

Department of Education, Training and Youth Affairs

Technical Standards for Online Education and Training: A Scoping Study

Jack Gilding
Backroad Connections Pty Ltd

May 2000

Report to the EdNA Reference Committee



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Preface

This report was commissioned by the Online Education & Training Section, Department of Education, Training and Youth Affairs on behalf of the EdNA Reference Committee (ERC).

The ERC Meeting on 28 July 2000:

- Accepted the scoping report and approved its public circulation; and
- Endorsed the recommendations in the consultant's report, in particular 1, 2 and 3 and the principles set out in section 2.4.

There are probably few areas more prone to jargon than education and technical standards. A report that covers both these areas is of necessity littered with organisations, abbreviations and acronyms. The Glossary in **Attachment A** provides a quick summary of the major acronyms and organisations used in this report, as well as definitions of selected key terms and the addresses of key websites.

Specific technical standards and their abbreviations are explained in **Attachment B**. Attachment B also contains descriptions of some relevant organisations and projects not described elsewhere in the report.

Acknowledgements

This principal author of this report is Jack Gilding of Backroad Connections Pty Ltd. A substantial amount of the section *What are Standards and how are they set?* was researched and written by Robin Whittle of First Principles.

In describing such a broad range of organisations, descriptions have been used from organisations' own websites where appropriate. These have not been always been explicitly quoted or acknowledged. Responsibility for any inaccuracies caused by summarising, paraphrasing or taking out of context the descriptions of organisations should be attributed to the author.

I would like to particularly thank all the members of the project Steering Group who provided invaluable assistance in the preparation of this report.

Jack Gilding

jack@backroad.com.au

<http://www.backroad.com.au>

May 2000

Executive Summary

Background to this report

This report was commissioned by DETYA on behalf of the EdNA Reference Committee (ERC) following the resolution at the October 1999 meeting of the ERC to establish a Standards Sub-Committee. The purpose of the report is to provide the proposed Sub-Committee with a solid body of information and advice on which to base its initial activities.

Focus of the Standards Sub-Committee

The focus of the ERC Standards Sub-Committee will be on:

- education and training delivery by electronic means,
- standards and operational guidelines to facilitate this delivery,
- agreement on the use of standards and guidelines, and
- collaboration among sectors.

The importance of technical standards

The importance of the use of online technologies in education and training is widely recognised and is explained in the ERC's Information Economy Action Plan and the supporting sectoral action plans.

A strategic involvement in a range of standards-related activities is an essential component of effective use of online technologies.

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.

The role of the ERC

The role of the ERC in relation to technical standards, as with other aspects of the EdNA Collaboration, is to provide an advisory and coordinating function. This report recommends that the Standards Sub-Committee undertake processes to identify technical standards which can be endorsed by the ERC as Preferred Standards for all of education and training in Australia. However it will be up to funding bodies, sectors, State / Territory authorities and individual educational institutions to decide on the implementation of these standards and the extent to which they might require mandatory adherence to ERC endorsed standards within their jurisdiction.

It is envisaged that the standards endorsed by the ERC will, wherever possible, be existing, widely supported open standards. The ERC should commission the development of new standards only where there this is clearly necessary and no other approach is viable.

Establishment of the ERC Standards Sub-Committee

Part of the purpose of this report is to provide advice on the establishment of the Standards Sub-Committee. Section 2 provides a rationale for ERC involvement in this area, as well as specific recommendation on the terms of reference and membership of the proposed Sub-Committee. These are based on the recommendations of the ERC with some modifications developed in consultation with members of the project Steering Group.

Principles

The *Principles* section (p.8) sets out objectives and operational principles which should guide the ERC's activities in this area to ensure that its activities maximise interoperability and other benefits but do not stifle innovation. Key principles that should guide the work of the ERC include:

- Endorsed standards should be as open and stable as possible.
- Wherever appropriate the Standards Sub-Committee will encourage the development of requirements specifications and operational guidelines as well as, or in addition to, the endorsement of technical standards.

Achievements to date

The education and training community can be justifiably proud of its achievements to date in developing and implementing technical standards in

Australia, and in having a formative influence on international standards development. Key achievements and activities are listed in the *Achievements to date* section (p.15) and more detail on individual activities is listed in Attachment B.

The range of standards bodies

There are many different types of technical standards relevant to education and training, ranging from formally endorsed international standards to de-facto standards not formally endorsed by any organisation but widely accepted as standards because of market domination or perceived usefulness.

The section *What are Standards and how are they set?* (p.23) describes both the various sorts of standards and the types of organisations nationally and internationally responsible for setting technical standards. Of particular note are the very different methods of operation of formal standards bodies (for example Standards Australia and the International Organization for Standardization) and the organisations responsible for Internet standards (for example the Internet Engineering Task Force and the World Wide Web Consortium).

The ERC Standards Sub-Committee will need to engage with both types of organisations, but different approaches to participation are necessary.

In relation to formal standards bodies this report recommends that the Standards Sub-Committee establishes a formal relationship with Standards Australia and works towards the establishment of a Standards Australia committee specifically responsible for learning technologies.

Standards areas

The section on *Standards Areas* (p.31) provides a brief description of the various areas in which technical standards exist which are relevant to the project scope. Evaluative comments are provided under each area on its relevance to education and training to assist the Sub-Committee in deciding priority areas for engagement.

Descriptions are grouped under the following headings:

- **Network Infrastructure:** general network infrastructure, end-user terminals, security, authentication and content filtering.
- **Content Formats:** storage and presentation of components of online content (text, graphics, audio and video files) plus programming languages and accessibility issues.
- **Resource Description and Resource Discovery:** Covers metadata, search interfaces and controlled vocabularies.
- **General Applications:** General network applications - web publishing, email, workgroups and videoconferencing.

- **Delivery Platforms and Content Packaging:** software systems used to manage the delivery of online content to students and to manage communications functions as part of the learning process as well as data structures to support interoperability of educational content. Also known as Learning Management Systems.
- **Administration and Management:** student records and educational statistics.

Key Issues

This section (p.43) discusses some key issues which need to be addressed by the Standards Sub-Committee in order for it to work effectively:

- **Working effectively in a cross-sectoral environment:** discusses the organisational structures of the sectors of education and training and the way this needs to be taken into account in the work of the Sub-Committee.
- **Communication Strategy:** sets out the complexity of the communication and information dissemination tasks necessary to the work of the Standards Sub-Committee.
- **Interacting with standards bodies:** provides recommendations on the priority activities for the Standards Sub-Committee in relation to a range of different standards organisations.
- **Implementation Issues:** discusses the implementation issues surrounding technical standards. The development of functional requirements and operating guidelines are at least as important as the endorsement of technical standards.
- **Intellectual property:** Management of intellectual property is a major issue in using online technologies in education and training. However the key requirements in this area at the moment are not to define technical standards, but to review existing developments internationally and to disseminate this information within the education and training sector.

Recommendations

Recommendations (p.55) are divided into priority activities which are recommended for immediate action by the Standards Sub-Committee and a listing of other possible activities to assist the Sub-Committee to develop a longer term workplan.

Priority activities

Recommended priority activities are:

- Establish an Internet site which supports publishing and discussion forums to allow dissemination of information and support communication across all sectors.
- Establish formal links with Standards Australia with the intention of establishing a Working Group and ultimately a Committee specifically involved with technical standards related to education and training.
- Provide liaison between key activities such as the Australian IMS Centre, The EdNA Metadata Working Group and the VET sector Preferred Standards project.
- Develop an ERC Preferred Standard in at least one standard area.
- Provide Australian input to at least one of the areas in which the IMS Consortium is planning to develop a specification.
- Map existing whole-of-government technical standards activities which might impact on the development of whole-of-education standards.

Planning future projects and activities

The section on planning future activities lists a number of possible future activities and project ideas which have been identified during the writing of this report. It is recommended that the Standards Sub-Committee develop:

- A workplan with priorities and costings of future projects for recommendation to the ERC so that priority projects can be readily initiated as funding becomes available.
- A communication and information dissemination strategy.

Summary of Recommendations

<u>Recommendation</u>	<u>Page</u>
R. 1 The following Terms of Reference be formally endorsed by the ERC.	6
R. 2 The following membership of the Standards Sub-Committee be formally endorsed by the ERC.	7
R. 3 The Standards Sub-Committee advise the ERC on the number and type of industry representatives who should be added to the Sub-Committee.	8
R. 4 The following statement of principles be adopted by the ERC to guide the work of the Standards Sub-Committee.	8
R. 5 The Standards Sub-Committee investigate whether formal membership of W3C by the ERC is practical and desirable.	49
R. 6 The Standards Sub-Committee actively monitor the work of the various IEEE LTSC Working Groups, engaging in forums where appropriate and practicable.	50
R. 7 Intellectual property developments be monitored and further action taken to ensure effective development of guidelines and information dissemination activities.	51
R. 8 The Standards Sub-Committee assess the need for it to take a more active role on intellectual property issues at the beginning of 2001.	51
R. 9 Wherever appropriate, activities initiated by the Standards Sub-Committee attempt to collect and disseminate operational guidelines for cooperation and interoperability in the effective use of particular technologies.	52
R. 10 The Standards Sub-Committee, as part of its general information activities, collect and disseminate information about software tools which assist implementation of agreed technical standards.	53

- R. 11 The Standards Sub-Committee, where appropriate, encourage the development of requirements specifications prior to or instead of the development of technical standards. 54
- R. 12 An Internet site be established which supports publishing and discussion forums to assist the Standards Sub-Committee in disseminating information to interested people across the whole education and training community and to facilitate communications between interested people across all sectors. 55
- R. 13 Establish formal links with Standards Australia with the intention of establishing a Working Group and ultimately a Committee specifically involved with technical standards related to education and training. 55
- R. 14 Re-establish the Australian IMS project Steering Group as a working party of the Standards Sub-Committee. 55
- R. 15 The Standards Sub-Committee be the mechanism by which the EdNA Metadata Working Group reports to the ERC. 56
- R. 16 The Sub-Committee ensure that information about the VET Preferred Standards activities in 2000 are publicised to the other sectors and opportunities are made available for other sectors to participate in these activities. 56
- R. 17 Take at least one of the existing VET Preferred Standards and arrange its updating and endorsement as an ERC Preferred Standard. 56
- R. 18 Organise a workshop or other process to develop cross-sectoral input on issues and desired functionality for at least one of the areas in which the IMS Project is planning to develop a specification. 56
- R. 19 The Standards Sub-Committee commission a research project to document existing and proposed National and State / Territory whole-of-government technical standards activities which might impact on the development of whole-of-education standards. 57
- R. 20 The Standards Sub-Committee develop a prioritised workplan and costings of future projects for recommendation to the ERC so that priority projects can be readily initiated as funding becomes available. 58

R. 21	A communication and information dissemination strategy be developed as part of the workplan.	58
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1. Project Scope

This project provides background material for the use by the Standards Sub-Committee in meeting its Terms of Reference (these are listed on p.6).

The scope of this project is to research and advise on issues related to technical standards relevant to information technology, online delivery, resource discovery and some aspects of information management in education and training in Australia in the context of international activities in these areas.

The project includes consideration of the following areas:

- organisations, projects and initiatives;
- selection and endorsement of technical standards;
- vocabularies;
- development of requirements specifications and operational guidelines;
and
- software tools.

The rationale for the inclusion of the last two points is made in section *Implementation Issues* (p.51).

The project is specifically concerned with Australian initiatives, however the Internet and the technical standards that underpin it are based within an international context and it is essential that Australian initiatives be framed in this context. This report therefore includes considerable discussion of relevant international activities, projects and standards setting bodies.

Focus of the Standards Sub-Committee

The focus of the ERC Standards Sub-Committee will be on:

- education and training delivery by electronic means,
- standards and operational guidelines to facilitate this delivery,
- agreement on the use of standards and guidelines, and
- collaboration among sectors.

Areas not covered

This project is not concerned with broader educational standards issues such as those being examined by the National Educational Performance Monitoring Taskforce (NEPMT) in the schools sector.

As part of the development of technology infrastructure, many State / Territory education and training authorities are developing guidelines and benchmarks for such things as numbers of computers per student and network performance. While

these can be broadly regarded as standards they are not within the scope of this project or the Standards Sub-Committee.

Similarly 'standards' for the development of skills in the use of information technology by teachers, students and support staff are an essential part of the successful use of technology. Professional development activities in relation to the use of online technologies are a key focus of the *Education and Training Action Plan for the Information Economy*. However these activities are also not within the scope of this project or the Standards Sub-Committee.

2. Establishment of the ERC Standards Sub-Committee

2.1 The rationale for ERC involvement

The need for concerted national action on technical standards

The importance of online technologies to education and training is widely recognised and is explained in the *Education and Training Action Plan for the Information Economy* and the supporting sectoral action plans.

There is also recognition across all sectors of key attributes of effective use of online technology including:

- The need for teachers and students to be able to quickly and efficiently find the online resources that meet their particular requirements.
- The need for online content to be able to be adapted to meet local requirements and to be accessed and delivered on a range of platforms.
- The necessity for interoperability of technical infrastructure across all sectors and wherever education and training takes place, which includes community locations, homes and workplaces as well as educational institutions.

Substantial public funds have already been committed to the three key aspects of online delivery; content development, infrastructure provision and professional development and it is likely that increasing funding will be allocated to these areas over the next few years. Understanding and implementing appropriate technical standards is one key requirement for ensuring that this funding is spent effectively and that the educational objectives are met.

