

Supporting Flexible Learning Opportunities

Based on the knowledge generated from the Australian Flexible Learning Framework projects and selected external literature, the Quick Guides series provides an introduction to key issues related to flexible and online delivery of Vocational Education and Training (VET).

What is Interoperability and Why is it Important?

Australian Flexible Learning Quick Guide Series

What is Interoperability and Why is it Important?

To be interoperable, one should actively be engaged in the ongoing process of ensuring that the systems, procedures and culture of an organisation are managed in such a way as to maximise opportunities for exchange and re-use of information, whether internally or externally.

Paul Miller (2002)

Scope of this guide

This Guide describes the various aspects that are part of achieving interoperability in both technology and information systems, illustrated by examples taken from activities in the Australian Vocational Education and Training (VET) sector, and in particular, projects within the Australian Flexible Learning Framework (Framework).

Why is it important?

One of the five goals of the Australian Flexible Learning Framework is:

To achieve a national VET system which facilitates affordable access by all communities, learners and employers to online services; is underpinned by advanced information and communications technologies; and achieves connectivity and associated interoperability in the application of technology to delivering training services and, where required, to its business processes. (p.13)

... interoperability allows universal access, promotes the sharing of content and resources across the VET sector, achieves efficiencies and, at the learner level, encourages the development of team processes, collaborative working and peer-to-peer learning which help learners take greater responsibility for shaping their own learning. (p.16)

A key mechanism for ensuring interoperability at the technical and semantic levels is to ensure that different systems conform to common technical standards.

The Scoping Study prepared for the ERC¹ Standards Sub-Committee argues that:

“Implementation of open and internationally consistent technical standards and their subsequent implementation can:

- Help make training available online without compromise due to problems of place, time, working arrangements or equity group.
- Reduce the risk and cost in making purchasing decisions at all levels.
- Ensure the maximum interoperability and scalability of technical infrastructure.
- Increase the ease with which quality teaching and learning resources can be found, obtained, transferred, adapted and used by teachers and students.
- Ensure that teachers and students can participate in teaching, learning and professional development activities across organisation, sector and State / Territory boundaries.
- Promote the international awareness and availability of Australian educational resources and services.
- Allow competition and cooperation as appropriate.” (Gilding 2000)

¹ The Australian Information and Communications Technology in Education Committee (AICTEC) is a cross-sectoral, national committee responsible for providing advice to all Australian Ministers of Education and Training on the economic and effective utilization of online technologies in Australian education and training. The Committee was known as the Education Network Australia Reference Committee (ERC) before 2001.

Aspects of interoperability

The AICTEC Standards Sub-committee (AICTEC) identifies the following areas in which technical standards are relevant to education and training (and hence in which interoperability is an issue):

- Network Infrastructure: general infrastructure to permit transmission of data and standards for transfer of particular types of media (text, audio and video).
- Content Formats: Standards for the storage and presentation of components of online content (text, graphics, audio and video files). Also covers programming languages and accessibility issues.
- Resource Description and Resource Discovery: Covers metadata, search interfaces and vocabularies necessary to assist reliable resource discovery.
- General Applications: covers web publishing, email, workgroups and video conferencing.
- Delivery Platforms and Content Packaging: covers software systems used to manage the delivery of online content to students.
- Administration and Management: covers such areas as student records and educational statistics.

Miller (2002) discusses the various “flavours” of interoperability which provide a useful framework for exploring these in relation to the VET sector:

Technical Interoperability

Technical interoperability is the most obvious and arguably the most straight forward aspect of interoperability. This is necessary to ensure that all the hardware and software component of networks and information system can physically communicate and transfer information successfully. With the primacy of the Internet and all the supporting technical standards, and the relative decline of closed networks and proprietary standards it tends to be taken for granted that for example, a browser can display information from any webserver on the Internet, and that numerous interconnected mail systems can exchange messages globally. However beneath the surface there is an enormous effort necessary to ensure that this remains the case.

At a more immediate practical level, there are many day to day decisions about exactly how technical standards are implemented and used which can increase or limit interoperability. The VET Preferred Standards project has addressed these practical questions in a series of Operational Guidelines (Preferred Standards 2000, pp.30-35).

