imported and made available for use by learners.

- Communication between the learner, the tutor, and other learning support specialists to provide direct support and feedback for learners, as well as peer-group communications that build a sense of group identity and community of interest.
- Links to other administrative systems, both in-house and externally.

As shown in Figure 1, the VLE will act as a "portal to online curriculum mapping, assessment, communication, delivery, tutor support, and tracking facilities.

The VLE makes up only one part of a college's overall systems (both computerized and non-computerized). Interfacing between these systems is possible by "connecting up" the constituent parts through the use of interoperability standards such as the IMS (Instructional Management System). Examples of these interfaces are ones between the student record system and the VLE, and between learning resources (or content) and the VLE.

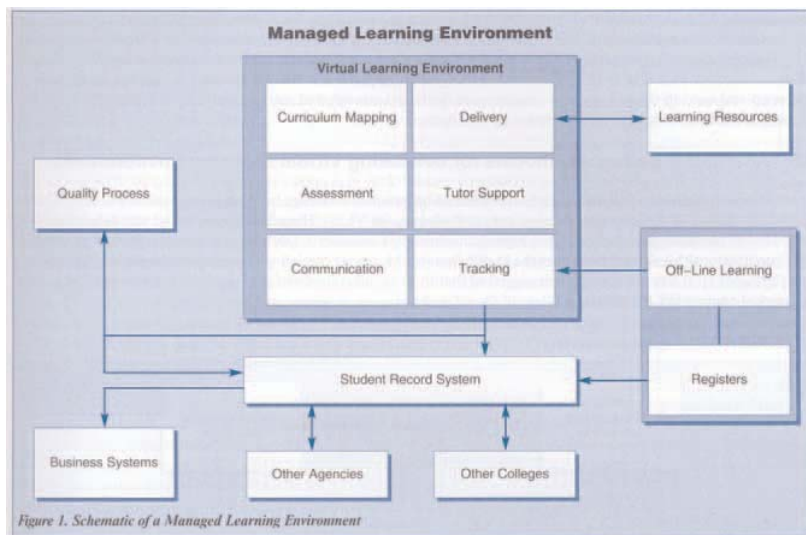


Figure 1. Schematic of a Managed Learning Environment

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VLEs are learning management software systems that synthesize the functionality of computer-mediated communications software (e-mail, bulletin boards, newsgroups, etc.) and online methods of delivering course materials (e.g. the Web). Several systems are emerging for the management of online learning, but none is currently able to deliver the full set of functions and linkages shown in Figure 1. Reports of evaluations carried out on particular VLEs, indicating the various pedagogical assumptions that developers may make in implementing VLEs, can be found at <http://www.jisc.ac.uk/jciel/mlesg/>.

Most VLE systems are intended not simply to reproduce the classroom environment online, but to use the technology to provide learners with new tools to facilitate their learning. They aim to accommodate a wider range of learning styles and goals, to encourage collaborative and resource-based learning, and to allow greater sharing and reuse of resources. A summary of the features of a number of current systems is provided in [VLETLS, VLEGRE]. In the MLE/VLE particular attention is given to the issues of interoperability, both between VLEs and various administrative systems and between VLEs and various providers of learning content.

2. Integrated Learning Environments in Different Countries

The e-learning situation worldwide is driven by similar factors, namely, technological developments increasing and changing the expectations of learners, changes in society resulting in changes in the nature of the student population (including globalization of learning), and new developments and understandings of what learning is and how it can best be accomplished.

The US higher education system is not as driven by central government as it is in other countries (e.g. in the UK). In addition to the traditional, privately run, large universities, there is growing use of commercial contracting out of instructional responsibilities rather than using tenured faculty, and increasingly private firms, such as Microsoft, are collaborating in higher education or running their own universities. These last developments are already becoming factors in UK and are likely to increase in coming years, once

again driven by the globalization of the educational marketplace.

The term "VLE" and "MLE" are not used in the US; distance learning is frequently referred to as remote learning, and the term "virtual classroom" and "Web-based instruction" are examples of terms used in a broader sense than VLE. There is no generic term for a networked learning environment encompassing both campus-and distance-based online instruction. This is in spite of the fact that the systems or platforms referred to as VLEs and MLEs are widely developed and used in the US, by both commercial firms and educational institutions. The difference in language probably indicates a difference in conception or priorities.

3. Alternative Pedagogic Models for Evaluating Virtual Learning Environments

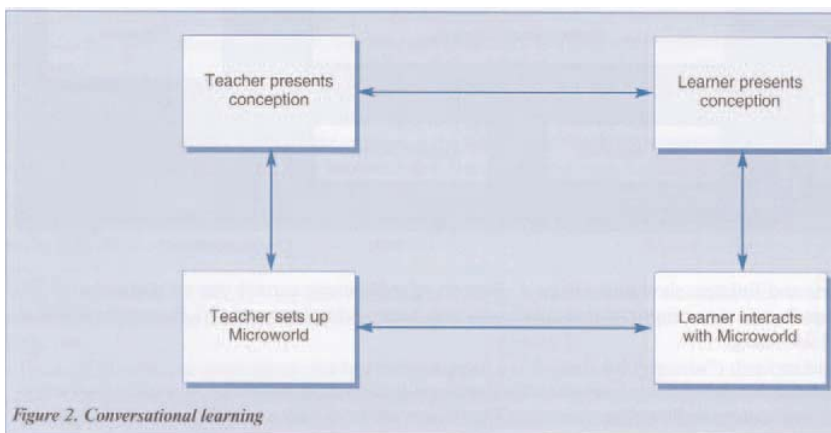
Two different models (one from education, the other from system modeling) have been explored in [VLEEVA] as a basis for constructing a pedagogical evaluation methodology for VLEs. The educational model was developed and applied to the use of learning technology in higher education by Laurillard [CONV93] as a Conversational Framework. The Organizational Model is drawn from the Viable Systems Model for modeling organizational systems proposed by Beer [ORGM81]. It has previously been suggested that this organizational systems approach may be applicable in a pedagogical context [VLEEVA]. Basic ideas of these frameworks are presented in Figures 2 and 3.