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.
- Reduce the total cost of ownership of infrastructure by ‘future proofing’ purchases and minimising incompatibilities.
- Ensure the maximum interoperability and scalability of technical infrastructure.

- Encourage a broader and more open market in the supply of hardware, software and online content.
- Maximise access to online resources for all users, including those with disabilities and users in remote locations.
- 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 sector and State boundaries.
- Promote the international awareness and availability of Australian educational resources and services.
- Allow competition and cooperation as appropriate.

However, as demonstrated later in this report, there are many different areas of technical standards that are relevant to education and training and a range of formal and informal bodies that are responsible for developing these standards. The work involved in monitoring and even selectively participating in these activities is quite substantial.

A coordinated national approach is therefore likely to save a considerable effort by individual States and Territories and systems and sectors in attempting to deal with these issues, provided this can be done in a way that meets the needs of the different sectors and jurisdictions.

The unique position of the ERC

The development of standards is an integral part of the development of an online educational community. For this reason, it is appropriate that the responsibility for co-ordinating this agenda rests with EdNA, which was established for precisely this purpose and which acts on behalf of all major stakeholders in the education and training community. Standards development activities provide an important complement to the community-building role played by EdNA Online. They will assume increasing importance as the amount of educational business transacted online increases and as education-related Web sites proliferate here and around the world.

The EdNA Reference Committee is uniquely placed to steer the development of technical standards for online education and training in Australia:

- It has been given a coordination and policy advising role by the Ministerial Council for Education, Employment, Training and Youth Affairs (MCEETYA).
- It has comprehensive cross-sectoral membership as well as expert members.
- It has gained recognition from the Ministerial Council for the Information Economy as the key national forum for online education and training.

The ERC is therefore well placed to negotiate education and training standards with both national and international standards authorities and to coordinate activity between the sectors within education and training.

Challenges

A coordinated national effort on technical standards needs to address several challenges:

- It must actively engage all the stakeholders, including policy makers, technical experts and practitioners with practical ‘on the ground’ knowledge of how online technology is being used throughout education and training.
- It must work within the reality that education and training is largely a State and Territory responsibility, and that in many cases operational decisions are devolved to the individual educational institution. There can be no central mandating of technologies or even approaches.
- The sectors have quite different structures and decision-making processes.
- While consistency and interoperability are important, the world of online technology is fast moving and it is essential that these goals are not pursued in ways that will stifle experimentation and innovation or result in processes that are too complex or time-consuming to be effective.

Fortunately there are precedents which suggest that a coordinated national effort on technical standards auspiced by the ERC can be effective and can deal with the identified challenges.

The overall history of the EdNA collaboration has demonstrated that issues of common concern can be addressed in a way that adds value and does not compromise the individual decision-making of sectors.

The VET Preferred Standards project has developed a methodology and approach which have enabled collaboration on the development of technical standards while recognising that ultimately it is the individual States and Territories which make the operational decisions about how these standards are implemented.

The structure and technical standards of the Internet are inherently global (albeit disproportionately influenced by developments in the United States). The market for the development of education resources and even the delivery of educational services is also becoming much more international. It is therefore highly desirable that Australian education and training is able to present a unified and authoritative voice in international forums. The ERC is the recognised national body able to represent all of education and training in these matters.

2.2 Terms of Reference

Following are the Terms of Reference for the Standards Sub-Committee as endorsed by the ERC with some minor revisions developed by the project Steering Group.

R.1 The following Terms of Reference be formally endorsed by the ERC.

The Standards Sub-Committee will:

- Develop and maintain a strategically focussed approach to technical standards in support of effective use of information and communications technology (ICT) in education and training;
- Draw together existing work on ICT-related standards in education and training, thereby avoiding duplication, fragmentation and inconsistency in current and future work;
- Work with other bodies as appropriate, to develop, implement and promote specific technical standards to support the effective use of ICT including in all action areas identified in the Education and Training Action Plan for the Information Economy;
- Provide expert advice to the ERC (and through the ERC, to MCEETYA) on the development and implementation of national standards to facilitate interoperability, at the ICT level, of education, resource access and usage;
- Ensure that it is seen by education and training stakeholders as being representative of their interests, and that all relevant expertise and stakeholder interests are considered in regard to particular matters as they arise;
- Build coherent linkages with standards efforts in other areas of the Australian community and internationally, working closely with Standards Australia.

2.3 Membership of the Standards Sub-Committee

R.2 The following membership of the Standards Sub-Committee be formally endorsed by the ERC.

The membership of the ERC Standards Sub-Committee shall consist of:

- Two representatives of each of the Higher Education, VET and Schools sectors (nominated by the HEITCF, EVAG and SAG respectively)
- A nominee of the Australian IMS Centre
- A nominee of ANTA or the EVAG Secretariat
- A nominee of the AVCC
- A nominee of Education.Au Ltd
- A nominee of the Curriculum Corporation
- A nominee of the Office of Government Online
- A nominee of DETYA

This is based on the decision of the ERC meeting of 29 October 1999 and further consideration by the project Steering Group. It does not include industry representation which is discussed below.

Industry Representation

While the ERC decision recommended a representative of a publishing company, consideration needs to be given to a broader industry representation once the Sub-Committee is established. Industry representation is valuable in its own right, and is also important if the Standards Sub-Committee is ultimately to have a formal role as a Standards Australia committee. Such committees are expected to consist of academics and representatives of relevant national bodies representing government, vendors/industry and users. In this context the industry representatives could be drawn from a range of types of organisations:

- Publishing - particularly educational publishers and/or publishers with a strong involvement in electronic publishing.
- e-commerce organisations and associations.
- Software developers and vendors.
- Multimedia developers.
- Hardware and networking suppliers.
- Telecommunications carriers and Internet Service Providers.

R. 3 The Standards Sub-Committee advise the ERC on the number and type of industry representatives who should be added to the Sub-Committee.

In considering the specific industry representatives selected for the Standards Sub-Committee, consideration should be given to the recommended role of the Sub-Committee as the Steering Group of the IMS Australian Centre. There would be synergies in having on the Standards Sub-Committee Australian representatives of organisations and companies which are active members of the IMS Consortium internationally.

2.4 Principles

This section sets out some proposed principles and approaches which attempt to capture what has been learnt to date about effective approaches to the development of technical standards in education and training and to set a framework for the effective operation of the ERC Standards Sub-Committee.

R. 4 The following statement of principles be adopted by the ERC to guide the work of the Standards Sub-Committee.

Objectives

The overarching objective is, through a nationally coordinated approach, to ensure that Australian students and teachers have access to quality assured online education and training to enable them to function as effective citizens in the 21st Century.

Within this overall objective, the specific objectives of all activities undertaken by the ERC in relation to technical standards are to:

- Increase the interoperability of networks, applications, and online information infrastructure.
- Increase access to online education and training in educational institutions, workplaces, homes and community venues.
- Increase the uptake of online education and training.
- Reduce the cost of acquiring and maintaining network infrastructure and ‘future-proof’ infrastructure provision.
- Ensure that infrastructure is scalable and able to support mainstream usage.
- Increase the ease with which quality teaching and learning resources can be found, obtained, transferred, adapted and used by teachers and students.

- Promote the international awareness and availability of Australian educational resources and services through the application of international standards.
- Ensure that education and training providers and students in Australia can access overseas resources and services through the application of international standards.
- Increase the efficiency and interoperability of management and administrative functions in education and training.
- Showcase Australian expertise in standards work

Mechanisms

- Agree on preferred standards to be used for education and training delivery in all sectors.
- Wherever appropriate, encourage the development of requirements specifications and operational guidelines as well as, or in addition to, the endorsement of technical standards.
- Communication and dissemination of information will be a priority for the Standards Sub-Committee.
- Monitor, report on and selectively engage with bodies developing formal standards, specifications and guidelines relevant to education and training, including formal standards bodies and industry consortiums.
- Commission the development of new standards only where there this is clearly necessary and no other approach is viable.

Operational principles

- International standards will be adopted to the maximum extent possible without compromising the goals of Australian education and training.
- Endorsed standards will be as open and stable as possible in terms of:
 - Their endorsement by formal standards bodies or broadly based coalitions.
 - The opportunities for engagement in the development and updating processes.
 - The extent of their testing and deployment.
 - The availability of detailed documentation for the standard.
 - The availability of products which support the standard from a variety of vendors.
- Standards endorsed by the ERC will be recommended standards. It will be up to funding bodies, sectors, state authorities and individual educational

providers to decide if and to what extent they require mandatory adherence to ERC endorsed standards.

- The purpose of endorsing standards is to increase interoperability and flexibility. Standards should not be used to stifle innovation and experimentation with new technologies.
- The ERC will ensure that there are adequate opportunities for consultation with relevant policy makers, technical people and practitioners in all sectors before developing or endorsing a standard.
- Appropriate processes for developing standards will be chosen on a case-by-case basis. For example, in some cases a 'lead sector' approach will be appropriate in which one sector is responsible for the development of a standard in consultation with other sectors. Once a standard has been endorsed by a sector process it will be considered for broader consultation and endorsement as an ERC standard. In other cases it will be appropriate to adopt a cross-sectoral approach to the consultation and development process from the beginning.
- Where standards are developed or endorsed by the ERC, part of the process will be to ensure that adequate resources and mechanisms are in place to ensure that the standard is maintained and that it is effectively communicated to all relevant parties.
- In developing standards for interoperability of metadata and other cataloguing and classification systems, the need for different sectors to use the terminology which is most accepted by their user communities will be supported.

3. Context and Trends

This section provides an overview of the various trends and developments which are important for the education and training community to address in the area of technical standards. The following list includes general trends in the use of information technology and specific issues related to the use of information technology in education. This reflects the fact that all areas of society, including industry and government services, are increasingly having to deal with the transformations which are both made possible, and driven by, the increasing pervasiveness of information technology.

General Internet developments

The trend to open systems

The supremacy of the Internet, and an open standards approach as the only sensible approach to online networks are now taken for granted. It is worth remembering however that as recently as 1995 when a whole of education network was being considered there was a case for using a proprietary network architecture (such as the Microsoft Network, CompuServe or Apple E-World) to achieve additional functionality.

Nor should the ongoing survival of open, decentralised, standards-based networks be regarded as inevitable. The Internet continues to thrive despite the apparent lack of a viable business model for many aspects of its operation. Large players acting at the intersection of telecommunications, media and network technology are always looking for arrangements which can provide an environment in which they can control both network access and content to create a more viable business model. The continuing announcements of mega-mergers such as Time Warner / AOL are examples of this.

Competition and standardisation

The rapid growth of the Internet and the ascendancy of open systems have led to new approaches to competition. In the past suppliers have tried to lock in users and markets through attempting to provide a full range of services and raising barriers to moving outside a proprietary environment. The current model focuses more on strategic alliances and the advantages of being able to move quickly to provide innovative solutions. In this model participation in the development of open standards, often in conjunction with competitors, is recognised as an essential part of growing the market.

Bandwidth initiatives

Affordable access to increased bandwidth (i.e. high speed Internet connectivity) is widely recognised as a necessity for ubiquitous use of online technology. Solutions are being sought both through regulatory arrangements to increase competition, and through innovative technological approaches, including satellite delivery, data over Pay TV cable, Digital Subscriber Line technologies to increase the carrying capacity of existing telephone cables, and a range of wireless access technologies.

It seems unlikely that there will be any single solution which will solve the affordable bandwidth problem in all cases. This makes it increasingly important that standards are in place to ensure that users can access the services they require however they are connected to this heterogeneous network infrastructure.

Focus on content

Despite the initiatives on network infrastructure, the commercial Internet world is increasingly focussing on the necessity for compelling content and applications to drive the uptake of online technology. The attempt to combine content control and delivery mechanisms has been the underlying dynamic in many of the recent mergers and takeovers.

Educational context*Blurring of the sector boundaries*

The boundary between the sectors of education and training is becoming increasingly blurred. Vocational Education and Training programs are delivered in schools. Many Universities now are also major VET providers. Articulation of courses now results in students moving more freely in both directions between VET and university courses to get the mix of qualifications and skills they require. Some universities provide programs at advanced levels to school students.

All sectors are heavily involved in developing their use of online technology and while there are particular issues in each sector, there are also many common issues in which the sectors can learn from each other's experiences.

Network infrastructure for education and training

Whether on or off campus, all participants in the education and training sector need access to high quality, reliable, sustainable and affordable ICT infrastructure that is capable of supporting the most up-to-date tools available for learning and knowledge creation. Advice provided by the education and training sector, and confirmed by a consultant's report (Olaf Moon, *Bandwidth Requirements for the Australian Education and Training Sector*, August 1999), indicates that limits on

access to ICT infrastructure are key impediments to the education and training sector's participation in the Information Economy. Disparities in access and cost between urban and rural and regional areas – an issue referred to in the recent report of the National Bandwidth Inquiry – present key equity issues as well as issues for regional and industry development.

The *Infrastructure* section of the ERC's *Education and Training Action Plan for the Information Economy* summarises both achievements to date in infrastructure provision in educational institutions, and the additional requirements to achieve ubiquitous access to online education and training.

Use of Internet content as a resource

Content freely available on the Internet is recognised as a valuable raw resource for use in education and training. However there is also recognition that the quality of this resource is highly variable; and that selection, quality assessment and description of these resources is essential if they are to be used effectively by teachers and students. These have been core activities of EdNA Online for the last few years.

