
The strategic role of digital libraries: issues in e-learning environments

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Abstract

This article describes research aimed at providing educational organizations with practical strategies for implementing e-learning. While conducting the research, the role of digital libraries in e-learning environments was recognized, and the core procedures for building a supporting, effective learning environment by means of the digital library were suggested. In addition, a number of relevant issues arising in the course of this research were addressed by means of focus-group discussions.

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Introduction

Recent developments in information and networking technologies have resulted in the creation of useful learning resources and mechanisms, both in multimedia formats and on the Internet. Today both instructors and learners need to acquire a new type of literacy – the ability to create, structure, locate, search, retrieve, and use materials in multimedia and digital forms. Contemporary distributed digital environments allow instructors and learners to communicate in virtual interconnected spaces and engage in on-line real-time seminars and tutorials (Bouras *et al.*, 2001). These new ways of learning have been generally categorized as “e-learning”, which covers a wide set of applications and processes such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration (Kaplan-Leiserson, 2001).

The pros and cons of e-learning have been argued extensively. First, it is claimed that the specific structure of digital information empowers learners to move into the mode of motivated and reflective cognition. Another claim is that, rather than imposing stimulation on learners, e-learning provides more choices, enhances flexibility and will often provide the learner with instant feedback. Broadbent (2000) has further pointed out the advantages and disadvantages of e-learning as follows:

(1) *Advantages for the learner:*

- 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

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- encourages students to take responsibility.
- (2) *Disadvantages for the learner:*
- may need to purchase or rent equipment; and
 - may have gaps in their computer knowledge.
- (3) *Advantages for the instructor:*
- permits instructors to develop materials using the world-wide resources of the Web;
 - allows instructors to communicate information in a more engaging fashion;
 - 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.
- (4) *Disadvantages for the instructor:*
- may need to purchase or rent equipment;
 - may have gaps in their computer knowledge; and
 - instructors may need to become familiar with electronic text-books, Internet-based research material, copyright, and other e-learning related topics.

Broadbent indicated that: Internet bandwidth may not be robust enough to support the desired level of multimedia; the dependence on using telephone lines and Internet service may lead to high user fees; and technical difficulties or operator errors may hamper students and instructors (Broadbent, 2000).

To try to test the actual effects of e-learning, the author started research by collaborating with an elementary school, which had never utilized the concepts and tools of e-learning. One objective of the research was to discover the practical strategic role of digital libraries within e-learning environments. To that end, a focus group was formed, because focus-group discussions are suitable for gathering data on the perceptions and opinions of both users and non-users of a system (Golding, 1997). Members of the focus group for this exploratory study were

teachers and students selected from elementary school. It was expected that this method would elicit discussions leading to formulating the core procedures for building the e-learning digital library and to investigating important issues that may arise from the procedures.

Strategic role of digital libraries

Information technology has made a profound impact on knowledge repositories and learning activities. Before the prevalence of digital library concepts and applications, it had already been acknowledged that electronic information resources could help learners to access a broader world of information, one in which learners would be stimulated to develop new search strategies and research skills (Wozny, 1982; Lathrop 1989). Today, coherent access to a large, organized repository of digital resources can be provided in a digital library world, without the user being aware of all the underlying complexity inherent in mapping its resources and content, and without the need to identify the separate elements of such knowledge, because all such multiple resources can be seamlessly integrated. Marchionini and Maurer (1995) described a scenario of the digital future in which teachers and students have access to information resources and tools that have been both physically and conceptually inaccessible to them. They envisioned vicarious field trips and virtual guest speakers together with opportunities for students to publish information actively where in the past they could only access it. The digital library therefore offers an even more extensive venue for helping learners develop the abilities to access, evaluate, and use information to build knowledge, to think critically, and to solve problems (Neuman, 1997).

Integrating a digital library into an e-learning environment requires considerable knowledge-building on the part of the organization involved. It is suggested that the digital library should:

- include all those learning resources which are relevant;
- classify the resources into logical categories;
- develop a knowledge vocabulary, including a thesaurus;

- create indexes and search mechanisms; and
- constantly refine the classification categories.

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 (Waller and Wilson, 2001). Consequently, an effective e-learning digital library should provide the infrastructure for supporting the creation, assimilation and leverage of knowledge.