The US Department of Defense's Advanced Distributed Learning Initiative (ADL) summarizes many approaches to solving the scala-

bility or "teacher bandwidth" problem in a model close to the conversational one:

- A one-to-one instructional model in which a teacher tailors instruction to individual student needs is preferable to other instructional models.
- Human (teacher-student) interaction in large scale learning environments is not economically feasible; therefore,
- Automating feedback and other learning support via intelligent instructional systems is the only viable solution to providing scalable online learning.

But automated instructional systems completely lack human interaction and social negotiation, which learning theorists are increasingly stressing as crucial to supporting meaningful learning. Highly decontextualized learning objects are reusable in the greatest number of learning contexts, but they are also the most expensive and difficult for instructional designers to reuse, creating a "reusability paradox". Fortunately, however, when educators have been trained and motivated, they can easily identify and share very small knowledge resources that can be readily reused by others, once discovered. This process can be facilitated by tools that support the synthesis and construction of larger resources out of a number of small resources. Examples of such tools include the Walden's Path software from the digital library research group at Texas A&M University, USA, the instructional architect from Utah State University, USA, and colleagues, and the VIADUCT tool that is part of the CITIDEL (www.citidel.org) effort at the Virginia Polytechnic Institute and State University, USA.



¹See: <http://research.microsoft.com/programs/>. The Jones Education Company aims to "get the cost of real estate out of education" and uses cable television to deliver six certificates and 11 degree in conjunction with 14 institutions. For these and more see: Michael Thorne. Universities of the Future. PowerPoint Presentation at SeSDL videoconference seminar series 2000/2001; scroll down page at: <http://www.sesdl.scotcit.ac.uk:8082/seminar/index.html> for link.

Some ideas of learner's organization and interaction with a knowledge sub-domain of the Organizational Model are reflected in the online self-organizing social systems (OSOSS) [OSOSS]. The most significant departure of the OSOSS approach from conventional learning objects approaches is that it relies on human beings to locate, assemble, and contextualize the resources. The OSOSS provides a conceptual framework for a new method of indexing, discovering, combining, using, and evaluating digital educational resources:

Indexing and discovery: Learning objects are not catalogued with metadata and submitted to a central repository. Community members know of existing resources and local resources collections. Learners gather information from a variety of sources. Individual resources are discovered through "community queries" in which community members respond with pointers to resources they know personally.

Combination: Learning objects are not automatically populated into one of many instruction templates. Without the direction of any single grand architect, peers contribute relevant resources and descriptions of how they might be employed within the context of the initiator's problem.

Use: Learners do not sit through a temporal sequencing of resources and assessments linked to decontextualized instructional objectives. They employ resources provided by peers as mediational means in the solution of a self-selected problem or accomplishment of another self-selected goal.

Evaluation: Learning objects are not critiqued out of an instructional context with a summative quality rating. Learners evaluate the relevance and suitability of resources within a specific learning context.

In an OSOSS learners are provided with meaningful learning support "anytime anywhere", yet the support is reached with human-to-human interaction. Learning objects are successfully embedded in a meaningful learning context, but the objects are discovered and contextualized by humans - again without scalability's becoming an issue.

Potential problems with the OSOSS approach:

- A standard curriculum may be difficult to impose on individuals in an OSOSS.
- Assessment of individuals may be difficult to carry out in an OSOSS.
- Required feedback may not be immediate in an OSOSS.

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Digital Libraries and Virtual Learning Environments

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1. Tasks of Digital Libraries in the Learning Environments

Within the context of changes in society, technology, and education in recent years, there have been two key developments relating to e-learning infrastructure in UK universities and colleges:

- The adoption of virtual learning environments and managed learning environments.

- The implementation digital and hybrid libraries.

VLEs are tools which support e-learning through the provision and integration of Web-based materials, including learning materials, links to other resources, online communication tools (such as electronic bulletin boards), and assessment tools. When such VLEs are integrated with other information systems and processes of

the institution, e.g. student records, the resultant system is generally referred to as an MLE.

For VLEs, truly digital libraries are required with all resources and services available online. Some of the candidate tasks that DLEs could support include [EDLL00]:

1. Highly directed uses, such as lab exercises to reinforce a specific disciplinary concept.

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2. Instructional modules that introduce concepts in an incremental manner and can be customized and extended by faculty for use in lectures.
3. Free form exploration conducted by students preparing term papers or faculty putting together a lecture that might include personal manipulation of data sets, information visualization, and the integration of new information or data sets to augment existing content.
4. Collaborative applications that might be used by students doing term projects or faculty and teaching assistants who are team teaching.
5. Discipline- or domain-specific methods of building knowledge that support specific information seeking and use processes.