Need for effective resource description and resource discovery

The explosion of available online resources, both through the general Internet, and increasingly through initiatives for content development specifically for education have meant there is a continuing demand for more effective ways to identify, classify and retrieve resources. Key initiatives in this area include the EdNA Metadata Standard Working Group, the Dublin Core Education initiative and the IMS Consortium's metadata specification.

Content development initiatives

Development of high quality content for online delivery is important in all sectors. Examples include ANTA Flexible Delivery Toolboxes, the Science Online for Middle Years project being conducted by the Curriculum Corporation and the proposed Online Content Development initiative for schools. While there is no similar central funding of online content development in higher education, the cost of initiatives in individual universities and departments would total many millions of dollars a year.

Interoperability and re-use

There is an active recognition of the need to move to a stronger focus on online development that allows for the ready customisation and re-purposing of content at the local level by teachers. This is reflected in the way content development is being funded and organised in many sectors of education and training.

There is an increasing awareness that interoperability is a key requirement for effective content development. This awareness is shared by both education and training and the information technology sector as demonstrated by the strong level of support internationally for the IMS Consortium.

Intellectual Property issues

There is widespread recognition that a range of intellectual property issues needs to be resolved to allow effective use of information technology in education and training. There is also legislation currently before Parliament which will change current arrangements. Various models are being developed to manage aspects of intellectual property. Some are based on detailed tracking of access and use of resources; others such as AShareNet seek to reduce some of this complexity by a collaborative approach to the sharing of intellectual property.

Two of the Cooperative Multimedia Centres (Access CMC and Impart Corporation) have worked together to develop Propagate, an online intellectual property trading system in collaboration with copyright collection agencies and publishers. Negotiations are currently underway with venture capital investors to fully develop the system.

4. Achievements to date

The education and training community is in a fortunate position in addressing issues of technical standards. All government agencies, organisations and industries are having to face the challenges posed by the rapid growth of the Internet and the impact it will have in transforming many aspects of their core business. But education and training in Australia has a head-start due to:

- The foresight in establishing the EdNA collaboration and the strength of the people networks this has created in its advisory groups and throughout the various sectors.
- The track record of working on key policy issues collaboratively through the EdNA Reference Committee.
- The involvement of universities in the development of the Internet from its birth.
- The strengths in information management in the education library community.
- The professional support available nationally through the independent companies owned by the Ministers of education and training, in particular the Curriculum Corporation, Education.Au Ltd and the National Centre for Vocational Education Research.
- Some innovative key projects described below.
- The strong participation by the Australian education and training community in a range of international standards activities, notably the Dublin Core Metadata Initiative, the IMS project and international standards on information management.

This section summarises some of the key initiatives. Details on other initiatives are included in Attachment B.

4.1 Australian Standards Setting Initiatives

This section describes work to date on setting technical standards for education and training in Australia.

EdNA Metadata Standard Working Group

EdNA was one of the earliest adopters of standards-driven metadata internationally. The first published draft of the EdNA Metadata Standard was approved by the EdNA Reference Committee and published on 1 May 1997. After a further fifteen months of consultation a version 1.0 was formally launched on 31

August 1998. EdNA metadata is based on the international Dublin Core metadata standard.

This work has now been formalised with the establishment of the EdNA Metadata Standard Working Group, charged with the responsibility for taking forward the next revision of the EdNA Metadata Standard. Each of the EdNA sectoral advisory groups is represented on the Working Group (Schools, Vocational Education and Training, Higher Education) as well as the Department of Education, Training and Youth Affairs (DETYA). The Working Group held its first meeting in October 1999.

VET Sector Preferred Standards project

Preferred Standards to Support National Cooperation in Applying Technology to VET is an ANTA funded national project.

The first stage of the project was conducted in 1997. It produced a Standards Policy and a Standards Maintenance Process. These were endorsed by ANTA CEOs. The Standards Policy sets a framework for the selection of standards which favours the most open and non-proprietary standard available which meets the needs of the sector in each area being considered. The Standards Maintenance Process sets out a process for reviewing standards and setting new standards. Key components of the Maintenance Process include:

- Identify the guiding policies
- Scope the sector's need for this standard area in relation to online delivery
- Identify existing technology and standards implementation
- Identify issues and constraints
- Appoint technical consultant
- Nominate technical experts and participating staff from States and Territories
- Prepare discussion paper for workshop
- Hold workshop
- Document Preferred Standards, Functional Specifications, Operating Guidelines as appropriate.
- Seek endorsement of ANTA CEOs.

During 1998 the Standards Maintenance Process was implemented in the following areas:

- Computer Managed Learning Systems
- Data interchange
- Email
- Groupware
- Internet and Intranets
- Personal Computers
- Videoconferencing

In some areas Preferred Standards were developed, in others it was appropriate to develop just Functional Specifications or Operating Guidelines. In two cases all three aspects were addressed.

On 2 March 1999, ANTA CEOs endorsed recommendations arising from this process, including:

- *that Chief Executive Officers endorse the Preferred Standards to support national cooperation in applying technology to VET.*
- *that Chief Executive Officers agree to implement the Preferred Standards in a manner appropriate to their jurisdiction, with due regard to 'whole of government' negotiations in their particular State or Territory, but with the intention of achieving the maximum feasible level of implementation and interoperability for the VET sector.*

ANTA CEOs have now endorsed *Flexible Learning for the Information Economy: A Framework for National Collaboration in Vocational Education and Training 2000-2004* and *Strategy 2000* a \$20m implementation plan for the first year of the Collaborative Framework. One of the components of Strategy 2000 is a further development of the Preferred Standards project. This will:

- Develop standards and operational guidelines in new areas and review and update existing Preferred Standards.
- Develop a communication plan for the dissemination of Preferred Standards.
- Conduct a survey and report on progress on implementation of Preferred Standards already endorsed.
- Identify areas in which additional standards would support national collaboration and interoperability.

The Project Manager of this project is a member of the Steering Group for the Standards Sub-Committee.

Inventory Of Computer-Facilitated Learning and Support Materials In Australian Universities

The report *Developing A Framework For A Usable And Useful Inventory Of Computer-Facilitated Learning (CFL) And Support Materials In Australian Universities* proposes a framework for how a successful national inventory of CFL resources could be set up and maintained. The development of national metadata standards for CFL resources would enable teachers and lecturers to search across distributed databases which contained contextual information about the resource, to facilitate access and guide potential use. The academic or student user accessing the database makes a considered selection based on the metadata material. He or she may then wish to trial the resource in order to make a final decision about the worth of the resource. They would then fulfil the intellectual

property requirements set by the author or institution for use, if they wish to use it in teaching.

Standards Australia Committee IT-19

This Standards Australia Committee is formally titled “IT-19 / Computer Applications - Information and Documentation”. Its terms of reference include, “Standardisation of practices relating to libraries, documentation and information centres, indexing and abstracting services, archives, information science and publishing.”

The committee has a particular interest in issues of information interchange and has been active in work on the X.500 standard. The committee also monitors the work of the corresponding international committee ISO/TC46 - “Information and Documentation”.

As the Standards Australia Committee with the closest relationship to the work of the ERC Standards Sub-Committee, there are ways the Sub-Committee could work through IT-19 to engage with formal national and international standards efforts. The chair of IT-19 is also a member of the Steering Group for this report.

Australian IMS Centre

The IMS Global Learning Consortium Inc (formerly the Instructional Management Systems project) is a US based initiative, incorporating some 600 educational institutions across the USA as well as many non-US participants. It is developing and promoting open specifications for facilitating online distributed learning activities. More details are included in Section 5.4.

DETYA has joined the Consortium as an investment member on behalf of the education and training community in Australia. Australia is one of four countries that have established IMS centres to facilitate national participation in IMS processes. The Australian IMS Centre has been established at the University of New England. It is active in harmonising IMS specifications with other standards efforts such as Dublin Core where Australian representatives have been participating.

4.2 Key Australian Projects Implementing Standards

This section describes some of the key Australian projects that are implementing technical standards.

EdNA Online

Among its suite of services EdNA Online provides a directory of quality Internet resources relevant to education and training in Australia. It is also a key reference point for information on many of the other initiatives described in this report.

EdNA Online provides a range of services, but in relation to the subject of this report, the most significant is the directory of web resources and the associated search functions. At the core of this is a database of over 10,000 individually evaluated web sites, and around 237,000 pages linked from these. Records associated with the evaluated web sites exist as 'surrogates' (metadata) within the EdNA Online database. The EdNA Online search function provides searching across all these pages, and also provides targeted searching based on metadata.

There are currently three main mechanisms for the creation and gathering of this metadata:

- **Item Administration:** A secure site with logon information is available to registered users to immediately add data about online resources. Using the EdNA metadata Standard information about online resources is captured and stored as surrogate records ("items"). This information is then available to users through the 'search' and 'browse' functions of EdNA Online.
- **Harvesting (embedded):** Where pages are owned by EdNA stakeholders, metadata can be added to the pages themselves in accordance with the EdNA Metadata Standard p.15). This metadata is then collected and updated as the pages are periodically scanned by the EdNA robot.
- **Harvesting (detached):** Where evaluated pages have been selected by EdNA stakeholders but are owned by external parties it is not possible to add metadata directly. Instead stakeholders evaluate the resources and catalogue them according to the EdNA Metadata Standard (this is known as 'detached metadata'). This information is stored in a single file which is then 'harvested' by the EdNA system and the page records are automatically added to the EdNA database and included in both the relevant directory categories and the search function.

When this system is fully implemented it will be possible to carry out a metadata based search across both types of resources.

Development of this sophisticated model of devolved identification and administration of resources has required several components.

- Development of a Metadata standard.
- Agreement on common vocabularies for metadata values.
- Development of agreements under which stakeholders agree to contribute resources and to be responsible for the quality of the cataloguing of those resources (whether the resources are owned by them or third parties).

- Operational rules to define how harvested information is treated (for example what happens if an external resource is identified and catalogued by more than one stakeholder).
- Documentation and software tools to assist stakeholders create metadata either in their web pages or as files of detached metadata.
- The technical infrastructure to actually carry out the harvesting and inclusion of resources into the EdNA database.

The development of this framework has resulted in a substantial group of people throughout education and training who are familiar with the underlying principles of resource description, metadata cataloguing and the requirements for interoperability between information systems.

AEShareNet

AEShareNet is an innovative initiative for managing copyright in the vocational education and training (VET) sector. The development of AEShareNet has been funded as an ANTA national project over three years and is being overseen by a national Establishment Group. A non-profit company owned by the State / Territory and Commonwealth Ministers of Education and Training is being established to implement AEShareNet.

Information about materials available for licensing by AEShareNet members will be imported from existing State / Territory databases on a regular basis. This has necessitated the development of an agreed data structure which is consistent with the EdNA Metadata Standard. This is documented at <http://www.dytech.com.au/aesharenet/#Documentation>

When fully established, the AEShareNet website will allow anyone with access to the Internet to search for VET material using a number of search criteria. Members of AEShareNet will be able to take out a licence via the website to use material offered by other members. This will considerably streamline the licensing process and improve copyright compliance.

The AEShareNet legal model has been designed to address many of the issues of management of intellectual property in the VET sector, particularly those arising from the need for VET teachers and course developers to modify existing material to be able to meet the needs of particular client groups or industries.

National Teaching and Learning Database

The NTLD is a central database of metadata about on-line learning material. The NTLD metadata tool provides the user with the option of requesting output of the metadata created in either HTML4 or XML format. The database is not a repository of the material itself, which remains on the creator's web site. A team at the University of Sydney developed the metadata tool with the assistance of a Commonwealth grant under the Higher Education Innovation Program, and

created an example database of more than 70,000 electronically accessible “learning objects” from the Australian University Museums On Line material and the Wilson-Henle Museum of Anatomy.

A consortium of universities will contribute to ongoing development, promotion and use of the system to catalogue and search materials in a standard format using IMS metadata standards.

Subject Gateways

University libraries have been involved in the collaborative creation of subject gateways, in many cases working with academic researchers. Gateway projects in agriculture, chemistry, engineering and literature are some examples. Several are also linked to overseas gateway projects. The EdNA Higher Education project, Education.Au and the National Library have also been active nationally and internationally on initiatives related to subject gateways. The first meeting of Australian subject gateway owners was convened on 22nd February 2000 at the National Library of Australia in Canberra. A best practice checklist for establishing and managing Australian subject gateways has been developed.

4.3 Participation in International Activities

Australia has an active involvement in international activities on technical standards which provide a strong basis for the ERC Standards Sub-Committee to have an impact internationally as well as nationally.

Both the IT-19 Committee and the IMS Australia Centre described above have a strong engagement with corresponding international activities. A number of Australian educational organisations are members of W3C (see p.49).

Dublin Core Metadata Initiative

Australia has been active in the Dublin Core Metadata Initiative through active participation of people from the EdNA Collaboration, the National Library of Australia and the Distributed Systems Technology Centre.

Dublin Core Education Working Group

This international working group is developing extensions to the Dublin Core Element Set that relate specifically to education and is also working on interoperability between the Dublin Core metadata standard and the IMS Metadata Standard. The Working Group is co-chaired by Jon Mason, Technical Director at Education.Au Ltd and held its first face-to-face meeting in Australia in February 2000.

5. What are Standards and how are they set?

This section provides an overview of the main organisations involved in setting the types of standards relevant to this report. It also includes a discussion of the different types of standards. Understanding the complexity of this both helps to define the scope of the Sub-Committee's work and also to inform later recommendations on how the Sub-Committee should interact with the various types of standards organisations.