Semantic Interoperability

Semantic interoperability refers to the *meaning* of information to its human users, as opposed to the simple physical transfer of data. Interoperability at this level can fail if different users, or groups of users, use different terms for the similar concepts, or use similar terms to mean different things. Friesen (p.105) argues that “semantic interoperability is tied directly to communities of practice, and to the negotiation of meaning that occur within them.”

Because meanings assigned by people and groups can vary over time and in subtle ways, semantic interoperability cannot be as easily ensured as technical interoperability but it can be improved, for example, by:

- Careful consideration of who the potential users of information systems are and the language that is necessary to communicate with them.
- Agreement on the standard thesauruses and lists of terms to be used in metadata systems.
- Consistent use of existing coding systems endorsed nationally within the VET sector - for example NTIS² codes, Australian Qualifications Framework terminology (AQF), and the Australian Standard Classification of Education (ASCED) for both field and level of education (ABS 2001).

² The National Training Information Service allocates national codes for Training Packages, Qualifications, Unit of Competency and Courses (<http://www.ntis.gov.au>)

Political/Human Interoperability

“Technology opens up new ways of doing things which inevitably challenge traditional power bases and interoperability agendas are often thwarted by the protection of ‘turf’ at all levels within an organisation, or between organisations.”
(McLean 2001, p.1)

McLean argues that “clear transparent technical agendas are the only answer to resolving territorial protection”.

The Australian Flexible Learning Framework has a variety of consultative mechanisms to facilitate liaison between different organisations in the VET sector. At the practical level the EdNA VET Project has established a discussion forum to facilitate sharing of information on interoperability and related issues (VET Websites Roundtable 2002).

Inter-community Interoperability

Many factors are contributing to the blurring of boundaries between sectors in education and training; VET programs are delivered in schools, many universities are also major VET providers, articulation results in students moving more freely in both directions between VET and Higher Education. In addition there is increasing blurring of the boundaries between formal accredited training and other learning opportunities and resources, for example those provided by commercial organisations outside the formal training sector, and by institutions such as libraries, museums and the media. Online technologies and new forms of training delivery both facilitate and are driven by these changes.

As a result it is increasingly important that information systems can interoperate across these boundaries. In the area of resource discovery, one of the main mechanisms for facilitating this interoperability is the EdNA Metadata Standard and the EdNA harvesting system which provides for consolidated resource discovery across all sectors of education and training in Australia. The EdNA Collaboration also provides a mechanism for access to Australian education and training resources by national and overseas audiences and for negotiation and agreements on international standards to facilitate resource discovery across different communities.

Issues of different “communities” also arise in what might be called “inter-jurisdictional interoperability”. While educational organisations are seeking to establish interoperability across state and territory borders, as well as sectoral boundaries, they can be constrained by state/territory whole-of-government standards and purchasing arrangements.

Legal Interoperability

While the Internet makes it easy to physically publish and access information, there are many important legal aspects which constrain and influence how information can and should be made available and used. These include laws related to copyright, content regulation, privacy, freedom of information, telecommunications regulation, e-commerce and trade practices. Activities which may be legal in one context or jurisdiction may be not be permitted in another. For example a teacher’s use of particular resources found on the Internet may be covered by the educational statutory licence in the Australian Copyright Act, but the teachers own use of the same resource may be an infringement of copyright. Teachers and course and content developers need to be aware of copyright and other governing regulations.

International Interoperability

Online technologies facilitate access to resources from anywhere in the world, and make Australian resources, and training delivery, available to an international audience. However this brings with it a need to ensure that interoperability issues are addressed in an international as well as an Australian context. This introduces increased complexity to many of the above aspects, for example on semantic interoperability and different legal jurisdictions and frameworks. It also highlights new aspects such as language differences and cross-cultural issues. For further discussion on cross-cultural issues and internationalisation see the Quick Guides on these two topics.