The key characteristic of learners with regard to the linkage of VLEs with digital libraries is their diversity. More and more learners are learning from home, from their workplace, part-time, or from a geographical distance to their course. They are coming from all age groups, and are learning throughout their lives. They are coming to the university expecting more, based on their experiences with the Internet and other information and communication technologies. There is no longer a typical "higher education" learner. Where library and information resource support to teaching was once comfortably housed in a library building, that support must now be provided to all students regardless of the medium or location of their learning.

2. General Criteria for Digital Library Quality within the Learning Environment

Quality of the resources to be discovered in the library: There is a great deal of discussion and divergence - some libraries focus on quantity as in the public library model; some focus on quality, as in specialized collections that might be found in a public library.

Seamless access: This includes seamless integration between the learning environment and the library or information resources at any point in the VLE and within one user's portal across

different courses, departments, or even institutions. The most important aspect of this was the single sign-on; one authentication procedure, regardless of whether the user is accessing the VLE from on- or off-campus.

Warning notes that were sounded included potential problems with seamless cross-searching of different databases, indexes, and other information resources. Lack of interoperability of search vocabularies, and a lack of awareness of and strategies to deal with this in course design, could lead to confusing, ineffective resource discovery experience for learners.

All library functions online: Concerns about this include the potential diminishment of two important educational functions of traditional libraries: serendipitous browsing (finding the book you need right next to the one you were actually searching for); and their social function as a place to meet fellow students and discuss sources of information, etc.

Individualization for the learner: This concept includes such ideas as the student portal, which could cross institutions and be available throughout a learner's life; the Amazon.com idea of tailoring resources and notifying the user about relevant resources; the ability to save and share searches; the ability to take and embed notes with information resources, and to share resources; and settings for "level", such as undergraduate, third-year, etc., with options to adjust upwards if the user wishes.

Flexibility for the teacher: Teachers would like to be able to adapt or update courses easily, including the information resources embedded in or linked to them, from anywhere. Flexibility in terms of being able to design the course according to their own pedagogical approach, rather than having it dictated by the system, was also seen as extremely important, and vital for bringing academics on board with e-learning. Finally, the system should have the capability to feed back data to the teacher about what information resources and services are being used.

Universal accessibility: Universal accessibility includes accessibility for users with differing physical abilities, adaptability to differing learning styles; availability on- and off-campus (an

issue with regard to certain subscription library materials), equitable access for distance learners abroad (usually the biggest problems are access to hard copy resources and time zone problems with communications), equitable access for the economically disadvantaged (those who have to wait in line at a computer center versus those with a PC or laptop of their own), and usability on any platform or hardware.

3. Example of a Project Incorporating a VLE and Digital Libraries into the Learning Process

Incorporation of VLEs into the learning process and interaction of VLEs with digital libraries can be illustrated by the framework planned according to a recent JISC/NSF proposal [GEOFRA]. The framework shows how the courses, content, and delivery mechanisms at the participating institutions (University of Southampton, University of Leeds, University of California at Santa Barbara, Pennsylvania State University) are linked to a range of digital resources through the application of VLE and DL technologies. As courses and modules cover particular topics, students will use links to digital resources that include a geospatial classification, within each of the following areas: human geography, geomorphology, geographical information science, and Earth observation.

Layer 1 in Figure 4 outlines the existing courses offered at partner institutions. Within each course, smaller components of learning can be identified that might involve one lecture and seminar in a week, or one practical class or on field visit, which are denoted as student learning nuggets, and which form *Layer 2* in the framework. *Layer 3* and *4* represent the integration of VLE and DL technology, where *Layer 4* shows a DL middleware technology for managing collections of resources, such as those shown in *Layer 5*. The instances of the middleware can interoperate, so that all the resources in the distributed collection are available to the VLE users.

The Alexandria Digital Earth Prototype (ADEPT) [ALEXBI, ADEPRO, ADEDLE, ADEPTS, ADEPTA, EGEODL] project has developed dis-

¹See JISC/RSLP funded project HILT (High Level Thesaurus) for a full analysis of this issue, at: <http://hilt.cdlr.strath.ac.uk/>

tributed digital libraries for heterogeneous geo-referenced information. In ADEPT, *libraries* are sets of collections. Libraries expose a single standard set of interfaces to all their collections, making it possible to issue a single query against multiple collections. (By contrast, the interfaces to collections are not standardized; instead, a library has standard mechanisms for adapting itself to whatever interfaces the collection exposes.) A library is, in effect, a "collection broker", mediating standardized access to its.

ADEPT incorporates a *bucket framework*: a canonical, simplified representation of the source metadata of heterogeneous collections, allowing uniform querying across all the collections.

The ADEPT architecture has recently been extended [ADECOA] to support an innovative form of VLE, based on the hypothesis that learning should proceed from a formal presentation of concepts and their relationships within a domain of knowledge. The architecture supports a representation of a domain ontology, or concept space, linked to a collection of learning objects. The granularity of these objects is more appropriate to their use in VLEs than traditional "information containers", such as books.

The proposal [GEOFRA] that has been accepted aims at the resource-based learning that involves active participation with multiple resources. Students are motivated to learn about a topic by trying to search for and evaluate authentic information. This learning experience mimics real life in targeting

the learner as the routine information hunter and interpreter who constructs knowledge by problem solving with information tools. The advantages to this approach include:

- A student-centered approach to learning;
- Promotion of the development of thinking skills (such as problem solving, reasoning, and critical evaluation);
- Improving student research skills, which supports the research-led mission of all four partners;
- Flexible and adaptable resources and materials for different learning styles and strategies;
- Integration of key skills and competences within the academic framework.