In particular it is worth noting the quite extreme differences in culture and approach between the formal national and international standards setting bodies and the more open and informal nature of Internet standards setting processes.

Official standards bodies are based on national representation and formal nomination of members to committees by organisations. Care is taken to ensure that committees have a reasonably balanced membership between academics, government, vendor and user representatives. (Committees can also establish Working Groups which are more informal in their composition.)

By contrast, many of the key bodies in setting Internet standards are completely open, and membership is of interested individuals, not organisational representatives. Conferences of the Internet Engineering Task Force, for example, are open to any interested person.

5.1 Formal Standards Organisations

While many organisations are active in developing technical standards, the most established and prominent are those for whom technical standards are their sole reason for existence. The International Organization for Standardization (ISO) is the peak global body for standards development. ISO's scope is all standards other than those involving electrical, electronic and related technologies – which are the focus of the International Electromechanical Commission (IEC). The field of information technology is handled by a joint ISO/IEC committee known as JTC 1.

The IEC was founded in 1906 and has over 50 participating countries. ISO was established in 1947 and its membership comprises 130 countries. Both organisations are based in Switzerland.

The membership of both organisations comprises national standards bodies, one from each country. For instance the Australian representative on ISO and the IEC is Standards Australia, the peak standards setting organisation in Australia. These organisations are typically non-profit, non-government organisations, which may receive considerable government support due to the importance of their work.

The work of developing standards is done by technical experts who may work for other standards bodies, government departments or companies or who may

participate as individuals. Standards are adopted by consensus (such as a two-thirds vote of the experts who developed the standard) and are intended to be guides for voluntary adoption. Some technical standards become mandatory due to government regulation in individual countries. Such government adoption of standards is common in the fields of health and safety and in technical fields involving interworking of systems – particularly telecommunications.

Telecommunications has traditionally been a government activity, and the International Telecommunications Union (ITU) is the global peak body in this field. Its membership is generally government telecommunications companies or regulators. Australia's representative is the Australian Communications Authority (ACA) (previously AUSTEL).

Important standards work is also carried out by regional and national bodies such as the European Telecommunications Standards Institute (ETSI) and the American National Standards Institute (ANSI). Often, the standards produced by ETSI, ANSI and the Institute of Electrical and Electronics Engineers (IEEE) are adopted by ISO, the IEC or the ITU, which gives the standards a more global and formal status.

Except for the IEEE, the sole purpose of all these organisations is standards. They constitute the “official” standards establishment, which is known for its rigor, open and democratic values, and often for its bureaucracy and lengthy timetables for standards development.

Institute of Electrical and Electronics Engineers (IEEE)

The Institute of Electrical and Electronics Engineers was established in 1963 after the merger of two US-based radio and electrical engineering organisations. The IEEE is now an international organisation of engineers, and includes many IEEE societies centred on geographical membership groups and particular fields of interest.

While not a formal standards body in the same way as ISO and IEC, the IEEE has a strong role in technical standards setting, and often works with the formal standards organisations. Its membership is primarily of individual engineers, rather than corporations, standards bodies or government regulatory agencies.

IEEE standards work encompasses a wide range of hardware, software and information management fields. Of particular relevance to this report is the IEEE Learning Technology Standards Committee (LTSC) described below (p.30).

5.2 Internet Standards and Standards Bodies

The Internet Engineering Task Force (IETF) and the World Wide Web Consortium (W3C) are the two most prominent bodies setting technical standards for Internet communications. The W3C was founded in 1994 and has a more commercial orientation than the IETF, which traces its roots back to ARPANET's

1969 development of the protocols which evolved into those now used in the Internet.

The IETF is generally concerned with naming, addressing and the transport and routing of data, whereas the W3C is more concerned with the content of that data.

The Internet Engineering Task Force (IETF)

The IETF is one of a group of organisations that collectively govern the Internet – to the extent that it *is* governed. These include the Internet Architecture Board (IAB, <http://www.iab.org>), Internet Society (<http://www.isoc.org>), the Internet Assigned Names Authority (IANA, <http://www.iana.org>) and the Internet Research Task Force (IRTF, <http://www.irtf.org>).

The IETF derives its imprimatur from the Internet Society (ISOC <http://www.isoc.org>), which describes itself as “a non-profit, non-governmental, international, professional membership organisation, focused on: standards, education, and policy issues.” ISOC has more than 150 organisation and 8,600 individual members in over 170 nations.

The IETF has no membership in a formal sense. Any person who is a member of one of the IETF’s many mailing lists is considered a member. There are eight areas of IETF activity, with a total of 124 working groups.

Most IETF activity takes place via mailing lists, but there are three conferences per year. Attendances have grown from 21 in January 1986 to 2,397 in November 1999. The 47th IETF conference was held 26-31 March 2000 in Adelaide; the first time the meeting had been held outside the USA, Canada or Europe.

The IETF is an international organisation, but its origins and current secretariat are located in the USA. The secretariat is hosted by the Corporation for National Research Initiatives, a not-for-profit body established in 1986. Any person may participate in the working groups of the IETF and be elected or appointed to its committees.

The World Wide Web Consortium (W3C)

The World Wide Web Consortium was created in October 1994 to “lead the World Wide Web to its full potential by developing common protocols that promote its evolution and ensure its interoperability”. W3C has more than 400 member organisations from around the world and is financed primary by its members and, to a lesser extent, by public funds. W3C membership is available to all organisations. Membership comprises “vendors of technology products and services, content providers, corporate users, research laboratories, standards bodies, and governments”.

Membership costs US\$50,000 pa, or US\$5,000 pa for non-profit and government organisations and for companies with revenue of less than US\$50m.

The W3C is hosted by three universities – in the USA, France and Japan. Its staff is the 57 person “W3C Team”, comprised of researchers and engineers from 10

countries, including one from Australia. This includes 12 members of the Management Team.

The W3C currently lists 12 areas of activity. Each activity is worked on by individuals from member organisations. This is in contrast to most standards organisations who accept experts in their fields for working groups and is in stark contrast to the completely open nature of IETF membership. While IETF mailing list discussions are open to all, W3C discussions and archives are only available to members.

The W3C describes the contrast with the IETF in the following manner:

The IETF works in an entirely open manner: meetings are generally attended, by email or physically, by anyone who wishes to participate. W3C, by contrast, is a Consortium of organisations that pay a Membership fee to support its operation (Membership is open to any organisation). W3C has a process for assigning defined groups of committed experts to solve specific tasks.

As a result of these differences, IETF working groups tend to be effective both for the collection of ideas from a wide community, and also, when a specification exists, for providing criticism from a wide community. W3C is effective at producing, in a timely fashion, a specification that is likely (though not guaranteed) to meet the needs of its Members and the community.

<http://www.w3.org/Consortium/Process/Process-19991111/activities.html#GroupsEvents>

The role of standards and protocols on the Internet

There are dozens of major protocols in widespread use in today's Internet, and new protocols are being developed continually. These basic protocols and many of the higher level ones are formally developed by the IETF and/or the W3C. However, there is nothing to stop a company, such as AOL or Yahoo, writing a program which communicates with a novel protocol, provided it does not conflict with established protocols. For example, IRC is the traditional Internet Relay Chat protocol, but for their own commercial purposes, AOL, Yahoo and ICQ have developed different protocols which achieve much the same functionality, but which are not standardised by the IETF and which do not interoperate with each other or with IRC.

While it is technically easy to violate Internet standards, most users would not want to because of the disruption it would cause, and the threat of being disconnected by their upstream provider.

Relationship between different standards bodies

Neither the IETF or the W3C is a formal standards body in the view of organisations such as ISO. The IETF in particular is a lightweight, flexible and informal body, which nonetheless has a record of success in its field which is the envy of more formal bodies. An example is the ascendancy of the Internet and

TCP/IP itself. Long after the Internet protocols were established and widely used, the formal bodies in the early 1990s attempted their own top-down global networking standards suite OSI (Open Systems Interconnect), which was formally adopted by governments as GOSIP, and which today is rarely referred to.

The IETF exists in something of a vacuum in terms of the formal standards bodies such as ISO, but to Internet users and developers, its standards are fundamental to Internet communications. IETF standards are generally developed more rapidly than those of the formal bodies. However some IETF standards – such as HTTP 1.1 and the “IPV6” expansion of Internet addressing and basic protocols – are taking years to develop.

The W3C also works with the IETF in some fields, such as the HTTP 1.1 specification, which enables multiple files to be sent via a single HTTP session.

5.3 De facto standards

The work of the formal standards bodies (ISO, IEC, ITU etc.) and the less formal organisations such as IEEE, IETF and W3C is complex and wide-ranging. But the work of such democratic and established standards organisations represents only part of the full picture of the proliferation of Internet technology.

In practice, effective technical standards (those defined technological processes with which most people must comply in order to be productive in a given field) can be established by individuals, companies and commercial consortiums as well as by standards organisations. Such informal standards may or may not be elegant and offer optimum performance, expandability and interoperability. Sometimes a standard results from the ubiquitous adoption of a product which was never intended to set a standard in the first place.

Despite the well-established, comprehensive and complementary nature of the IETF / W3C oversight of Internet standards, important Internet standards are still developed without the involvement of either organisation.

An informal “standard” may be established by a single company. An informal standard may be established within a year or two because of short-term adoption resulting from some combination of technical merit and marketing clout - without the benefit of being crafted to fit in well with existing and future Internet protocols. Such de facto standards often involve proprietary technology which is kept secret, or which is subject to patents and licensing fees.

A good example of a lasting standard being established by a single programmer is the PGP (Pretty Good Privacy) message format, security model and encryption standards which are the product of Philip Zimmermann’s volunteer work and the open-source development which followed.

Companies often desire to establish their technology as the de facto standard in terms of wide or ubiquitous adoption, and then have it accepted as, or as the basis for, a more formal standard. An example is Sun’s development of Java – a platform-independent programming language generally regarded as crucial for

sophisticated web applications and perhaps for loosening the grip of Microsoft on operating systems and application programs. Sun developed Java commercially and there has been a protracted dispute regarding Sun wanting it to be accepted as a formal standard, whilst still retaining proprietary control over its development.

Even when an important new Internet standard is developed deliberately to be a standard, rather than evolving from a successful product, it may be created by an industry-based consortium operating without involvement or liaison with the IETF or W3C. Such is the case when a number of telecommunications manufacturers formed the WAP (Wireless Application Protocol) Forum (<http://www.wapforum.org>). WAP is a method of achieving Internet communication on a handheld wireless device such as a mobile phone. It involves WML (Wireless Markup Language) and WTP (Wireless Transport Protocol) which are necessarily different analogues to HTML and HTTP. This content language and protocol are likely to be of immense importance in the years to come and it seems that a somewhat parallel “WAP” web will develop using the same servers as the World Wide Web we know today. Yet WAP was developed and its implementation began before the WAP Forum established a working relationship with W3C.

While the IETF and W3C are the most important bodies for developing Internet standards, the field is so dynamic and commercially charged that the true picture of the development of the technologies we must regard as “standard” is more complex than any one organisation seems prepared to acknowledge.

Industry Standards

The term ‘industry standard’ means a published standard that is implemented by more than one manufacturer and allows interoperability of products. An industry standard may be formal or de facto in terms of the discussion above.

5.4 Standards bodies specifically concerned with education

JTC 1/SC 36 - Subcommittee on Learning Technology

JTC 1 has recently established a new Subcommittee on Learning Technology. Its formal title is “ISO/IEC JTC 1/SC 36 -- Learning Technology” and its scope is “Standardisation in the area of information technologies that support automation for learners, learning institutions, and learning resources.” The first meeting of this Subcommittee was held in London on 16-17 March 2000.

The establishment of this group is significant as it indicates that the formal international standards bodies have recognised that online education and training is sufficiently important and sufficiently distinctive to justify a separate Subcommittee.

This development is important for the ERC Standards Sub-Committee. To date most of the initiative on standards for online education and training has taken place through bodies such as IMS. It will now be necessary to liaise with formal bodies both as a source of information and to ensure that formal standards meet the needs of education and training and take into account work already undertaken through initiatives such as IMS and DC-Education.

IMS Project

The IMS Global Learning Consortium Inc (formerly the Instructional Management Systems project) is a US initiative, incorporating some 600 educational institutions across the USA as well as many non-US participants. The consortium also includes a number of industrial partners, many of whom have made a significant financial contribution to the project as investment members of IMS. Over and above the substance of the work, it is this direct participation by a large number of multinational corporations that has fuelled global interest in the IMS and has led to the setting up of satellite IMS centres in Australia, Canada, Singapore and the UK, operated by local agencies.

The IMS project started work with the academic community in the US in constructing a detailed requirements specification for online learning. The IMS vision has been broken down into a number of fairly modular areas. Members are able to participate in the specific areas with which they are most concerned.

Key areas include:

- E-Commerce
- Enterprise Systems
- Metadata
- Content Packaging
- Question & Test
- Security
- Content Management
- Profiles
- Conformance Testing

Specifications for Metadata and Enterprise Systems were released in the third quarter of 1999. The metadata specification was developed in collaboration with the IEEE Learning Object Metadata (LOM) Working Group. In addition to the LOM specification, the IMS specification describes a set of core elements that it is desirable that developers support, and gives guidelines on implementation.

