Collaborative Links Between Distributed Databases. Developing a Framework for an Inventory of Computer-facilitated Learning (CFL) Materials across the Higher Education Sector in Australia

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Abstract: This paper will report on the results of a DETYA*-funded project which investigated the extent of use of computer-facilitated learning (CFL) materials across the higher education sector in Australia in order to determine overall trends. In addition, the project also investigated how an updated national inventory of such materials might be developed in the context of developing a strategy which could lead to a greater adoption of CFL materials in Australian higher education. * Department of Education, Training and Youth Affairs - a central Australian government department

Introduction and Scope of the Study

There has been a great deal of development of electronic educational resources in the last few years, fuelled by a climate in higher education which demands educating more students with less resources. This has occurred together with substantial development of information technology (IT) systems and infrastructure in all Australian universities. However, the evidence is that there is little dissemination of these electronic resources and practices. Greater collaboration and sharing of resources is becoming an increasingly urgent issue. There are several existing databases of computer-facilitated learning (CFL) materials but these databases do not appear to have increased the take-up of CFL materials and strategies a great deal. We need to investigate educational, technological and management issues in designing ways in which more use can be obtained from the valuable resources that exist.

The term computer-facilitated learning (CFL) materials is used to describe materials which use information technology in some way to facilitate teaching and learning, including: educational CD-ROMs, online course content materials, and the use of software for computer-mediated communication within a course.

Methods Used

The study used a multi-method approach, employing online surveys of institutional practice (28 Australian universities responded); a literature survey; and a case study of five universities at project, faculty and institutional levels. The data included survey results, interview transcripts, focus group transcripts, institutional documentation and short descriptions or vignettes.

The study explored issues which facilitated or mitigated against teachers being able to work in an environment which facilitates the adoption of CFL, in terms of:

- appropriate policies, infrastructure and supports within the institution;
- access to information about CFL resources; and
- being able to work collaboratively both within and across institutions.

Existing Information about CFL Resources at Australian Universities

A substantial amount of data was accumulated from a range of sources about the resources which exist to support CFL at Australian universities. It is clear that many universities are actively engaged in producing CFL resources to enhance the educational offerings they have. There is also a clear commitment to developing appropriate infrastructure to support the use of technology. The diversity in universities' structural arrangements made it difficult to compare data across institutions. There is also a variation in the stage of adoption of new IT from contexts where there are a significant number of early adopters and the use of technology is clearly embedded, to contexts where significant use of technology is a newly emerging trend. Precise information about CFL resources may not have been obtained from some universities because the survey was not responded to by the person with most accurate knowledge, or because facilities were devolved and centralised data was not available. The rapid change in the area also means that information provided to the investigators may be soon out of date. Overall the information about existing CFL resources at Australian universities is patchy and incomplete. In particular, there is limited or no information about:

- the educational design of the CFL resources being produced,
- the incentives and support that exist for individuals to produce CFL resources,
- the technical design and access specifications for using these CFL resources,
- the experience of using the CFL resources in actual teaching contexts,
- evaluations carried out to determine how educationally effective these resources are in practice,
- intellectual property and copyright issues which might affect the use by others, and
- how access can be obtained to these CFL resources from either colleagues in the same university or another institution.

Major Issues Relating to the Adoption of CFL Resources at Australian Universities

The major issues were selected from the case studies using three criteria:
- frequency of being mentioned,
- intensity of expression in the interview, and
- who articulated the idea-senior administration and/or teachers.

Three major themes emerged with a considerable overlap between a number of the issues and factors involved in each theme.

Policy

The policy theme looked at specific institutional policies, such as equity and intellectual property, the alignment of policy throughout the organisation, the direction of policy change (bottom-up or top-down) and a number of strategic processes which flowed on from policies such as grant schemes. There was a variation in the direction of policy change across the universities studied. The universities with a traditional emphasis on distance education had a strongly top-down policy direction. Two other universities had a predominantly bottom-up policy direction, and one university was reported by case participants as having essentially no policy with respect to CFL. In the institutions in which adoption of CFL seemed to be progressing most effectively, there was a balance between top-down and bottom-up policy implementation. This reinforces the need for balance between policy, culture and support; policy on its own will not succeed unless it aligns with institutional culture.

Copyright was a particularly complex issue which impacted in different ways according to the contextual level (personal, institutional or sectoral) in which it was being examined. Some individuals, for example, believed university copyright policy presented a personal barrier to the sharing and development of CFL; while from an institutional perspective there was concern and a growing awareness of the complexity of the issues which limited organisational capacity to maximise specific institutional uses of CFL. Finally, across the higher education sector in

general there were broad ranging legislative issues, with respect to moral rights, licensing, royalties and payments for use of copyrighted materials, and continuing uncertainties relating to technological capability and usage.