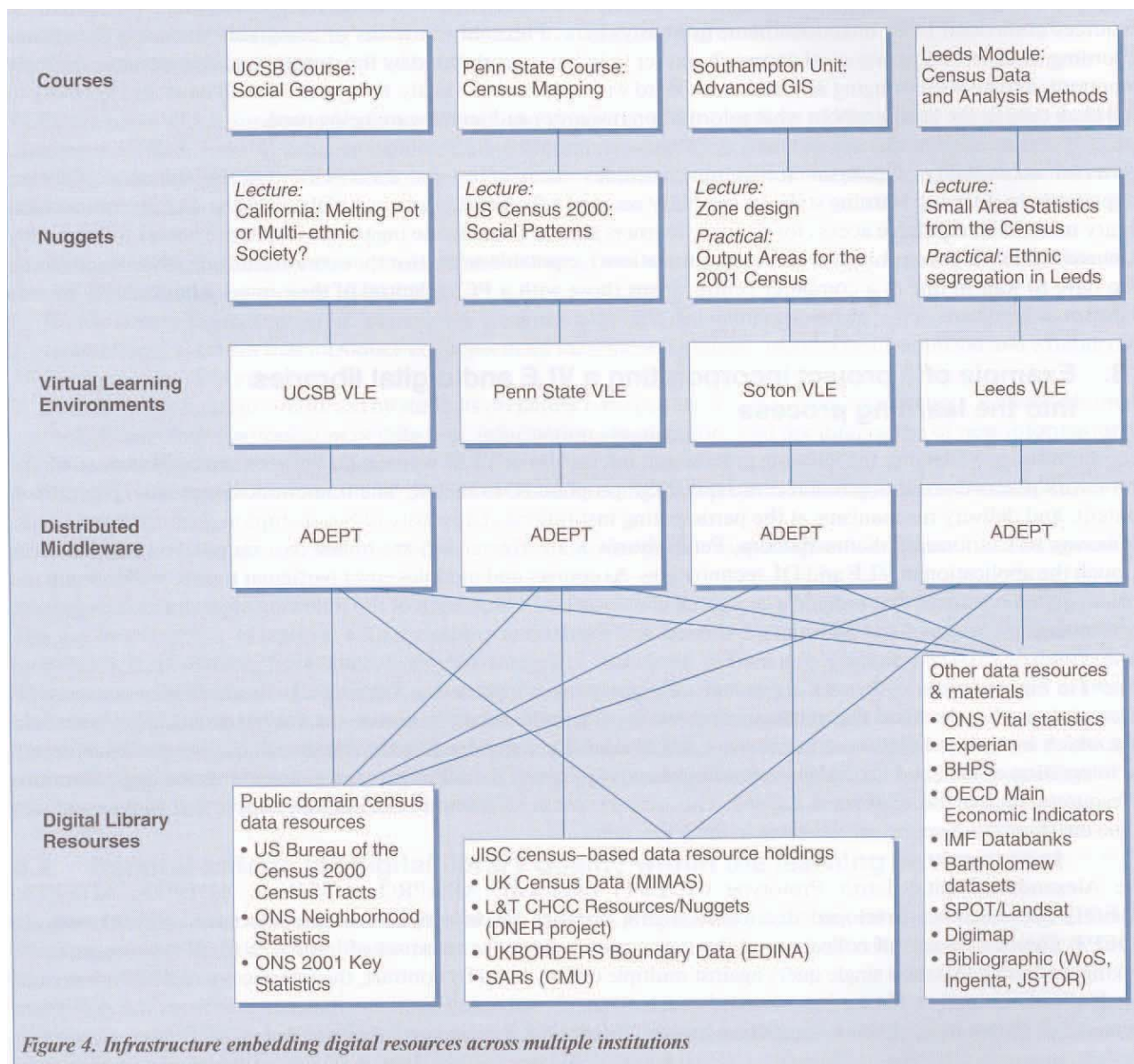


Figure 4. Infrastructure embedding digital resources across multiple institutions

The rest of this survey is devoted to the current state and anticipated evolution of DLEs that eventually should meet the requirements discussed above. The survey shows that the existing technology and services constitute a step in the evolution to true DLEs.

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IICBA's Electronic Libraries

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The concept behind IICBA's Electronic Library Series is simple: many teacher education institutions and schools lack up-to-date reference materials for use in teaching. IICBA seeks to provide these materials through CD ROMS.

The following libraries are presently available:

- i. Primary Mathematics (in English)
- ii. Primary Science (in English)
- iii. Secondary Science (in English)
- iv. Primary Mathematics (in French)
- v. Primary Science (in French)
- vi. Primary Mathematics (in Portuguese)
- vii. Primary Science (in Portuguese)
- viii. Primary Mathematics (in Arabic)
- ix. Primary Science (in Arabic)
- x. School Management (in English together with the Commonwealth Secretariat)
- xi. HIV Library (in English)
- xii. Assessment of Learning Library
- xiii. Large Classes Library
- xiv. Teacher Education Portal and Electronic Library

The following are close to completion:

- i. HIV Library (in French)
- ii. HIV Library (in Portuguese)
- iii. Educational Policy (in English)
- iv. HIV interactive CD-ROM (in English)
- v. Girls and Women Education (in English)
- vi. School curriculums for HIV/AIDS (in English)

The Primary School Mathematics Electronic Library has been developed to assist teacher trainers and teachers in Africa to improve the teaching and learning of mathematics in primary schools. It seeks to:

1. Provide samples of innovative, practical and interesting lesson plans that can be adapted to suit conditions in each African country.
2. Provide teacher trainers with the basis for discussion of useful methodologies that can be utilized for primary mathematics teaching in Africa.
3. Initiate discussion in teacher education and curriculum development institutions on how to improve the teaching of mathematics in primary schools.
4. Provide access to up-to-date research and development in primary mathematics teaching.
5. Provide a practical guide to educational psychology and methodology prepared as part of the UNICEF Edukit Program (1996).