The second published IMS specification is the Enterprise Systems Specification. This describes a data model for representing student data encompassing personal data, groups, group membership and grades.

Another area in which progress has been made is the Content Packaging group. This group is producing a specification for packaging educational content for delivery to the learner, addressing issues such as which files might be required on the user's machine through to supported installation and usage, etc. A piece of demonstration software has also been produced called 'packman', which

incorporates the metadata and package description files along with the content in a single file. Commercial vendors such as Microsoft have been quick to release a product, the Learning Resource iNterchange (LRN) Toolkit, which conforms to the content packaging specification (see <http://www.microsoft.com/eLearn>).

The Question & Test group have developed an extensive hierarchy for classifying question modes and suggested developing an XML schema for passing the results back to a Learning Management System. Proposals have also been put forward on Content Management.

(The description above is summarised from “The Standards Fora for Online Education” <http://www.dlib.org/dlib/december99/12miller.html>)

European Working Group on Requirements for Educational Technology

“In Europe, the Information Society Standardization System of the European Committee for Standardization (CEN/ISSS), in co-operation with Directorates General III and XIII of the European Commission, has set up a working group to address European requirements for Educational Technology.”

<http://www.cenorm.be/iss/Workshop/lt/>

The IEEE Learning Technology Standards Committee (LTSC)

Within the “Information Technology” area of IEEE, the Learning Technology Standards Committee (LTSC) was established in 1996 and currently oversees the work of some 20 Working Groups.

“The mission of IEEE LTSC working groups is to develop technical standards, recommended practices, and guides for software components, tools, technologies and design methods that facilitate the development, deployment, maintenance and interoperation of computer implementations of education and training components and systems.”

The work of the LTSC is important for the ERC Standards Sub-Committee both because it works in a number of relevant areas, and also because IMS specifications make use of IEEE standards, for example the IMS Metadata Standard is heavily based on the IEEE Learning Object Metadata.

6. Standards areas

This section provides a brief description of the various areas in which technical standards exist which are relevant to the project scope. It is not intended that that Standards Sub-Committee should be active in all these areas. Rather, the Sub-Committee should choose a few priority areas for project activity. However developments in most of these areas should be at least monitored by the Sub-Committee and relevant information disseminated via the proposed website.

NB: Some of these descriptions contain names or acronyms of relevant standards. These have been included for cross-reference but have deliberately not been spelt out or described here as this section is intended as an overview. More detail on individual standards will be found in Attachment B.

In this context, the term 'standards' is used in the broadest sense, including proprietary formats (eg PDF) and guidelines (eg accessibility guidelines).

Any classification of standards or attempt to define different layers of operation is bound to be somewhat arbitrary and contentious, however for the purpose of discussion the following broad headings have been used:

- **Network Infrastructure:** general network infrastructure for transmission of data and standards for *transfer* of particular types of media (text, audio and video). Also covered are standards for end-user terminals. This section also covers control of access to resources including security and authentication as well as content filtering.
- **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 the controlled vocabularies necessary to assist reliable resource discovery.
- **General Applications:** General network applications which are not specific to education and training. Covers web publishing, email, workgroups and videoconferencing.
- **Delivery Platforms and Content Packaging:** Covers software systems (sometimes known as Learning Management Systems) used to manage the delivery of online content to students and to manage communications functions as part of the learning process as well as data structures to support interoperability of educational content. In some ways these can be seen as the core of online education and training.
- **Administration and Management:** These are specific applications related to the management of education and training. Covers student records and educational statistics.

6.1 Network Infrastructure

What is it? This section covers general network infrastructure for transmission of data and standards for transfer of particular types of media.

Relevance to education and training: Much of this area is general Internet infrastructure for which there is not much need or ability for education and training to set standards. In some of the new emerging areas there may be a case for monitoring and dissemination of information about relevant activities.

General data transmission

What is it? Transmission of digital data, independent of particular applications.

Relevance to education and training: WAP (Wireless Application Protocol) is attracting a lot of industry attention and development at the moment. However it is not clear that there are foreseeable educational applications which would justify an active engagement. Standards for satellite delivery of data could be significant in addressing needs of remote users. Datacasting over the proposed digital TV infrastructure may also have significant educational applications.

Examples of Standards: TCP/IP, DOCSIS (Data over Cable Service Interface Specification), WAP, DSL (Digital Subscriber Lines)

Text transfer

What is it? Standards for transmission of mainly text data for applications such as web pages, email and chat.

Relevance to education and training: This is the core of most Internet usage in education. Many of the standards are well set and implemented. Activities for education and training are likely to be mainly in the area of formal endorsement of existing standards and guidelines on usage.

Examples of Standards: HTTP, NNTP, IRC, SMTP, FTP

Streamed media

What is it? Transmission and control of live and stored audio and video material which is viewed while being transferred as opposed to being viewed after it has been downloaded to the viewer's workstation.

Relevance to education and training: This is an emerging area, particularly as higher bandwidth connections become available. Bandwidth limitations are less of a problem within institutions. These technologies can be implemented now on

Local Area Networks. Appropriate use of streaming audio and video could add substantially to the impact of online delivery of content. Advice on appropriate standards and operational guidelines could greatly assist providers to make use of these emerging technologies.

This area is likely to be a focus of the VET Preferred Standards project in 2000.

Examples of Standards: SDP - Session Description Protocol, RTP - Realtime Transport Protocol, RTCP - Real Time Control Protocol, RTSP - Real Time Streaming Protocol, MBONE

Client terminals

What is it? Description of standard configuration(s) and capabilities of end-user terminals for education and training.

Relevance to education and training: The installed base of computers in educational institutions, homes and workplaces will always be diverse, but there is still value in both collecting information on the installed base and setting guidelines for software and content developers on the sorts of equipment on which applications should be designed to perform satisfactorily. This includes both hardware and the application support (for example browser capabilities) - the latter is covered under *Web publishing* below.

These guidelines can also assist educational organisations in specifying hardware for equipment purchase.

Various attempts have been made to both reduce purchase and maintenance costs and improve the security of large networks in educational institutions using 'thin client' technologies, diskless workstations and similar approaches. To date the promised potential of these has not materialised, but with the increasing predominance of web-based and server-side applications it is possible that at least a significant subset of education usage could be met by lower cost terminals, or so-called "network computers".

Examples of Standards: There is an existing ANTA CEOs Preferred Standard on PCs although this type of standard is particularly prone to dating as higher performance computers become the consumer standard.

Directory Services

What is it? Standards for storing and accessing basically static information of a descriptive nature, for example contact information about people and the relationship to their right to access electronic resources, or capability information about resources.

Relevance to education and training: Much of the technology in this area is relatively mature, but it has not been implemented on a consistent basis in education and training. Sample areas in which it might be used are:

- A central service on which one could search for contact information about particular individuals (eg to find email and postal addresses, phone number etc.) Information would be sourced from participating institutions databases in a standard format and would be subject to the privacy guidelines of the individual institution.
- Individuals could tag their contact details with details of their interest, job role etc from a standard vocabulary so that they could be posted or emailed information of interest (eg conference announcements). Operating guidelines would need to be developed to prevent junk mail and privacy violations.
- Increasingly resources are made available online which are only available to enrolled students in a particular course. At present access to these is controlled either by location on the physical network (which prevents off-campus access) or by password access. Without agreed standards in place individual teachers have to create and maintain class lists and access control lists. If agreed directory services standards were in place this could be automated so that, for example, this data came directly from the institution's Student Management System and a single login would provide access to all the online resources that student was allowed to access.

Examples of Standards: LDAP, X400, X500

Security and authentication

What is it? Standards and guidelines to ensure that networks are secure, that content can only be accessed by those authorised to do so, and that the identity of users is authenticated.

This is included under the heading of network infrastructure but some security issues are dealt with at the network level and some at the application level.

Relevance to education and training: Security and authentication are key aspects of any online system. Particular issues of authentication of users arise as more student work is submitted online and as students located remotely are adopting flexible learning approaches. Other issues arise in relation to administrative systems which handle both online delivery of student information and student management. Many educational authorities use firewalls to increase the security and prevent inappropriate use of their network resources. However this can sometimes prevent innovative educational usage. Libraries purchase many resources under license conditions which relate to use by specific groups of students and teachers. Appropriate authentication is vital in information service delivery.

Examples of Standards: HTTPS, SSL, PGP, proposed IMS Security specification.

Content filtering

What is it? Standards and systems for blocking access to undesirable or illegal resources.

Relevance to education and training: Education and training organisations are required both to comply with legislative requirements on the availability of filtering software and to exercise a duty of care in relation to the content their students access, particularly those under the age of majority. The W3C PICS standard provides a technical means of describing content selection and blocking schemes and implementing restrictions at the browser level. However other components of content filtering, for example the actual rating schemes, lists of blocked sites and administration tools for managing filtered Internet access at the network level are to date all proprietary schemes. Given this environment and the newness of the new Australian regulatory environment for management of content access it is probably premature at this stage for standards or operating guidelines to be considered by the ERC.

Examples of Standards: PICS, RSACi

6.2 Content Formats

What is it? Standards for components of online content.

Relevance to education and training: To some extent these sorts of standards do not need to be addressed individually because the key issue is whether they are supported by the browser software used. However emerging standards for content formats can offer advantages for online delivery. It is important to be able to provide advice on the extent to which they should be endorsed for the development of online content, and therefore whether in turn client software should be expected to support these new formats.

Markup

What is it? Standards for markup for display and presentation of text and multimedia content.

Relevance to education and training: Engagement in the actual development of these standards is not a priority but understanding developments and setting guidelines for their adoption is important. For example decisions about what version of HTML should be used in content development, and what markup languages should be supported by delivery platforms will have a major impact on the interoperability of educational content.

The VET Preferred Standard on Internet & Intranets recommends standards for versions of HTML and Java and guidelines on web publishing.

Examples of Standards: SGML, XML, WML, HTML, DHTML, XHTML, SMIL, PDF, Postscript

Graphics

What is it? Standards for graphic components of online content.

Relevance to education and training: Existing widely supported standards (eg GIF and JPG) are not an issue but emerging standards such as SVG (Scalable Vector Graphics) may offer considerable advantages and should be monitored.

Examples of Standards: GIF, JPEG, PNG, SVG

Audio / video

What is it? Standards for static or streamed audio and video content.

Relevance to education and training: Similar issue apply as discussed above for markup languages and graphics.

Examples of Standards: (static) MP3, AU, AVI, MPG, quicktime

Examples of Standards: (streamed) Real Systems formats, ASF (advanced streaming format), hinted quicktime

Programming

What is it? Programming languages, especially those commonly used on the World Wide Web.

Relevance to education and training: The move from static display of web pages consisting of text and images to the incorporation of programming languages such as Javascript and Java has greatly increased the interactivity of web content. However this does introduce considerable security risks, as well as issues of content being usable across a range of browser platforms.

Examples of Standards: Javascript, Java, CGI, Perl

Accessibility issues

What is it? Ensuring that online content is available to the greatest range of users, including users with disabilities and users with low bandwidth connections.

Relevance to education and training: Online delivery is often promoted as making educational opportunities available to those who have difficulty in attending educational institutions, including people with disabilities and people in remote locations. This makes it particularly important that content for online delivery works effectively with low bandwidth connections, and with non-standard browsers.

Examples of Standards: WAI - Web Accessibility Initiative

6.3 Resource Description and Resource Discovery

Metadata

What is it? Systems for consistent description of resources to facilitate resource discovery and management across distributed systems on electronic networks.

Relevance to education and training: Consistent description of educational resources will assist teachers and students to readily find relevant materials. As the quantity of online content increases basic text searching becomes less and less useful and consistent metadata is required to allow more targeted searching. The area is largely covered by the EdNA Metadata Standard Working Group and any activity undertaken by the Standards Sub-Committee should be done in conjunction with the Working Group.

Examples of Standards: Dublin Core Element Set, EdNA Metadata Standard, IMS Metadata Standard, GEM metadata, AEShareNet data structure, RDF

Search interfaces and distributed searching

What is it? Consistency and interoperability in the way resources are searched for across different systems.

Relevance to education and training: The ability to identify and retrieve resources from diverse sources is a crucial aspect of a flexible approach to use of online technology in education and training. Consistent metadata is one part of this. Other aspects include the technical ability to combine searches across multiple metadata repositories and consistent users interfaces so that users can readily move from one search engine to another.

Examples of Standards: Z39.50

Vocabularies

What is it? Vocabularies are standard terminology to describe resources within a particular domain. These can vary from a simple list of acceptable terms to a full thesaurus incorporating a hierarchical structure of broader and narrower terms and ‘use instead’ terms that refer users from non-supported terms to supported synonyms. Agreed vocabularies are an essential part of resource description and discovery. A metadata standard can list the attributes used to describe a resource and their meanings, but without an agreed vocabulary it can still be difficult to find resources that match a user’s requirements. In choosing vocabularies there will always be some level of trade-off between interoperability across domains, and meeting the requirements of a specific domain. The Dublin Core community has done a lot of work to define principles which minimise the problems of this trade-off. The library community in all educational sectors has developed and uses a variety of vocabularies and thesauruses.

General vocabularies

What is it? Vocabularies that relate to a domain broader than education and training.

Relevance to education and training: A significant development in this area is the use of AGLS (the Australian Government Locator Service) which is increasingly being mandated by State / Territory and the Commonwealth Governments for description of online resources. AGLS includes the use of AGIFT, the Australian Governments’ Interactive Functions Thesaurus. Educational resources intended to be accessed in whole of government search engines will need to include AGLS metadata.