Obviously it is important to examine what information and functions should be included within the e-learning digital library. Outside environmental forces should be analyzed because they are the macro-level interventions that can bring internal change. It is also expedient to define a number of internal factors which organizations can target in particular. Such factors may include policy, culture, personnel, alliances, technology, capacity, and the like. Based on this, goals can be determined. In addition, setting goals requires re-examination of the organization's strategic direction at the highest level. So the following questions need to be addressed:

- (1) What are the needs of learners and instructors?
- (2) Of these needs, what are the priorities?
- (3) What is the mission of the target organization?

A needs assessment and SWOT analysis would help to analyze the trends and decide the specific objectives of the e-learning digital library. Based on this, the content structure and resources as well as the functions can be designed to fit the objectives. After the stage of design, the digital library can be built and introduced to instructors and learners. It is also very important to embark on promotion strategies, such as training, including traditional classroom teaching. Then follows a stage marked by the need to evaluate results by collecting and analyzing users' opinions on the following questions:

- What contributes to successes or failures?
- Is anything overlooked in the design stage?
- Are there any unanticipated results?
- What could be done differently?

Finally, it is suggested that the digital library be maintained and modified according to the feedback received. In summary, these strategic implications produce a tactical and operational six-step process:

- (1) conducting a SWOT analysis;
- (2) setting the goals;
- (3) designing and adjusting the contents and functions of the e-learning digital library;
- (4) introducing and promoting the digital library;
- (5) collecting feedback; and
- (6) modifying the digital library.

Issues arising from core procedures

While formulating the suggested procedures, relevant issues that may arise were also identified and discussed. These issues relate to content, technology, human factors, and learning theories.

Content

Connor (1990) indicated, "The materials collection is the heart of a library". As suggested by the American Library Association (ALA), the collection should suit its intended use, and consideration must be given to the intellectual contents of the material, the philosophy and goals of the school districts, and characteristics of the users (ALA, 1988). Many people apply these ideas equally to the digital library world – that is, the digital collections should respond to the users' needs and provide an appropriate balance between quality and demand.

According to the focus-group discussions, some expressed the expectation that the digital library should reproduce a collection of textbooks, newspapers, magazines, encyclopedias, images, maps, multimedia resources, notes, and the like, such as are used in the on-going, existing curricula. The primary focus of this aggregation is to include diverse digital materials that service the information needs of all the target instructors and learners at the highest level. Some argued that the focus of the digital library should shift to adding value to the current available learning resources, and there is no need simply to reproduce them in digital form. The focus of endeavor should be transferred to rearranging and redesigning these materials into a mode that can teach learners to look at facts and concepts in a variety of ways, both

experienced in conventional media (e.g. a chronological list) and not previously experienced (e.g. a visit to a virtual space). They emphasized the need to create new information based on existing learning materials, to leverage it, and to apply it to create value in virtual space for learners. These efforts, of course, require great commitment and creativity from instructors, and those who advanced this view also stated that this kind of participation is the key to saving instructors from extinction in the future.

In conclusion, there were two different opinions about the content of the e-learning library: the quasi-all-inclusive approach and a value-added transformation approach. Both raised the following questions:

- In what contexts and from how many perspectives do they have to be represented?
- How to present it?
- Who chooses the dominating perspective(s) (e.g. elite or popular)?

The above questions pointed to the issue of technology, e.g.:

- Which technology to adopt?
- Does it mean that the construction of digital e-learning contents lies in obvious application of new and “fancy” technologies?

Technology

Digital technology is a powerful tool for assisting the flow of information, such as, at the simplest level, the introduction of e-mail, and shared storage of documents, threaded discussion boards and knowledge directories. It is also capable of effectively creating and capturing information in various digital formats, making these easily available to others, and possibly pushing these with discrimination to individuals who may find them useful (Dawson, 2000). Other elements adopted by digital libraries include employing the knowledge management approach, such as collaboration tools, retrieval and navigation tools and knowledge-based systems.

However, despite the appropriateness of its application in this fashion, it was clear that technology possesses limitations, which could result in many conflicts before a solution is achieved. And so the idea that information technology possesses unique powers has been the subject of intense scrutiny.