Australian Flexible Learning Framework projects

Given that interoperability is crucial to the development of online learning, many projects within the Australian Flexible Learning Framework have addressed these issues. The key ones are:

Interoperability Projects

In 2003, the Framework's Collaborative Interoperability Project undertook an environmental scan to assist in the development of the VET Interoperability Framework. The Interoperability 2004 Project aims to build on work from 2003 to further develop understanding and commitment to the use of interoperability within the VET sector. Information on this project can be viewed at: <http://flexiblelearning.net.au/projects/interoperability.htm>. Research will continue on relevant topics, including controlled vocabularies, web services, content packaging and intellectual property management. The Interoperability Framework website can be viewed at: <http://flexiblelearning.net.au/interop/>

Learning Object Projects

The 2003 VET Learning Object Repository Project aimed to identify the state of play with regard to learning objects, bringing together multiple perspectives, diverse opinions and experiences associated with the learning object paradigm. A suit of research papers were produced in relation to the use of metadata, standards, and the Sharable Content Object Reference Model (SCORM) in developing learning object repositories in vocational education and training. For further information on the project and access to the research papers go to: <http://flexiblelearning.net.au/projects/learningobject.htm>

The 2004 Learning Object Implementation Project will consolidate and implement applications of research undertaken in 2003. The major intention is to promote, trial and progress the work of the VET Learning Object Repository project in practical implementation situations on a national basis. The purpose of the project is to build the capacity of the Australian VET sector to share teaching and learning resources that support flexible delivery through the establishment and embedding of interoperable principles in the design and development of resource repositories. For further information on this project go to: <http://flexiblelearning.net.au/projects/learningobjectimplementation.htm>

Quality e-Learning Resources Project (Toolboxes)

The Toolbox Project promotes accessibility and interoperability through specification guidelines for developers. The Toolbox specifications can be viewed at: <http://www.flexiblelearning.net.au/toolbox/documents/>

The Toolbox Project has been researching issues and realities of implementing standards within product development projects and have developed guidelines to assist product developers. The Toolbox project has been instrumental in promoting and refining technical standards and metadata guidelines with the Collaborative Interoperability, Preferred Standards Project, and EdNA VET Online Project.

EdNA VET Project

The EdNA VET Online Project is an ongoing activity to improve services within EdNA Online for the VET sector. The project coordinates the VET Websites Roundtable. <http://www.edna.edu.au/vetproject/>

Legal Issues in Flexible Learning Project

Legal issues in flexible learning was an Australian Flexible Learning Framework initiative that aimed to communicate information about the important legal issues to VET professionals working in flexible learning. <http://flexiblelearning.net.au/projects/legalissues.htm>

Preferred Standards Project

In 2000 the project "Preferred Standards to Support National Cooperation in Applying Technology to Vocational Education" considered six areas of standards relevant to the online

delivery of training: management systems, groupware, web protocols, multimedia, resource locator technologies and hardware. For each of these standards areas the Project produced recommendations on preferred standards, emerging standards requiring further attention, operational guidelines, and continuing work. The preferred standards and operational guidelines were signed off by ANTA CEOs in May 2002. The project is currently disseminating and promoting the Preferred Standards and conducting a Proof of Concept exercise, which will report on interoperability of standards.

<http://flexiblelearning.net.au/projects/preferredstandards.htm>

Key Resources

Interoperability Framework

This website was developed as part of the Framework's 2003 Collaborative Interoperability Project. It provides information on interoperability (including recommended standards) relating to the priority areas for the VET sector.

<http://flexiblelearning.net.au/interop/>

Interoperability convergence of online learning and information environments

Paper by Neil McLean. "The purpose of this article is to describe the dynamics underlying the convergence of online learning and information environments as a means of exploring and explaining the current pre-occupation with the term interoperability."

http://www.colis.mq.edu.au/news_archives/convergence.pdf

Interoperability. What is it and Why should I want it?

Discusses in clear terms the various types of interoperability, what it really means to be interoperable, and why interoperability is important.

<http://www.ariadne.ac.uk/issue24/interoperability>

Executive summary v0.1 Access to Flexible Learning Resources

A major part of this project was gaining endorsement by States to cooperative endeavours to maximise access across major resource holdings; furthering, establishing core data structures, establishing classifications structures, and continuing the development of a resource catalogue.

<http://flexiblelearning.net.au/accessresource/docs/execSummary.pdf>

Technical Standards for Online Education and Training: A Scoping Study

The report; makes the case for the importance of technical standards in education and training; documents achievements to date in this area; explains the various ways in which formal and de-facto standards are set; describes the various areas in which standards are important in education and training; and makes recommendations for priority activities. The report was commissioned by DETYA to provide the newly formed Standards Sub-Committee of the EdNA Reference Committee with a solid body of information and advice on which to base its initial activities.