The Dublin Core community is developing vocabularies for some of its elements which are intended to work across multiple domains.

Examples of Standards: AGIFT, Dublin Core Element Set qualifiers.

Education vocabularies

What is it? Vocabularies specifically related to education and training.

Relevance to education and training: The issue of interoperability versus domain relevance also occurs within education and training. The different sectors have different organisational structures and educational frameworks and while sharing some vocabularies and thesauruses for cataloguing resources, have also developed their own. With the blurring of sector boundaries and the increasing interest in accessing online resources across sectors it is timely to review this situation. The interoperability / specificity trade-off can be addressed in various ways. One way would be to develop a unified thesaurus for all of education and training, another would be to develop mappings between the different vocabularies. Recent developments in resource discovery and artificial intelligence suggest that there may be alternative approaches to resource discovery that reduce

the need for up-front cataloguing of resources. Many of these suggestions have been made for some years without coming to any satisfactory conclusion. It may be however that their time is now right.

Examples of Standards: AEI-TED, ASCED, AVETMISS Discipline Groups, Ozjac Subject Thesaurus, SCIS, UNESCO Thesaurus, VOCED Thesaurus. The DC-Education Working Group is currently developing educational qualifiers for Dublin Core elements.

6.4 General Applications

Web publishing

What is it? Ensuring that online content meets acceptable quality standards.

Relevance to education and training: Online content for education and training needs to be developed and maintained according to quality standards for accessibility, clarity, navigability, legality, inclusiveness, authority and accuracy. This is an area in which guidelines and agreed procedures are more important than technical standards.

Examples of Standards: There are many sources of information and guidance on quality web publishing. The EdNA VET Quality Assurance System is available at: <http://www.otfe.vic.gov.au/edna/quality/quality.htm>

EdNA Online lists a variety of resources in the category “Publishing Resources” <http://www.edna.edu.au/go/browse/528:9090>

Email

What is it? Standards and guidelines for electronic mail.

Relevance to education and training: Email is a well-established application in education and training. It is also a building block of other applications such as mailing lists, online discussions, online conferencing and distributed workgroups. Technical standards are essential to ensure that email systems interoperate effectively. Equally important are guidelines on configuration and usage to ensure that email can be used as effective communication between different systems and applications. There has been a strong shift from proprietary to Internet technical standards for delivery of email. However attempts to introduce new features such as formatted and styled text including sending HTML instead of plain text have actually reduced the interoperability between different mail systems. The treatment and content format of attachments is also a continuing source of frustration and incompatibility between different email systems.

The VET Preferred Standards project has endorsed particular technical standards, and developed functional specifications and operating guidelines for email usage. These could well be considered for updating and wider endorsement by the ERC.

Examples of Standards: POP3, IMAP, MIME

Workgroup applications

What is it? Applications to allow people in dispersed locations to work together on tasks. Aspects of this include scheduling activities and working collaboratively on documents.

Relevance to education and training: This is a difficult area to define precisely and aspects will overlap with the section below on delivery platforms. Collaborative work is a key aspect of education, both for teachers and students. Selection and endorsement of open standards will facilitate collaborative work between teachers and students in different institutions and sectors.

Examples of Standards: iCalendar (group scheduling), ODMA for document management and workflow, vCalender, vCard, Open Groups

Videoconferencing

What is it? Synchronous multi-way communication using audio and video. This can be enhanced by facilities such as graphic display, file sharing and application sharing.

Relevance to education and training: While extensive use is already made of videoconferencing in some areas of education and training, this is currently restricted by the physical limitations of room-based systems and the cost of ISDN lines. Use of videoconferencing is likely to increase with the move to PC based systems and the increasing availability of Internet bandwidth.

Examples of Standards: H.320, H.323, T.120. The VET Preferred Standards project has developed recommended standards and operating guidelines.

6.5 Delivery Platforms and Content Packaging

Delivery Platforms

What is it? Software systems (often known as Learning Management Systems) used to manage the delivery of online content to students and to manage communications functions as part of the learning process. Many delivery

platforms also incorporate student management functions such as recording enrolments and student progress (examples include proprietary products such as WebCT and Blackboard).

Relevance to education and training: Online delivery platforms are at the core of online education and training. In some cases choice of delivery platforms is made at the individual teacher or institution level. In other cases, particularly in the VET sector, States and Territories have chosen or developed platforms for use across the whole State / Territory.

The Standards Sub-Committee can undertake a useful role in all three approaches to this area:

- The technical standards developed by IMS could be tested for their relevance and appropriateness to Australian requirements and if appropriate endorsed by the ERC as Preferred Standards.
- Requirements specifications could be developed which describe the general requirements of delivery platforms to assist education and training providers in specifying and selecting appropriate commercial products.
- Operational guidelines could be developed to assist in making best use of whatever delivery platform is chosen.

Examples of Standards: IMS Enterprise Systems, IMS Questions and Test Specification. IMS Learner Profile Specification.

Content Packaging

What is it? Data structures that are used to provide interoperability of Internet based content with content creation tools, learning management software, and run-time environments.

Relevance to education and training: Given the variety of delivery platforms likely to be used in education and training it is essential that educational content can be readily moved between different delivery platforms. At the most basic level this is provided by ensuring that individual components are in standard formats at the file level. For example any browser can read content that is in a certain version of HTML or view a JPG graphic.

However useful educational content is likely to consist of a large variety of files even to deliver a relatively small unit of educational content. For example material to support a single Training Package Unit of Competency may consist of text in HTML, graphics in various formats, test questions and perhaps a program which runs a simulation exercise. Content packaging provides a standard for specifying, describing and grouping these individual files so that they can be moved between different delivery platforms as a single unit.

Examples of Standards: IMS Content Packaging specification

6.6 Administration and Management

Student Records

What is it? Information about student enrolments and progress.

Relevance to education and training: Traditionally student management systems have been administrative systems maintained centrally within an individual educational institution. With the increasing use of online learning a greater level of interoperability is required between administration systems and learning management systems. For example access to a set of online resources might be available only to students enrolled in a specific course or module. Unless there is interoperability between these systems the teacher managing the online delivery system will have to reproduce this information manually, for example creating user names and passwords for each student in each subject.

From the student perspective, unless this interoperability exists they may have to keep track of a different login and password for each different learning management system they use, either within the one institution or between institutions if they are undertaking study from several different sources.

Examples of Standards: IMS Learner Profile Specification, AICC component of IMS Enterprise Systems, Schools Interoperability Framework (SIF)

Statistics

What is it? Collection of statistical information about education and training such as enrolments, educational delivery and course completions.

Relevance to education and training: Like student management systems, statistics have traditionally been treated as a 'back-office' function. However with the increasing use of online delivery it make sense for learning management systems to be interoperable with systems which collect statistics for reporting purposes.

Examples of Standards: AVETMISS, NSSC (National Schools Statistical Collection managed by MCEETYA), Higher Education Data Collections (DETYA)

7. Key Issues

This section discusses some key issues which need to be addressed by the Standards Sub-Committee in order for it to work effectively.

7.1 Working effectively in a cross-sectoral environment

Section 3 *Context and Trends* discusses the increasing blurring of the boundaries between the various sectors of education and training. While the boundaries in delivery are blurring and many of the interests of the sectors in addressing technical standards issues are similar, there remain quite significant differences in the history, resourcing and organisational structures of the sectors which will impact on the way the sectors address issues of technical standards. To operate effectively the ERC Standards Sub-Committee will need to take account of these differences. This should not be overstated as a problem - the history of the EdNA collaboration to date provides many practical examples of the way the sectors have worked together for mutual benefit.

Characteristics of the sectors

Higher Education

The higher education sector has been the most active in addressing technology issues. It was the birthplace of the Internet in Australia, and has by far the most sophisticated network infrastructures. This is facilitated by the relatively small number of sites (38 universities, although many more campuses) and by the size of these institutions allowing them to have a good range of onsite specialists in areas such as network infrastructure, online content development and information management.

While the Australian Vice-Chancellors' Committee (AVCC) provides a strong voice to government on major policies issues, universities are independent organisations and the central structures and funding mechanisms which might encourage national activity are not as strongly developed as in other sectors. Much national activity is initiated by committees in specific areas with representatives from some or all universities. In the context of this report, key bodies include:

- The AVCC's Standing Committee on Information Policy
- The Higher Education Information Technology Consultative Forum
- EHEAG: the EdNA Higher Education Advisory Group

- CAUL: the Council of Australian University Librarians
- CAUDIT: the Council of Australian University Directors of Information Technology
- NCODE: The National Council for Open and Distance Education.

Vocational Education and Training

The Vocational Education and Training (VET) sector has over the last few years made a major transformation from a primarily state-based system of public TAFE institutes, to a national system which consists of public and private providers and many different forms of training delivery including an increasing emphasis on workplace-based and flexible training. The delivery of vocational education and training is still a state responsibility but following the establishment of the Australian National Training Authority (ANTA) there is now a much stronger national focus in all areas, including the use of information technology in training delivery.

The EdNA VET Advisory Group (EVAG) was originally established as part of the EdNA initiative but now has a dual role of also advising ANTA on policy issues related to online training. The collaborative state and national approach facilitated by EVAG has culminated in the endorsement by ANTA CEOs of *Flexible Learning for the Information Economy: A Framework for National Collaboration in Vocational Education and Training 2000-2004* and *Strategy 2000* a \$20m implementation plan for the first year of the Collaborative Framework. A significant aspect of this framework is the decision by Ministers to allocate infrastructure funds (which would have otherwise been allocated to States and Territories on a per capita basis for buildings) to a central fund to support projects related to information technology including professional development and content development.

Adult Community Education

The Adult Community Education sector is organisationally part of Vocational Education and Training in most States and Territories but has a distinct culture. The main organisational structure at the national level is the MCEETYA ACE Taskforce.

The Schools Sector

School education is managed on a state basis more strongly than either VET or Higher Education. Like EVAG, the Schools Advisory Group has a dual function of advising both the key EdNA bodies (ERC and the Education.Au Ltd Board) and CESCEO, the Conference of Education System Chief Executive Officers on matters related to use of information technology.

The Curriculum Corporation plays an important national role in managing specific projects in the Schools sector, but there is no body equivalent to ANTA or the AVCC with staff who can both develop and take forward national initiatives.

Implications for the Standards Sub-Committee

The cross-sectoral responsibility of the ERC raises issues in several areas:

- Sectors may have different priorities for the areas in which it is important to address standards issues.
- The organisational structure and culture of the sectors will influence the way standards activities are developed and endorsed.
- The different organisational structures will also influence the most effective way of communicating information about standards activities in the different sectors. (This is discussed in the next section.)

Sectoral differences are also a strength which can inform the work of the Standards Sub-Committee. Sectoral representatives will bring different experiences and perspectives to the work of the Sub-Committee.

The VET Preferred Standards project has demonstrated the value of a consultative process in which standards are developed by close consultation with both central agency policy staff and practitioners in a specific technology area. If the Sub-Committee wishes to seek endorsement of ERC Preferred Standards across all sectors it will need to develop processes which have a strong consultative basis but do not become too complex or time-consuming to be effective.

Several possible models are suggested in the *Recommendations* section, and given the range of standards areas which the Sub-Committee needs to address, it is desirable to test several of these models. Once the Sub-Committee has some experience with these activities it may decide that one model works best for future activities. However it may also transpire that a variety of approaches remains appropriate.

The suggested models are:

- A ‘lead sector’ model in which one sector manages a process to develop a standard, but other sectors are invited to participate in the process. This is recommended as the approach to activities already planned as part of the VET Preferred Standards project for 2000.
- A variation on this approach could apply where a standard has already been endorsed by a sector as is the case with the VET Preferred Standards in several areas. The Sub-Committee could initiate a process to update and test this standard across all sectors in order for it to become an ERC Preferred Standard.
- A ‘whole of education and training’ approach in which the Sub-Committee initiates a process involving representatives from all sectors to develop an ERC Preferred Standard. This model will be most relevant where significant work has not been done already and the standard area is of

strong interest to all sectors. One example of this might be input into the next stage of the IMS Content Management specification.

Whatever mix of approaches is used, it is clear that effective communication between interested individuals in all sectors will be an important part of any successful process. This is addressed in the following section.

7.2 Communication Strategy

Effective communication processes are an essential part of the Sub-Committee's work. This section analyses some of the aspects of the required communication activities.

Audiences

There are many different audiences for aspects of the ERC's standards activities:

- Educators must appreciate the necessity for following standards to facilitate the delivery of education and training.
- Senior policy makers in the sectors need an overview of the standards development process and the key decision points.
- Practitioners in particular technical areas need to be aware of the ERC processes and the ways in which they can participate.
- Formal standards organisations need to understand the interests of education and training practitioners in developing technical standards that meet their needs.
- Information technology professionals and other people in education and training making purchasing and product selection decisions need to understand the role of technical standards in assisting their decision making.
- International organisations developing standards related to learning technologies need to be aware of both the overall approach being taken by Australian education and training to standards development and the expertise that can be drawn on across the various sectors.

Mechanisms

The Standards Sub-Committee and the ERC will need to use a variety of communication mechanisms.

- A website should be established which supports both publishing of documents and online discussion forums (see p.55).