These materials are also available in French, Portuguese and Arabic.

The resource material for school heads in Africa electronic library is intended to help school managers improve their performance. This Material was originally prepared under the Training and Support Programme

for School Heads in Africa supported by Ministries of Education in Africa, the Commonwealth Secretariat, UNESCO, SIDA and GTZ. Editing, design and production of the training modules was coordinated by the Commonwealth Secretariat Education Programme. It is designed to be used in any English-speaking education system in Africa; country-specific versions may be available for some systems. The materials can be used in a variety of contexts: for self-study, distance learning, by peer groups and in workshops, and as a basis for coursework in institutions and faculties of education. They attempt to introduce school heads to important aspects of managing a school, from the most basic to more complex tasks, in a very practical way.

The HIV/AIDS electronic library is a compilation of resources taken from the Internet, NGO's, national curriculums, United Nations agencies and individuals working to educate youth about HIV/AIDS. This Electronic Library is intended for use by teachers, teacher trainers, curriculum developers, policy makers, and all of those people involved in the teaching and training of teachers and those who work with children in the fight against HIV/AIDS.

The purpose of this Electronic Library is to give access to new, up-to-date and useful materials that will assist in learning and teaching about HIV/AIDS, and, in particular, about the

devastating effect that the epidemic is having on Africa. Although Africa is experiencing the largest percentage of HIV/AIDS infections in the world, HIV/AIDS is a global problem and it is important for students, in particular African students, to be aware that the epidemic is global in scope. Therefore, the included materials are comprehensive and cover a wide variety of topics surrounding HIV/AIDS. Teachers, teacher-trainers and students alike can benefit from the information contained in this Electronic Library.

It is our hope that teachers and teacher trainers will see the urgent need to integrate HIV/AIDS education across their entire curriculum, and will realize that there is a place for teaching about HIV/AIDS in every lesson, and for every subject. This Electronic Library contains lesson plans for grades 3-12, curriculum guides, visuals, information and facts sheets about the disease, scientific information, development information and statistics, among many other important documents. The Electronic Library also contains information on policies that have been implemented in some African countries that are allowing education systems to play an important role in fighting against HIV/AIDS.

The Electronic Library on Learning Assessment includes excerpts from selected books and Training Material Modules on Educational Assessment. This Material is intended for Teachers and Teacher Trainers throughout Africa. The books are:

Alternatives in Assessment of Achievements, Learning Processes and Prior Knowledge (edited by Birenbaum, Menucha and Dochy, Filip J.R.C). The

books address assessment issues related to "Culture of Assessment" in two parts. In the first part, new Alternatives in Assessment of Achievement in various subject matter areas are discussed, focusing on agenda, practice, impact and evaluation of the assessment. In the second part, issues related to the shift towards Assessment of the Learning Process are discussed.

Learning Through Assessment: A Resource Guide for Higher Education (Gardiner, Lion; Caitlin, Anderson and Barbara Cambridge) offers a comprehensive resource guide and annotated bibliography. Contact information for organizations and institutions that provide a range of resources that include audiotapes, books, conference and websites. The complete access to these specialized resources is to provide council for teachers and administrators on various aspects of assessment.

Assessing Assessment: Intuition or Evidence? (Gipps, Caroline; Brown, Margaret; Bet McCallum and Shelly Mcalister) provides a detailed case study on the effects of a compulsory primary national assessment program in mathematics, English and science on class curriculum and student aptitude in England. The interviews, data and experiential evidence compiled in 32 schools over four years, offer insight into teacher perspectives on the role of assessment in influencing student performance and the learning-teaching exchange.

Testing, Reform and Rebellion (Corbett, Dickson and Bruce Wilson) examines the impact and implications of the standardized tests as a deterministic model of student achievement. The

authors claim that these tests are used as a political-tool. The legitimacy of these tools is premised on their ability to quantify the performance of students and schools, in order to implement hastily conceived and far-reaching educational reform. The authors posit that nationwide testing programs do control school activity on the local level, but the resulting activities do not translate into real reform.

A Training Material on Educational Assessment (Tizazu Asar and Endale Shewangizaw) has three modules. Module One includes definition, instruments and purposes of educational assessment. Module Two explains the techniques of test development. Achievement test development process involves three consequential stages: planning, item writing and reviewing. The basic principles of each activity are discussed here. Module Three discusses about Continuous Assessment (CA).

The electronic library on Teacher Education aims at providing relevant materials for teacher educators in Africa. The articles are culled from the Internet. The major categories this library are: Teaching English, Teaching Math, Teaching Science, Supervision, Assessment, Methodology, Large Classes, General Articles on various aspects of teacher education.

The articles contained in the Large Classes library are meant to provide African teacher educators with information, techniques and survival strategies that would help them cope with the situation.

These electronic libraries are available online on <http://library.unesco-iicba.org>

The Internet and Its Uses in the Education Sector

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Brief History of the Internet

The Internet is basically known as a network of networks. Computers in a wide area network are able to communicate and exchange information.