Key issues relating to the policy theme:
- Safety net policies need to be continued, and possibly increased, in order to address the specific needs of the minority who cannot gain access to computing equipment for equity reasons.
- Funding schemes need to take account of earlier experiences - mechanisms are needed for monitoring the progress of initiatives and learning from failure.
- Funding schemes need to explicitly take account of the need for ongoing maintenance of CFL developments.
- Appropriate criteria for teaching performance need to be developed in order to provide an effective incentive for staff to adopt CFL materials and practices.
- University staff need access to a centralised service which provides practical support to staff on intellectual property and licensing issues.
- There needs to be widespread dissemination of the legal situation with respect to online intellectual property.
- If a CFL resource is made available to the academic community, mechanisms are needed to facilitate copyright clearance of CFL materials so that due recognition is given to the originator.
- Legislation relating to the use of online resources in education, the ownership of copyright on materials used in offshore courses, and moral rights is in train. Appropriate legislation should be supported.

Culture

Culture incorporated factors such as collaboration within institutions, and personal motivation of staff to use CFL, as well as particular aspects of funding, staff rewards and time, leadership, teaching and learning models, and attitudes such as 'not invented here'. The case studies showed a great difference in the organisational cultures of the universities studied and of the infrastructures set up to nurture, develop, deliver and support CFL. The climate of the organisation is made up factors such as:
- strategic vision and leadership,
- attitudes to risk taking and innovation in teaching and learning,
- attitudes to adopting CFL,
- allocation of resources, and
- staff recognition and rewards.

Factors that motivated staff to adopt CFL did not vary greatly over the universities studied. Institutions with large numbers of early adopters had made changes to their cultures and policies, and had well-supported infrastructure. This resulted in a high level of acceptance so that some of the issues were no longer relevant to them. Main barriers to take-up were seen as:
- lack of knowledge about CFL;
- lack of academic time release;
- pressure to keep up the research quantum;
- non-recognition of teaching;
- lack of funding to maintain programs, staff and technical infrastructure; and
- lack of student acceptance of the new approaches.

On the other hand, factors that would motivate staff to use CFL included:
a university culture which supports new approaches,
- good leadership from academic managers,
- recognition of teaching as of equal value as research,
- appropriate support infrastructures for staff and students,
- workload adjustments to develop materials and become computer literate,
- the opportunity to think about learning and not teaching,
- evaluation studies showing improvements in student learning,
- improving learning opportunities and outcomes for distance students,

- adding value to existing courses,
- providing a means to offer courses offshore,
- the chance to interact more with students,
- positive feedback from students,
- solutions to problems of large classes and funding cuts,
- support and sponsorship from mentors, and
- peer pressure.

Changing educational practices and styles can produce many negative reactions and this negativity needs to be acknowledged and managed effectively. Change should be introduced and implemented within a supportive environment. The culture of the organisation needs to be able to embrace change while offering staff opportunities to develop their own levels of comfort with the change. Within the university environment, leaders need to develop vision statements that are clear and well articulated to the staff. Appropriate levels of infrastructure and support should be part of the policy formulation to match the vision.

Key issues relating to the culture theme:
- Universities need to have a clearly articulated vision of the changes to teaching and learning that technology brings.
- This vision should have ownership and commitment from all levels of management.
- The Dean or Head of Department/ School should lead and support moves by the academic unit into increased use of CFL materials and strategies.
- Policies developed from the vision should include positive values and well funded infrastructure to support staff and students.
- Issues of staff workloads in the changeover to use of CFL should be clarified.
- The tension between teaching and research needs to be resolved so that staff gain appropriate recognition for the development and use of CFL materials.

Support

Support incorporated a whole gamut of institutional issues including IT, library and administrative infrastructure, professional development for staff, student support, educational and instructional design support for academic staff, funding and grant schemes, and IT literacy. There was a belief that real efficiencies could be possible with supportive infrastructure and good planning. Many universities are now focussing on an overall systems approach across the university so that infrastructure planning is linked to the development of professional development and support services. At this time, however, all universities are in transition and are grappling with the issues involved in designing and managing new ways of working.

Key issues relating to the support theme:
- Internal structures and funding for CFL development units create tensions between central administration and the faculties; open exploration of this tension is needed.
- Ongoing budget support for CFL development is needed. Funding for CFL development is ephemeral in many universities.
- Institutional development grants should focus on sharing processes and experience, as well as looking for product-oriented outcomes.
- The costs involved in hardware and facilities, and appropriate technical and support staff, are high. Mechanisms are needed to assist universities in managing these costs.
- The diversity of roles of ITS staff are high, and keeping skilled staff is difficult. Schemes to recognise and reward technical staff are needed as much as schemes to recognise and reward academic staff.
- Professional development and training is a complex and multi-faceted area. There is a need for high quality staff developers, for flexible support programs, for using mentors, and allowing adequate time for staff to engage in staff development.
- Student support services cover a wide range of issues, including equity and access, access to academic help (this has implications for funding staff time), access to technical help, and access to computers. Further attention is needed to all these issues.