- A brochure should be available which provides a short summary of the ERC's work on technical standards and refers to the website for more information.
- A (physical) mailing list needs to be developed for occasional distribution of printed material. The Sub-Committee will need to set guidelines on how extensive this list is, in particular whether it is worth trying to cover end users or whether it should focus just on key bodies which would then use their own networks to disseminate information.
- To raise the profile of ERC standards activities, presentation opportunities should be sought at selected national conferences.
- The Sub-Committee should initiate workshops to bring together interested people on specific topics. For example intellectual property management, content interoperability, and administration systems. These workshops would be in addition to the workshops held as part of the process of developing specific standards.

Targeting communication

While the different audiences and sectors all have an interest in the work of the ERC on technical standards, it is clear that effective communication requires targeting information in a range of ways:

- The website discussion forums should provide a number of different lists which can be used for specific areas of interest.
- Discussion forum participants should be able to choose whether they get regular emails, or just periodically visit the website to review the discussion archives.
- An announcement only mailing list should be available so that people are notified of major site updates and events without getting all the discussion messages.
- Sector representatives on the Standards Sub-Committee should be responsible for providing advice on how to target information most effectively to people and relevant organisations in their sector.

Adding value to the communication process

Choice of appropriate technical mechanisms can assist greatly in managing targeted communications. However a great deal of value can be added if the Sub-Committee has some capacity to employ a project officer to interpret and disseminate information.

For example an enormous amount of information is available through existing electronic mailing lists from standards committees and other bodies such as IMS and W3C. These can easily be forwarded on in their original form, however it

would assist greatly the interpretation of this information if some advice could be provided about the significance of this information in the context of current Australian activities.

The development of a communication and information dissemination strategy is recommended as part of the Standards Sub-Committee's workplan (p.58).

7.3 Interacting with standards bodies

Based on the description of the different types of standards and standards organisations described in section 5 above, this section discusses how the Standards Sub-Committee should approach interaction with the different organisations.

Engagement with formal standards bodies

Engagement with formal international standards bodies (ISO, IEC, JTC 1) is always handled through national standards bodies. While it is possible to monitor the activities of some of these groups via mailing lists, formal input requires firstly engaging with the national body which, for Australia, is Standards Australia.

Participation in the formal national and international standards structures should be a high priority for the Standards Sub-Committee for several reasons:

- The recent establishment of JTC 1/SC 36 indicates that the area of learning technologies has been internationally recognised as an important area in its own right by formal standards bodies. Australian involvement will help ensure that any standards developed meet the needs of education and training in Australia.
- Participation in these structures will provide access to a great deal of information about what is happening in relation to development of learning technologies internationally.
- The formal decision-making structures are complex and to date there has been little engagement by educators in Australia. There is a need to engage with these processes to develop a more widespread understanding of how they work.
- Engagement in these processes will build personal links between Australian educators and those engaged with developing technical standards in Australia and internationally.
- Establishment of a Standards Australia committee as recommended below will involve formal processes with significant lead times, particularly given the need for relevant national organisations to nominate members.

This process of engagement should therefore be started as soon as possible.

For these reasons, establishing a formal relationship with Standards Australia is recommended as a priority in Section 8.1 *Priority Activities* with a medium term aim of establishing a Standards Australia Committee to shadow the work of JTC 1/SC 36.

There is a separate stream of standards activities related to telecommunications standards handled internationally by the ITU and nationally by the Australian Communications Authority. While these standards underpin much of the use of technology in education and training, engagement with these activities is not a priority for the Standards Sub-Committee because these activities are well handled by existing organisations and there is little or no ability, or need, to influence these for educational purposes.

Participation in Internet standards bodies

Many of the Internet standards setting bodies such as the IETF do not require formal membership; participation is open to any interested individual. The Standards Sub-Committee could however play a useful role by disseminating information on current areas of development, and also by providing a mechanism for individuals from education and training involved in these groups to disseminate information on their involvement and seek input from other interested individuals in the education community.

The World Wide Web Consortium (W3C) does have a formal membership structure. Existing Australian members include RMIT, MelbourneIT, the Distributed Systems Technology Centre, and UNSW. While much of the W3C information is publicly available there is some member-only access to information and participation in decision-making.

DETYA has joined the IMS Consortium as an investment member on behalf of education and training in Australia and there may be a benefit in a similar approach to W3C.

R. 5 The Standards Sub-Committee investigate whether formal membership of W3C by the ERC is practical and desirable.

Ultimately the Standards Sub-Committee will need to decide whether formal membership and participation in W3C is a priority. Given limited resources it may be better to focus available effort on the bodies developing standards specifically related to learning technologies.

Engagement with IEEE Learning Technology Standards Committee

The IEEE Learning Technology Standards Committee has many Working Groups directly relevant to the work of the ERC Standards Sub-Committee. As a first step, the Sub-Committee should actively monitor the work of these Groups via mailing lists to identify which are likely to be of most relevance to Australian activities.

R. 6 The Standards Sub-Committee actively monitor the work of the various IEEE LTSC Working Groups, engaging in forums where appropriate and practicable.

Attendance at LTSC meetings is open to any individual; however there is a charge of US\$200 to attend meetings and an individual has to have attended two meetings of the same workgroup in the last eleven months to vote. Meetings to date have been held in Europe or the USA. It is intended that future meetings of the LTSC and SC 36 may be co-located which may make it more viable for Australian participants to attend.

7.4 Intellectual property

Intellectual property issues arise in a number of ways when considering the role of information technology in education and training:

- What are the obligations of educational institutions for ensuring that users do not breach copyright when accessing material?
- Changes to the copyright legislation currently being considered in Australia will have implications for institutions.
- The increasing trend to re-use, re-purpose, adapt and enhance educational material creates complexities in enforcing copyright, and in even tracking ownership of materials. This is exacerbated by the ease with which diverse materials can be quickly re-combined and changed in the electronic environment.

Many of these issues are outside the scope of the current project, but in Australia and internationally there are many diverse initiatives aiming to deal with the various aspects of intellectual property management. Some initiatives, including the Australian AShareNet and Propagate projects and the overseas initiatives *indecs*, OpenRights and InterTrust, are described in Attachment B. Some aspects of intellectual property management may also be addressed through the IMS initiatives on e-commerce and content management.

It is premature at this stage for the Standards Sub-Committee to attempt any activity which provides guidance on technical standards related to intellectual property management. The development of guidelines rather than standards might

be more appropriate in this area. One new legislation is in place, a fresh approach can be taken.

- R. 7 Intellectual property developments be monitored and further action taken to ensure effective development of guidelines and information dissemination activities.**
- R. 8 The Standards Sub-Committee assess the need for it to take a more active role on intellectual property issues at the beginning of 2001.**

7.5 Implementation Issues

Section 7.3 above sets out recommended processes for the ERC to participate in processes which develop technical standards related to learning technologies. Section 8.1 below recommends processes by which the ERC might achieve endorsement of particular standards as Preferred Standards for education and training in Australia. These activities will require a considerable amount of work, but they are not sufficient to meet the objectives set out in the Terms of Reference section above.

To meet these objectives the following implementation issues need to be addressed in addition to the actual development of endorsed standards:

- Decision-makers in education and training must be aware of the endorsed standards and must see the value in implementing them in their area of responsibility.
- Creators of content must be aware of the endorsed standards and implement them.
- Providers of educational technology must understand the most effective way to implement technology in a particular area.
- Independent and authoritative information must be available about the extent to which particular products meet the endorsed standards.
- Software tools need to be available which facilitate adherence to endorsed standards.

The first of these points is discussed in the *Communication* section above.

This section focuses on the following three areas:

- development of operational guidelines;
- conformance testing; and
- availability of software tools.

In addition this section presents a case for the development of requirements specifications in various standards areas.

The final part of this section, *Moving to Open Standards*, discussed some specific issues related to implementation at the government policy level.

Operational Guidelines

In this report “operational guidelines” refers to guidelines on how best to use a particular technology. The need for this type of guidelines was identified in the VET Preferred Standards project. The 1998 project developed guidelines in three areas: email, internet/intranets and videoconferencing.

The combined mailing list and workshop process used by the VET Preferred Standards project proved an effective means for collecting and discussing the sorts of recommendations that should be included in these guidelines. This allowed the valuable experience of ‘on the ground’ practitioners to be collected and codified.

- R. 9 Wherever appropriate, activities initiated by the Standards Sub-Committee attempt to collect and disseminate operational guidelines for cooperation and interoperability in the effective use of particular technologies.**

Conformance Testing

As a general rule, neither policy makers nor educational practitioners make decisions about standards *per se*. Rather the decisions they make are generally about choosing a particular software or hardware product. For this reason, if standards endorsed by the ERC are to be implemented, people making these decisions need to be able to determine whether products under consideration meet ERC endorsed standards. In some cases conformance to ERC standards can be made a tender requirement or selection criterion for system-wide purchases. However it is desirable to have some independent assessment of this compliance rather than just relying on vendor assurances.

Conformance testing is a highly specialised and time-consuming activity, and requires constant updating as new products and software versions are released. For this reason the ERC will need to proceed cautiously in this area. The IMS Consortium internationally has had some discussion about the development of an “IMS-OK” mark which can be applied to products and the Australian IMS Centre has expressed interest in working in the area of conformance testing. No formal recommendation is made in this report about activities in this area, however it is included in the list in Section 8.2 *Planning Future Projects and Activities*. It would make sense for the first activity in this area to be undertaken in conjunction with the Australian IMS Centre.

Software Tools

In some cases technical standards are embedded in products, but in other cases there may need to be software tools developed specifically to assist users to implement standards. For example:

- A basic EdNA metadata wizard is available to assist web-publishers to add EdNA compliant metadata to their pages. More sophisticated tools for management of metadata are currently being developed by the EdNA Higher Education project.
- The IMS Content Packaging specification provides a standard for combining a range of learning resources into a single file for transfer between delivery platforms. Ultimately one would expect a range of delivery platforms to provide facilities for both exporting and importing these content packages, but in the interim it would be useful to have stand-alone tools for creating these packages from existing resources.

R. 10 The Standards Sub-Committee, as part of its general information activities, collect and disseminate information about software tools which assist implementation of agreed technical standards.

Requirements Specifications

In this report “requirements specification” means a description of the functions which are required in a particular area of learning technology and which need to be addressed in a technical standard. The VET Preferred Standards project uses the term “functional specification” however this is potentially confusing, because in software development methodology this term is normally used for a much more detailed specification of the functions of software immediately prior to starting actual coding.

Developing requirements specifications is an important activity in two situations:

- Before a technical standard is developed it is important to be clear about the areas to be covered. Establishing an effective process for this will ensure that educators who are the ultimate users of products which embody the standard are able to define ‘up front’ the important areas to be covered. Without this process it is easy for a technical standard to incorporate all sorts of ‘nice-to-have’ features which are not really important, or worse, to not support functions which are educationally important. An effective requirements specification process will allow educators to define their requirements in ‘plain English’ without having to be involved in the inevitably more technical and less accessible process of actually developing a technical standard.
- In some cases it may be impractical or premature to develop a technical standard in a particular area. Development of a requirements specification

will allow users to assess proprietary products against a specification of agreed requirements.

R. 11 The Standards Sub-Committee, where appropriate, encourage the development of requirements specifications prior to or instead of the development of technical standards.

Section 8.1 recommends a workshop process to develop Australian requirements specifications in one or more of the areas in which the IMS Consortium plans to develop future specifications. This would be a valuable way of both contributing to the IMS project and helping ensure that future products meet Australian requirements.

Moving to Open Standards

While there is general agreement about the benefit of moving to open standards as an overall policy direction, a range of specific issues can impact on the actual implementation of this in education and training:

- Existing investments in information technology infrastructure in education and training, and in government generally, are very substantial. The need for incremental additional investment to be compatible with existing infrastructure can slow the move to new standards even when they are clearly desirable.
- Investment decisions are influenced by a range of factors, including existing supplier relationships and industry development objectives.
- There are existing whole-of-government arrangements for information and communications technology which may influence the ability to set whole-of-education-and-training arrangements.

The first two points influence the environment in which decisions are made, but are not amenable to direct activity by the Standards Sub-Committee. However the actual impact of whole-of-government arrangements does require further investigation and there is a recommendation in the section below on *Priority Activities* (p.56).

8. Recommendations

8.1 Priority Activities

This section recommends high priority activities which should be initiated as soon as the Standards Sub-Committee is established.

Communications and Dissemination

- R. 12 An Internet site be established which supports publishing and discussion forums to assist the Standards Sub-Committee in disseminating information to interested people across the whole education and training community and to facilitate communications between interested people across all sectors.**

Discussion forums must be able to be accessed via email and be archived as web pages.

Links with formal standards bodies

- R. 13 Establish formal links with Standards Australia with the intention of establishing a Working Group and ultimately a Committee specifically involved with technical standards related to education and training.**

In the first instance this might be a Working Group of the Standards Australia IT1 Committee or the IT19 Committee but in the medium term it is desirable to establish a separate Committee specifically on technical standards for education. The Committee would shadow the work of the newly established international JTC 1 Subcommittee on Learning Technology (SC 36).

Provide liaison between key projects

- R. 14 Re-establish the Australian IMS project Steering Group as a working party of the Standards Sub-Committee.**

- R. 15 The Standards Sub-Committee be the mechanism by which the EdNA Metadata Working Group reports to the ERC.**
- R. 16 The Sub-Committee ensure that information about the VET Preferred Standards activities in 2000 are publicised to the other sectors and opportunities are made available for other sectors to participate in these activities.**

Participation by other sectors in these activities is not intended to turn these into cross-sectoral activities. The managers of these activities will remain responsible for judging the extent to which the needs and priorities of other sectors might influence the standards developed by the VET sector.