The Internet is a result of the US military research in the 1960's. The Advanced Research Project Association (ARPA) conducted the research and ARPANET was developed, which was a network of four campuses.

According to Howe (2001) the Internet then known as ARPANET, was brought online in 1969 under a contract let by the renamed Advanced Research Projects Agency (ARPA) which universities in the southwestern US (UCLA, Stanford Research Institute, UCSB, and the University of Utah). By June 1970, MIT, Harvard BBN and systems development corp. (SDC) in Santa Monica, Cal. were added. By January 1971, Stanford MIT's Lincoln Labs, Carnegie-Mellon, and Case-Western

Reserve U were added. In months to come, NASA/Ames, Mitre, Boroughs, RAND, and the U of Illinois plugged in.

We can see that the benefits of this type of connectivity was foreseen, as the number of users increased significantly with in a short period of time. The new technology witnessed another phase of development in the 1970's. The application of email and USENET newsgroup were the most significant ones.

Howe (2001) notes "the Internet matured in the 1970's as a result of the TCP/IP architecture first proposed by Bob Kahn at BBN and further developed by Kahn and Vint Cerf at Stanford and others throughout the 70's. It was adopted by the defense department in 1980 replacing the earlier Network Control Protocol (NCP) and universally adopted in 1983".

The 1980's was a time for the Internet to expand because of the revolution that took place on desktop computers. Companies were able to join the Internet as a result of the availability of cheaper computers.

One of the most important developments in the history of the Internet was the World Wide Web (WWW) in 1991. Gopher was also developed in the early 1990's.

Some points about the Education Sector

"Every person - child, youth and adult - shall be able to benefit from education opportunities designed to meet his or her basic learning needs. These needs comprise both essential learning tools such as literacy, numeracy and problem solving, and the basic learning content such as knowledge values, and attitudes required by human beings to be able to survive, to develop their intellectual capacities, to live and work in dignity to improve the quality of their lives, to make informed decisions, and to continue learning".

From Article 1.1 Convention on the rights of the child

It is important to discuss about the education sector in the modern world, before trying to see the usefulness of digital ICTs mainly the Internet in education.

Hadad and Draxler (2002) state that "One of the most universally recognizable and enduring human institutions is the school. Changes in schools over time have been mainly in the logistics: physical plants, materials and comforts and conditions of teachers and learners. In many cases, technologies have been brought in to enhance an otherwise static process. The learners gather, the teachers communicate information, the learners reproduce what they have heard and seen, and they are evaluated on their accuracy. The relevance of this process to life has been questioned often by seldom modified substantially never system-wide."

According to Tiffin and Rajasingham (1995) "it is the interaction of these four factors - learner, teacher, knowledge and problem in a particular context - that constitute the fundamental communication process that is education. All these factors need to be present for education to take place, but the factors only exist in relation to one another and only for the period of time it takes a learner to master an ability to solve a class of problems."

There is no doubt that ICTs can be a great support to the education sector. The implementation of radio and television to facilitate the teaching learning process has been there for a long time. Other recent technologies are also being used in the education process. The most powerful and appropriate technology that is being utilized in education is the Internet.

The need for the use of the Internet in Education

Education has existed as a tool for human beings to pass on knowledge from generation to generation for many hundreds of years. In these hundreds, there have been changes in the ways it is conducted and the materials/medium used for information exchange, and for preserving and distributing knowledge/Information.

Since the creation of the Internet, it is becoming the most affordable and appropriate source of information. The number of its users is increasing drastically and most importantly is reaching to everyone.

Haddad and Jurich (2002) explain that "social economic and technological changes of the past decades are making education and training for all more crucial than ever. Yet educational systems, to different degrees worldwide, are struggling to afford educational opportunities for all, to provide their graduates with the necessary knowledge and skills for evolving market places and sophisticated living environments and to prepare citizens for lifelong learning.....some countries and institutions have turned to information and communications technologies (ICTs) and are exploring ways by which ICTs may help them in pursuing their educational goals."

The Internet is a source for a vast amount of human knowledge. Since education is also a tool for passing

knowledge between societies/generations there is a great inter-relationship between the two.

According to Forsyth (1996) "with the advent of the wider availability of the Internet, there emerges a belief that there is another structure to support teaching and learning delivery of information and there is an assumption that becomes 'reality': the Internet also has possibilities to assist learning. After all, an exchange of Information between peers is an educational process. However, in a teaching and learning situation the exchange is between teachers and learners. This is not an exchange between equals. The development of course materials for the Internet need to take this imbalance into account."

This raises the issue of the roles the Internet can play in education or in other words in what ways can the Internet be used in Education.

De Cicco et al (1999) say that one way to view the web's benefits is to divide its use into three areas

- as a resource
- as a publishing medium and
- as a tool for discussion and communication

The Internet has become the greatest resource of information on almost any field of activity. The increasing number of users and the ease of putting information there makes it a common place for information in demand. The issue these days is information overload than shortage of information in the Internet environment.

The Internet is also being used mainly by higher educational institutes, for delivery of information in the education process. It has managed to become the main medium in distance education.

Kem and Esirgen (1998) tries to show the extent of the use of the Internet for distance education by saying "Many universities and their professors are experimenting with and implementing the "virtual classroom", classes taught and conducted through the Internet, virtual eliminating the need for any classrooms. As Michael Loceff of Foothill College says 'In the era of fiscal tightening, it may just be those colleges which are proactive in utilizing the Internet and web are the ones that will adapt, survive and ultimately thrive'".

It should also be considered that the Internet is a tool to distribute information to many people in a very short period of time.