Unsurprisingly, although some members of the focus group believed that technological tools can upgrade the quality and efficiency of learning activities, some disagreed with this view and emphasized that the focus of the learning process be on people not technology, and that to start from a computer perspective would ensure the failure of learning. Some even mentioned that technology only provides pipeline and storage systems for information and knowledge that have already existed in traditional forms or channels, and reiterated that the emergence of information technologies and the Internet merely facilitates the sharing of information but cannot assist in developing wisdom. The most radical view was that the essence of technology may actually be anti-learning, in that it will lead to a glut of learning materials and sheer frustration.

Some specified that technology *per se* is not so much the issue, but rather motivation and expectation, which are related to human factors and learning theories.

Human factors

Human factors have to be taken into account in order to build a promising foundation for e-learning environments. The human resource management of e-learning organizations must be responsive to the changing needs of participants (including instructors, learners, and supporting staff), as well as the changing nature of the outside environment. Therefore, a culture of knowledge sharing, trust and willing collaboration must be built up or allowed to emerge gradually, and it is important to maintain an atmosphere that is fair and supportive (Stern, 1989).

Since it is common that no extra financial incentives are offered to teachers who develop digital resources and e-learning structures, some members of the focus groups stressed that recognition of the merits of the work should be given, even if the outcome is imperfect. Some were also very concerned about the issue of learners' motivation, and made the following suggestions:

- to recognize that learning is affected by individuals' ability, and their circumstances;
- to offer the learners an awareness mechanism of having made progress;
- to try to make the learners feel that by utilizing the digital library they will acquire desirable skills; and

- to make sure that they know the limitations of the e-learning library.

Learning theories

It was recommended that the following learning theories need to be carefully reviewed when applying digital library concepts and tools to e-learning. Behaviorist theories consider learning as a link between a stimulus and a response, so there should be reinforcement and response-reward. Gestalt theory further emphasizes that learning is essentially the acquisition of cognitive maps that direct behavior. So it is suggested that learners be placed in a situation that requires restructuring in order to provide a solution (Köhler, 1929; Hilgard, 1987).

Constructivism refers to several perspectives that view knowledge as a human construction. The basic premise is that knowledge is not part of an objective, external reality that is separate from the individual. Instead, knowledge is an active construction by the learners, and the instructors' role is to develop an adequate model of the learners' way of viewing an idea, to devise situations that challenge the child's way of thinking (Confrey, 1985; Piaget, 1973; Prawat and Floden, 1994).

Skinner (1968) indicated that to ensure that a skill be acquired by the learner, lots of reinforcement is required. Therefore, it was mentioned by the focus group that an appropriate implementation of a digital library can free instructors to spend more time communicating with individual students and developing instruction strategies, rather than supplying such reinforcers. Meanwhile, the opinion that e-learning can switch the learning environment from spoon-feeding patterns to a more self-initiated and more interactive approach was fiercely questioned because some teachers strongly believed that e-learning digital libraries are not the panacea for various learning problems. They said, for example, that e-learning cannot cure an unwilling learner, and it cannot be guaranteed that the use of multimedia, games and virtual realities can provide powerful reinforcers to those learners already found to be inadequate in traditional learning environments. This also brought a significant concern about educational activities becoming too entertainment-oriented. In addition, as learners become more accustomed to the digital repertoire, their stimuli to use the

digital library system is contingent upon continued new reinforcement. Yet, it is very time- and effort-consuming to correct these problems.

On the other hand, all these issues are interrelated, so they should be carefully synthesized in order to produce a compromise design that is able to deliver information- and knowledge-structure that enable learners and instructors to learn at the appropriate rate, while avoiding those mistakes and confusions that rapid change too often creates. In addition, the principles that encompass the instructional technology and components of learning theories should not be neglected. For example, Fleming and Levie (1993) raised numerous guidelines, such as "purely decorative pictures should be used sparingly", "the acquisition of unfamiliar content can be improved via familiar examples, analogies, and metaphors, while such strategies are less essential for familiar content", amongst others. However, some analysts have also discovered that there are lots of conceptual and practical difficulties in designing an e-learning library that is capable of accommodating all such principles. Ideally a comprehensive approach that examines all relevant findings and studies is necessary to provide a conceptual framework for designing an effective e-learning library (Neuman, 1997).