Adoption and Collaboration

Unless the climate within and between universities supports the development and use of CFL resources, there will not be an increase in appropriate uses of technology in teaching and learning. Staff will use technology in their teaching when culture, policy and support structures are congruent. Some particular issues that were highlighted were:

- Time and scalability: from an institutional point of view, the current situation is that infrastructure and time allowance is possible only for a relatively small number of staff. Mainstreaming the use of CFL has enormous resource implications.
- Good evaluation of existing CFL programs is a crucial aspect of adoption. Late adopters want evidence that CFL materials and strategies can enhance student learning
- Adoption depends on key individuals who can act as role models and mentors for others. Institutions need to recognise and support these individuals.

The tension between collaboration and competition is important. We argue that collaboration can assist healthy competition in higher education. Using resources efficiently in collaborative arrangements can allow institutions to develop their own specialities more effectively. During the next few years each university will need to find its own balance point between external collaborative work and internal work aimed at developing its own specialisations.

Dissemination and Databases

Dissemination of information about CFL resources, and the location of CFL resources via databases were fundamental parts of the study. A framework for the development of a national inventory system is proposed whereby the development of national metadata standards will enable teachers and lecturers to search across a distributed set of interest-group-based databases.

Dissemination of information about CFL resources through marketing programs was seen to be problematic by case study participants, for a number of reasons, some of which are:

- Potential purchasers/ users had varying levels of IT skills.
- Everyone is keen to be a seller in the marketplace, but few want to be buyers.
- Some programs proved to be too difficult to transfer to another context-there were technical, content and remuneration barriers.
- Commercialisation often becomes a dead issue; not many people are interested in pursuing this.
- Often there is insufficient kudos involved in disseminating information about CFL developments.
- Intellectual property is an issue, in that some people might not want their material to be used by others. There are concerns about compromising the competitive advantage of universities.

Nevertheless, it was felt that databases of CFL resources could be useful if designed well. A number of features were identified which could characterise a well-designed teaching and learning database. These are:

- The data submission and retrieval process is simplified.
- It has a distributed nature.
- It is maintained in an ongoing sense.
- It is owned by academics.
- Resources are submitted by people with expertise in CFL and knowledge of the discipline, following a scholarly review process.
- Resource submission should not be by the developer of the resource.
- It should contain contextual information about the resource, including a full description of the product; the rationale behind its development; its unique characteristics; the pedagogical approach used; intellectual property details, and how it might be obtained; and evaluation data.
- It should contain a range of experiential information on how the resource was used in a real-life teaching context, both by the developer and others.
- It should return the appropriate level of information to the queries submitted by users.
- Resources successfully submitted to the database should attract scholarly recognition.

The contextual and experiential information required of an ideal database is encapsulated in the idea of metadata. There is a need for cooperation amongst database owners and proponents with respect to metadata standards. The central idea of the framework is that databases can be created which fill a particular market niche, but that a global 'megasearch' facility enables academics searching for information to seamlessly traverse a range of databases. The framework we are proposing for the development of a unified, Australia-wide collaborative framework for interoperable online databases strongly urges that international metadata standards be developed.

A prototype distributed Links database has been developed by ASCILITE. This forms a searchable resource that is interoperable with other databases and is sustainable and credible. It allows for distributed maintenance of hypertext links within the system. Loosely based upon a Yahoo-style system, the Links database allows reviewers to moderate categories in which they have expertise. Any person can submit useful links to a particular category. The moderator provides a third-party, quality assurance role that adds value to the to resources maintained within the database.

The recommendations on dissemination and databases are that DETYA support and funding are needed for the development of a high level technical database framework which:
- is implementable;
- encourages open discussion with the various teaching and learning resource database owners to strive to achieve interoperability between their sites;
- develops standards to ensure inter-exchange of metadata between different domain-specific teaching and learning resource databases, by working with the various domain communities;
- works with other DETYA-funded bodies to establish standards and encourage adoption of such standards for resolving intellectual property issues, with the aim of creating of a market for learning artifacts; and
- ensures that all standards are interoperable with emerging international standards.

The framework we are proposing for the development of a unified, Australia-wide collaborative framework involves interoperable online databases. While our considerations have been mainly directed towards databases of CFL materials, we believe that this framework has a wider applicability. To be successful, the development of the framework needs to be a national initiative, funded appropriately, and coordinated through a suitable coordinating body. The coordinating body will need to develop standards for metadata by leveraging off the Dublin Core and IMS standards, and working closely with other Australian interest groups, such as the Australian Library and Information Association (ALIA), the Committee of Australian University Librarians (CAUL) and the Distributed Systems Technology Centre (DSTC).

Professional organisations, such as ASCILITE, can also participate in this national framework of collaboration in areas such as:
- educating the academic community about the need to provide metadata,
- providing pedagogical and educational design advice in the formulation of standards,
- providing a testbed for the implementation of the standards, and
- evaluating the effectiveness of the standards and the impact of the standards on the quality of education.

The size of the Australian economy does not allow us to re-invent the wheel all the time. The Australian education sector needs a collaborative framework to capture the synergy that may be generated by the aggregation effect. Information technology changes the size of a market, as well as the way the market is shared. To remain competitive in the global market, Australian higher education cannot afford to wait for the development of standards which will influence how education will be delivered and how effective the digital education system will be.

Reference

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