Of course a number of limitations exist in the use of the Internet especially in the developing world, but the Internet is proving to be a major component of education sector and even that of our day-to-day activities.

Internet Search tools

The ease to publish documents on the Internet, the fact that it is cheaper to use the Internet as a tool for reaching to many and other factors makes it a great source of information but at the same time cause a problem of information overload. That is where the issue of search engines arises.

Bickerton defines search engines as "evaluators of material presenting the user with a list of sieved and selected pages that are chosen according to keywords entered. As intermediaries between the user and the mass of information on the web, they are your first port of call when publicizing a new site....".

The function of search engines is to facilitate the effective accessing of relevant information. They allow users to search for sites using keywords of preference.

There are a number of search engines available currently, among which Google, Yahoo! and Altavista are among the most popular ones. These search engines have some features in common. For flexibility in searching all three have other categories besides the "web", which searches websites using the keyword entered. These are "images", "yellow pages" and "products" in Yahoo!, "images", "Mp3/Audio", "Video", "Directory" and "News" in Altavista and "Images", "Groups", "Directory" and "News" in Google.

All three have options for advanced search under which they give detailed options like if results are needed with exact phrase or any of the words entered for searching, i.e. the Boolean expression, domain type, date of update and so on.

A more user-friendly system would help the user to retrieve the required information more efficiently.

Also, putting more information in the search system would avoid information overload.

To show the differences in search results among these three search engines, I made a search using the term "Internet in developing countries", using each of the engines. The numbers of sites found (number of hits) after the search were about 1,540,000 for Yahoo! 225,419 for Altavista and 2,180,000 for Google. It is obviously impossible to check on all the sites to see if that is what the user is looking for.

The importance of search engines is invaluable when it comes to retrieval of information, but I believe that a lot more can be done in terms of improving the quality of search results.

The Internet in Education

In the 1990's the Internet has become the main tool for organizations worldwide, for communications and retrieval of information.

There are different means of communications that can be applied for organizations. The most common and useful one is the email, the advantage of using it being that it takes a very short time to reach to the person it is sent to.

Even though chatting is mostly known for entertainment, there is a great potential in it, to be used by organizations for discussions between two or more people. Other features like audio and video, besides text, enhance the usability of this technology.

Video conferencing is being used, mostly by educational institutions, to conduct conferences between people in two or more geographically distant group of people.

Of course these communication technologies have their own advantages and disadvantages.

As we discussed earlier the ease in publishing documents on the web is the main factor for the constant growth of contents.

Organizations especially in developing countries can benefit a lot from the Internet as a source of information. Again in the education sector, the Internet is becoming the main bridge to connect the developing world with the rest. Students in Africa can now access an article on a certain subject by a pro-

fessor from any part of the world. And the good part is that the student could be accessing the article only minutes after it has been released.

Organizations are also representing their existence in the web world by putting websites that would tell people about who they are and what they do, for promotion purposes. Urls have now become as common as telephone numbers. The greatest advantage of promoting organizations on the Internet is that they can reach to far more millions of people, within even less cost and time, than other media.

Information Resources on the Internet

Most people agree that Africa's biggest challenge in the 21st century is HIV/AIDS. The disease is killing millions of people every year in the region. At the same time there exists thousands of organizations dealing with the different aspects of HIV/AIDS among which most focus on prevention. Information is the greatest tool these organizations can use to succeed in the prevention of the disease.

For information on issues related to HIV/AIDS the first thing these organizations use as a resource is the Internet, other than their own researches and available documents.

The most popular resource on the net for documents on HIV/AIDS is the UNAIDS website (<http://www.unaids.org>).

In most cases the user may only know of the name of the organization but not the url to it's website. So the first thing this user would do is to search by the organization's name as the keyword using one of the search engines.

The other option is to search by terms like HIV/AIDS. The UNAIDS website will definitely be in the search result but the problem is that the search engine will list too many websites that contain the term "HIV/AIDS" in any of their pages. This makes it very difficult for the user to access the website especially if it is not listed among the first 20.

In the case of UNAIDS, I have noticed that all the three engines put it first in the list of search results. The numbers of hits of the searches were 2,740,000 on Yahoo!, 4,000,000 on Google and 876,427 on Altavista.

If the user is only searching for relevant documents on HIV/AIDS, then what he/she will do after the search is try to check on the first few of those thousands of sites. So the hierarchy of the list is very crucial.

The way the websites are organized is also an important factor. If we look at the UNAIDS website, there is a very good arrangement of resources. The viewer can go to a list of "topic areas" the link to which is clearly put in the publications section. The user can then open and see the resources under the topic area of his/her interest.

Another important website for information on HIV/AIDS is the WHO site (<http://www.who.int>). In the HIV/AIDS section here, there are links to important topics, facts and figures, publications and so on. The publication section is arranged by topics. Full text documents are available in these topics arranged in chronological order.

Another information resource that I found interesting is the website of the Royal tropical institute (<http://www.kit.nl>). This website has links to it's electronic information on HIV/AIDS and reproductive health from its current discussion archives and Information lists. These are arranged in different topics but the viewer has to pass through a number of pages to reach to the actual content. It also has a search facility for the discussion group archives.

Is the Internet worth using?

The Internet has already become a major part of human life. Organizations cannot simply afford not using the Internet in their activities. One of the major issues is promotion.