Conclusions

This research elicited and examined a number of extreme points of views about implementing e-learning through digital libraries. Some felt that the e-learning library is capable of bringing new vitality and momentum for instruction and learning; others argued that the emphasis on the technology perspective would result in disappointing teaching and learning outcomes. Although it was discovered that developments in the immediate digital future would not be straightforwardly beneficial for learning, there was still general agreement, after all, that educational organizations need to understand what values an e-learning digital library adds and what values it takes away. Finally, it was suggested that educational organizations that wished to involve themselves in e-learning should underpin their education strategy and plan

their infrastructure proactively, rather than being driven by technological and political imperatives and the demands of organization image change.

References

- ALA (1988), *Information Power: Guidelines for School Library Media Programs*, American Library Association, Chicago, IL.
- Bouras, C., Philopoulos, A. and Tsiatsosm, T. (2001), "e-learning through distributed virtual environments", *Journal of Network and Computer Applications*, Vol. 24 No. 3, pp. 175-99.
- Broadbent, B. (2000), "Championing e-learning", www.e-learninghub.com/articles/championing.html#Pros%20and%20cons%20of%20e-learning (accessed 17 September 2002).
- Confrey, J. (1985), "Towards a framework for constructivist instruction", in Streefland, L. (Ed.), *Proceedings of the Ninth International Conference for the Psychology of Mathematics Education, Noorwijkerhout, Psychology of Mathematics Education*, Vol. 1, pp. 477-8, 483.
- Connor, J.G. (1990), *Children's Library Services Handbook*, Oryx, Phoenix, AZ.
- Dawson, R. (2000), "Knowledge capabilities as the focus of organizational development and strategy", *Journal of Knowledge Management*, Vol. 4 No. 4, pp. 1-9.
- Fleming, M. and Levie, W.H. (1993), *Instructional Message Design: Principles from the Behavioral Sciences*, Educational Technology Publications, Englewood Cliffs, NJ.
- Golding, A. (1997), "Joking, being aggressive and shutting people up: the use of focus groups in LIS research", *Education for Information*, Vol. 15, pp. 331-41.
- Hilgard, E.R. (1987), "Perspectives on educational psychology", in Glover, J.A. and Ronning, R.R. (Eds), *Historical Foundations of Educational Psychology*, Plenum, New York, NY, pp. 425-9.
- Kaplan-Leiserson, E. (Ed.) (2001), "E-learning glossary in learning circuits", available at: www.learningcircuits.org/glossary.html#E (accessed 17 September 2002).
- Köhler, W. (1929), *Gestalt Psychology*, Horace Liveright, New York, NY.
- Lathrop, A. (1989), "Online information retrieval as a research tool in secondary school libraries", in Lathrop, A. (Ed.), *Online and CD-Rom Databases in Schools; Readings*, Libraries Unlimited, Eaglewood, CO, pp. 287-339.
- Marchionini, G. and Maurer, H. (1995), "The role of digital libraries in teaching and learning", *Communications of the ACM*, Vol. 38 No. 4, pp. 67-75.
- Neuman, D. (1997), "Learning and the digital library", *Library Trend*, Vol. 45 No. 4, pp. 687-709.
- Piaget, J. (1973), *To Understand Is to Invent: The Future of Education*, Grossman, New York, NY.
- Prawat, R.S. and Floden, R.E. (1994), "Philosophical perspectives on constructivist views of learning", *Educational Psychologist*, Vol. 29 No. 1, pp. 37-48.
- Skinner, B.F. (1968), *The Technology of Teaching*, Appleton-Century-Crofts, New York, NY.
- Stern, G.M. (1989), "Ten steps to help raise staff morale", *Communication Briefing*, Vol. 8, August, pp. 8a-b.
- Waller, V. and Wilson, J. (2001), "A definition for e-learning", *ODL QC Newsletter*, October, pp. 1-2.
- Wozny, L.A. (1982), "Online bibliographic searching and student use of information: an innovative teaching approach", *School Library Media Quarterly*, Vol. 11 No. 1, pp. 35-42.