<http://www.edna.edu.au/edna/file20520>

Making Sense of Learning Specifications & Standards: A Decision Maker's Guide to their Adoption.

This paper by the e-Learning Consortium at the Masie Center in the USA, Explains the meanings and reasons for specifications and standards that are currently part of the interoperability and reusability agenda for digital learning content. The report explains concepts clearly using graphic models to show components and their relationships. An excellent resource to enhance understanding or to explain the concepts to others.

<http://www.masie.com/masie/default.cfm?page=standards>

EdNA Metadata Standard

The EdNA Metadata Standard is a key mechanism for facilitating interoperability between information systems in education and training nationally. Ensuring that catalogues and other resource database are designed to be consistent with the EdNA Metadata Standard will facilitate

transfer of data to EdNA Online and other information systems in education and training, as well as providing consistency with the international Dublin Core Metadata Initiative (DCMI).

<http://www.edna.edu.au/metadata/>

Collaborative Online Learning and Information Services (COLIS)

Is an example of a consortium approach and major initiative on interoperability between institutions. This project was funded by DETYA to establish a test bed for the development of collaborative online learning and information services.

<http://www.colis.mq.edu.au/>

References

- AICTEC Standards Sub-committee
<http://www.aictec.edu.au/priorities/standards/>
- ABS - Australian Bureau of Statistics 2001, *Australian Standard Classification of Education 2001*
<http://www.abs.gov.au/> and search for 1272.0
- AQF - Australian Qualifications Framework
<http://www.aqf.edu.au/>
- Australian Flexible Learning Framework for the National Vocational Education and Training System 2000 - 2004*, ANTA.
<http://flexiblelearning.net.au/aboutus/keydocuments.htm>
- Collaborative Online Learning and Information Services (COLIS).
<http://www.colis.mq.edu.au/>
- DCMI - Dublin Core Metadata Initiative
<http://www.dublincore.org/>
- EdNA Metadata Standard v1.1
<http://www.edna.edu.au/metadata/>
- e-Learning Consortium 2002. *Making Sense of Learning Specifications & Standards: A Decision Maker's Guide to their Adoption*. The Masie Center, New York.
<http://www.masie.com/masie/default.cfm?page=standards>
- Friesen, N 2002. *Semantic Interoperability and Communities of Practice*. Global Summit Conference. Adelaide.
<http://www.cancore.ca/documents/semantic.html>
- Gilding, J 2000, *Technical Standards for Online Education and Training: A Scoping Study*, Department of Education, Training and Youth Affairs (DETYA).
<http://www.backroad.com.au/standards/scoping.pdf>
- Ip, A, Currie, M, & Morrison, I 2001. *Resource Synergy: Improving the discovery of quality resources to support an Information-dense learning environment*.
<http://ausweb.scu.edu.au/aw01/papers/refereed/ip2/paper.html>
- Jones, C 2002, *Executive summary v0.1 Access to Flexible Learning Resources*, ANTA.
<http://flexiblelearning.net.au/accessresource/docs/execSummary.pdf>
- McLean, N 2001, 'Interoperability convergence of online learning and information environments' in *The New Review of Information Networking* Volume 7, 2001
http://www.colis.mq.edu.au/news_archives/convergence.pdf
- Miller, P 2002, *Interoperability. What is it and Why should I want it?* Ariadne Issue 24.
<http://www.ariadne.ac.uk/issue24/interoperability>
- Preferred Standards to Support National Cooperation In Applying Technology to Vocational Education and Training 2000 Summary and Recommendations*, ANTA.
<http://flexiblelearning.net.au/standards/reports/summary.pdf>
- The Diffuse Project Standards and Specifications List, *Electronic Learning Standards*, European Commission Information Society DG
Unable to provide electronic reference –URL is no longer active.
- Walker, E 2002, *The New Agenda for E-Learning Specifications*. Global Summit Conference. Adelaide.
<http://pandora.nla.gov.au/pan/31332/20030310/www.educationau.edu.au/globalsummit/papers/walker.pdf>

Reference as:

Backroad Connections Pty Ltd 2002, *What is Interoperability and Why is it Important?* (Version 2.01), Australian Flexible Learning Framework Quick Guides series, Australian National Training Authority.

PDF versions available at:

<http://flexiblelearning.net.au/projects/sharingknowledge.htm#guides>

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