Bickerton and others (1998) state, "It [the Internet] is an international listing that enables both existing and potential customers to have easy access to information about your company. The Internet has become the phone book to the world. The benefits of enlisting increase in proportion to the global coverage of your organization. For international organizations, the Internet provides the first opportunity to produce a truly global brochure that can be quickly and easily kept up to date."

In the education sector, the Internet can be used for the delivery of educational materials, to quickly exchange messages between a teacher and students, to conduct discussions among students and to easily cover geographically large area.

When it comes to cost, according to Bickerton "despite the frustrations of quality and global publication, organizations can see low cost as one of the most exciting opportunities of Internet technology. An Internet presence can be created for less than the price of a small direct mailshot. There are ongoing costs of keeping an Internet site live and the cost of updating the information must not be underestimated but the key is that there are relatively few production and distribution costs."

The world is moving into the information age, and being left out of the Internet, one of human beings greatest achievements, is staying behind.

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NEWS IN BRIEF

The Deputy Director of IICBA led a mission to United States and Canada

Dr. Joseph Ngu, the Deputy Director of UNESCO-IICBA, led a mission of three people to United States and Canada from August 22 to September 4, 2003. The group consists of Prof J. Cronje from University of Pretoria, South Africa, and Prof. Habtamu Zewdie from Addis Ababa University, Ethiopia.

The mission aimed at three important targets: Negotiating content for the Master of Education in Information Communication Technology (MED-ICT) Program, IICBA is trying to introduce in Sub-Saharan Africa; Educational visit to universities in USA which are well known in delivering MED-ICT via ICT, and exploring the possibility of identifying development partners who could finance IICBA's activities in Africa.

UNESCO-IICBA has tailored a M.Ed. in the use of ICT for Education curriculum. Initially, IICBA plan to run the program in at least three Anglophone universities in Africa: Ghana, Uganda and Ethiopia. The Sudan University of Science and Technology is already running the curriculum from the University of Pretoria and that has given us a valuable experience to tailor the curriculum. The new curriculum is designed and tailored in such a way that the content originators will teach the course by distance and/or face-to-face in block teaching mode. Local course facilitators will be attached with each course.

Potential content providers were identified among universities in the USA and Canada. The three-member delegation visited George Washington University in USA, Dr Ngu visited University of Montreal in Canada and Prof. Habtamu visited Pennsylvania State University (PennState) and University of Pennsylvania in USA. The details of courses that fit into the MED-ICT Program, course delivery modes and modalities for delivering the required services by the universities was discussed. The universities visited were identified for having strong Master of Education in Information

Communication Technology. The group has also benefited from the visits of the ICT facilities of the various Universities (network, content production units, videoconference facilities, etc).

The group also held discussions with representatives of several International Organizations and Agencies located in Washington D.C. area on possible areas of collaborations. The following are among the organizations that showed interest in IICBA's activities.

1. The World Bank
Dr Shola Aboderin,
Regional Coordinator, ODL & ICTs
for learning, Africa Region
Dr Bobak Rezia, Sr. Information
Specialist, Africa Region
2. African Virtual University
Prof. K. P. Dzvimbo, Rector
3. U.S. Agency for International
Development
Mr Gary Bittner, Director, Higher
Education & Workforce Development
Ms Tracy Brunette, Basic Education
and Technical Advisor
Mr Stephan A. Tournas, Computer
Assisted Learning Specialist
4. American Federation of Teachers
Mr Joseph W. Davis, Coordinator,
AFT-Africa AIDS Campaign

Dr Ngu, the Deputy Director extended his visit to Canada, University of Montreal. The purpose of the visit was to renegotiate the expansion of Micro-programme of the use of ICTs in Education for Francophone countries from Cameroon to Burkina Faso, Mali and perhaps Benin.

Visit to the Pearson SkyLight Professional Development Company, Chicago/USA, 19-29 September 2003.

UNESCO IICBA and Faculty of Education of Addis Ababa University agreed to embark on a new M. A. program in the teaching of Math and Science via distance education. Consequently, a sales agreement was signed (29 August 2003) between UNESCO-IICBA and Pearson SkyLight Professional Development Company, Chicago, USA for the purchase of

instructional materials in the teaching of Math and Science.

A tour team comprising of Prof. Tirusew Teferra, Dean (Faculty of Education, AAU), Dr Temechegn Engida, the Associate Dean for Research and Graduate Programmes and Ato Bizuayen Tamirat, a Staff from IICBA, visited the SkyLight Professional Development Company and held discussions with staff from partner universities in order to finalize details before the program's commencement. The discussion participants from USA were:

Dr. Karen Evans, V/P, Business Development, Pearson SkyLight, Facilitator

Dr. Janet McMahill, Associate Dean, Drake University

Dr. Hattie Gilmore, St. Mary University

Dr. Larry Gregg, St. Mary University

Mr. Thomas Super, Senior Project Manager, Pearson Professional Development

The purposes of the study tour were to lay the groundwork for the commencement of the program, to discuss details on program design, content, structure and implementation, and to exchange experiences on distance learning. It was learnt that Pearson SkyLight is an internationally recognized company dedicated exclusively to continuing education to teachers and administrators and has 30 years of working experience in the education area and chooses partners that are seriously innovative. The partner universities have also many years of experience in offering distance courses that are on line, video and print based. The courses selected for the new MA programme are based on "Enquiry Method" and focus on improving practice of teaching (practicum).

The tour team then visited Dominican University, the focal center being the School of Education. The Dean, Sr. Dr. Colleen Mc Nicholas, and her faculty staff briefed the tour team about the University's partnership with SkyLight for the last six years in areas of postgraduate programmes via distance.