Identify standards and guidelines for endorsement by the ERC

- R. 17 Take at least one of the existing VET Preferred Standards and arrange its updating and endorsement as an ERC Preferred Standard.**

The areas in which VET Preferred Standards have been identified are email, Internet protocols, Personal Computers and Videoconferencing.

- R. 18 Organise a workshop or other process to develop cross-sectoral input on issues and desired functionality for at least one of the areas in which the IMS Project is planning to develop a specification.**

Future areas proposed by IMS for development include:

- Security
- E-Commerce
- Content Management
- Profiles

Map Whole-of-Government Activities and Standards

When discussing standards activities at a whole-of-education level many senior decision makers in States and Territories perceive a potential conflict with existing or proposed whole-of-government standards for telecommunications services, IT network infrastructure or other technical standards.

Given that any ERC endorsed standards will be based on open, typically international, standards and that they can only be advisory rather than mandatory this is unlikely to be a real implementation problem. However it is recommended that the ERC take a proactive approach to this issue.

R. 19 The Standards Sub-Committee commission a research project to document existing and proposed National and State / Territory whole-of-government technical standards activities which might impact on the development of whole-of-education standards.

This project should be conducted in a way that will also serve to highlight to other areas of government the existing positive achievements of education and training in the technical standards area and alert them to the positive impact of future ERC coordinated activities.

8.2 Planning Future Projects and Activities

This section records a number of possible future activities and project ideas which have been identified during the writing of this report. They are recorded for future consideration by the Standards Sub-Committee. The Sub-Committee would need to prioritise these projects and develop more detailed descriptions and briefs for those it wishes to progress. The number of these projects which can be undertaken will depend on both available funds and the ability of the Standards Sub-Committee to effectively manage a number of different projects simultaneously.

- Undertake communication activities to make people within education and training aware of existing standards activities and the role of standards in supporting interoperability.
- Undertake a marketing campaign to make the IT industry, publishers, the specialist media and other government agencies aware of standards activities already undertaken by education and training.
- Organise a national workshop on intellectual property management including consideration of relevant standards and models (eg Propagate, AEShareNet, *indecS*)
- Commission a research report on trends in resource discovery and in particular the extent to which artificial intelligence and other technologies may reduce the need for up-front indexing of resources.
- Commission a research report to explore software tools available for mapping, interpreting and searching between resources catalogued with different vocabularies.
- Work with the EdNA Metadata Standard Working Group to explore whether it is desirable to develop a consistent thesaurus of educational descriptors that will work across all sectors of education and training.

- Develop a framework and initiate a project to test a process for developing an ERC Preferred Standard in an area in which there is not already an existing VET Preferred Standard.
- Develop a process to undertake a test implementation of recently completed IMS specifications:
 - Enterprise Systems
 - Metadata
 - Content Packaging
 - Question & Test.
- Investigate the feasibility of establishing a process for conformance testing which can identify whether products meet the standards endorsed by the ERC.

R. 20 The Standards Sub-Committee develop a prioritised workplan and costings of future projects for recommendation to the ERC so that priority projects can be readily initiated as funding becomes available.

R. 21 A communication and information dissemination strategy be developed as part of the workplan.

See Section 7.2 *Communication Strategy* for a discussion of what should be covered in this strategy.

9. Bibliography

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A report prepared by Olaf Moon for the EdNA Reference Committee.
August 1999

Delivering The Promise: The case for rapidly expanding the digital curriculum resources available in Australian classrooms and for developing the digital content industry

A report to MCEETYA by Trinitas Pty Ltd in association with Cutler & Company Pty Ltd

The EdNA Metadata Standard - additional requirements to support online curriculum content for schools

Sets out a broad level project plan to develop the Standard to the level required to support a major online content development program in the school sector. Prepared by Marianne Nestor in consultation with the EdNA Schools Metadata Group.

http://www.edna.edu.au/EdNA/showpage.html?file=%2Fedna%2Fsystem%2Fedures%2Fschool_meta_reqts.html

Education and Training Sector Action Plan for the Information Economy

The Plan was developed in consultation with all parts of the education and training sector, through the Education Network Australia (EdNA) Reference Committee (ERC). MCEETYA supported the broad directions of the Action Plan for the Information Economy at its meeting on 30-31 March 2000.

Flexible Learning for the Information Economy: A Framework for National Collaboration in Vocational Education and Training 2000-2004

A strategic plan produced by the EdNA VET Advisory Group for the five year ANTA national project allocation for flexible learning. Also acts as the VET sector component of the Education and Training Action Plan for the Information Economy

ISBN 064 270 4759

Available via <http://www.otfe.vic.gov.au/antafd/>

The Future of the Rating System

A paper by Stephen Balkam, Executive Director, Internet Content Rating Association (ICRA) outlining the current (September 1999) context in which decisions needed to be made about the future of the rating and filtering system managed by ICRA.

Preferred Standards to Support National Cooperation in Applying Technology to VET

February 1999 Report of the project conducted by the Centre for International Research on Communication and Information Technologies (CIRCIT)

ISBN: 0 642 25407 9

<http://www.vicnet.net.au/~neptune>

School Education Action Plan for the Information Economy

Produced by the EdNA Schools Advisory Group. November 1999.

School sector changes in relation to EdNA Metadata Standard 2.0

Analyses the metadata requirements of EdNA school sector stakeholders for the revision of the EdNA Metadata Standard. Prepared by Marianne Nestor in consultation with the EdNA Schools Metadata Group.

http://www.edna.edu.au/EdNA/showpage.html?file=%2Fedna%2Fsystem%2Fedures%2Fschool_meta.html

The Standards Fora for Online Education

This paper provides an overview of work taking place in five different working groups/committees, each concerned with developing standards for the description and sharing of educational resources in an online environment.

D-Lib Magazine, December 1999, Volume 5 Number 12. ISSN 1082-9873

<http://www.dlib.org/dlib/december99/12miller.html>

Strategy 2000

The implementation plan for the first year of *Flexible Learning for the Information Economy: A Framework for National Collaboration in Vocational Education and Training 2000-2004*. Published by ANTA and the EdNA VET Advisory Group. ISBN 064 276 0063

Available via <http://www.otfe.vic.gov.au/antafd/>

The Tao of IETF - A Guide for New Attendees of the Internet Engineering Task Force

Written as an introduction to new attendees at IETF meetings, this provides a good introduction to the informal culture of Internet standards setting processes.

<http://www.ietf.org/tao.html>

The Way Forward: Higher Education Action Plan for the Information Economy

This paper was developed in 1999 by the Higher Education I.T. Consultative Forum and approved by the Australian Vice-Chancellors' Committee and its Standing Committee on Information Policy on behalf of the Australian higher education sector. It is part of the Education and Training Action Plan for the Information Economy.

<http://www.avcc.edu.au/avcc/itpolicy/actionplan/index.html>

Attachments

Attachment A - Glossary

This glossary provides a quick summary of the most important organisations and terms used in this report and the addresses of key websites. Specific technical standards and their abbreviations are explained in Attachment B. Attachment B also contains descriptions of some of the organisations and projects mentioned in the Glossary.

ACA	<p>Australian Communications Authority The Australian Communications Authority (ACA) is responsible for regulating telecommunications and radiocommunications, including promoting industry self-regulation and managing the radiofrequency spectrum. The ACA also has significant consumer protection responsibilities. http://www.aca.gov.au</p>
AEShareNet	<p>AEShareNet AEShareNet is an innovative concept for managing copyright in the vocational education and training (VET) sector. http://www.aesharenet.edu.au/</p>
AGLS	<p>Australian Government Locator Service The AGLS metadata standard is a set of 19 descriptive elements which government departments and agencies can use to improve the visibility and accessibility of their services and information over the Internet. http://www.naa.gov.au/govserv/agls/</p>
ANSI	<p>American National Standards Institute ANSI is a private, non-profit membership organisation supported by a diverse constituency of private and public sector organisations. It is the administrator and coordinator of the United States private sector voluntary standardisation system. http://web.ansi.org</p>
ANTA	<p>Australian National Training Authority ANTA was established to develop a national system of vocational education and training in cooperation with State and Territory governments, the Commonwealth government and industry. http://www.anta.gov.au</p>

ANTA CEOs	<p>ANTA CEOs The Chief Executive Officers of each State and Territory Training Authority, the CEO of the Australian National Training Authority and the CEO of the Commonwealth Department of Education, Training and Youth Affairs.</p>
AVCC	<p>Australian Vice-Chancellors Committee The Australian Vice-Chancellors Committee (AVCC), the council of Australia's university presidents, is the peak organisation representing Australian universities nationally and internationally. http://www.avcc.edu.au</p>
CAUDIT	<p>Council of Australian University Directors of Information Technology</p>
CAUL	<p>Council of Australian University Librarians</p>
CCITT	See ITU-T
CESCEO	<p>Conference of Education Systems Chief Executive Officers CESCEO comprises senior executives of all Australian State, Territory, Catholic and Independent school systems.</p>
controlled vocabulary	<p>A list of allowable terms for use for example in a database or in metadata. Use of a controlled vocabularies can increase the accuracy of searching by allowing only specific terms to be used for data entry and searching.</p>
Curriculum Corporation	<p>Curriculum Corporation The Curriculum Corporation is a company owned by all Australian State, Territory and Commonwealth Ministers of Education. It develops products and services to help schools improve student learning. The Curriculum Corporation manages the National Training Information Service for ANTA, OZJAC (The Australian Course and Careers Database) and SCIS (Schools Catalogue Information Service). http://www.curriculum.edu.au</p>
DCMI	<p>Dublin Core Metadata Initiative Dublin Core is a metadata element set intended to facilitate discovery of electronic resources. http://purl.org/dc Australian mirror: http://mirror.nla.gov.au/dc/</p>
DETYA	<p>The Commonwealth Department of Education, Training and Youth Affairs DETYA provides the secretariat for the EdNA Reference Committee. http://www.detya.gov.au</p>

DSTC	<p>Distributed Systems Technology Centre The DSTC is a joint venture between the Australian Government and 25 participating organisations which is supported by the Government's Cooperative Research Centres Program. The Resource Discovery Unit is actively involved in Australian and international metadata developments. http://www.dstc.edu.au/ http://www.dstc.edu.au/Research/Resource_Discovery/</p>
Dublin Core	See DCMI
EdNA	<p>Education Network Australia and EdNA Online See description on page 19. http://www.edna.edu.au</p>
EdNA Metadata Standard	<p>EdNA Metadata Standard See description on page 15. http://www.edna.edu.au/metadata</p>
Education.Au	<p>Education.Au Ltd Education.Au Ltd is a non-profit company owned by the Ministers of education and training in Australia. The company fosters collaboration and cooperation in relation to the use of the Internet in education and manages EdNA Online and edna.com. http://www.educationau.edu.au/</p>
EHEAG	<p>EdNA Higher Education Advisory Group The advisory body providing higher education input into EdNA Online. (see higher education page under HEITCF)</p>
ETSI	<p>European Telecommunications Standards Institute ETSI is a non-profit making organisation whose mission is to produce telecommunications standards that will be used throughout Europe and globally. http://www.etsi.org</p>
EVAG	<p>EdNA VET Advisory Group The Education Network Australia Vocational Education and Training Advisory Group provides advice to ANTA, ERC and Education.Au Board. http://www.edna.edu.au/vetproject</p>
harvest	The automatic collection by a search engine of information from other sites about online resources. See p.19 for a description of EdNA harvesting.
HEAG	see EHEAG

HEITCF	<p>Higher Education Information Technology Consultative Forum</p> <p>The HEITCF examines IT policy issues relevant to Australian higher education, and is one of two higher education bodies that report to the EdNA Reference Committee (the other being EHEAG). It also reports to the Australian Vice-Chancellors' Committee, which provides secretarial support for the Forum. EdNA higher education homepage: http://www.edna.edu.au/EdNA/showpage.html?file=/edna/aboutedna/hed/h eag1/home.html</p>
IEC	<p>International Electromechanical Commission</p> <p>The international body for standards involving electrical, electronic and related technologies. http://www.iec.ch</p>
IEEE	<p>Institute of Electrical and Electronics Engineers</p> <p>The IEEE has a strong role in technical standards setting, and often works with the formal standards organisations. http://www.ieee.org http://standards.ieee.org</p>
IETF	<p>Internet Engineering Task Force (IETF)</p> <p>The Internet Engineering Task Force is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. It is open to any interested individual. http://www.ietf.org/</p>
IMS	<p>IMS Global Learning Consortium Inc.</p> <p>IMS is developing and promoting open specifications for facilitating online distributed learning activities. http://www.imsproject.org/</p> <p>Australian Centre: http://www.une.edu.au/ims/</p>
ISO	<p>International Organization for Standardization</p> <p>ISO is the peak global body for standards development. http://www.iso.ch</p>
IT-19	<p>Standards Australia Committee IT-19 / Computer Applications - Information and Documentation</p> <p>This Standards Australia Committee is responsible for standardisation of practices relating to libraries, documentation and information centres, indexing and abstracting services, archives, information science and publishing. https://committees.standards.com.au/COMMITTEES/IT-019/</p>

ITU	<p>International Telecommunication Union</p> <p>The ITU, headquartered in Geneva, Switzerland is an international organisation within which governments and the private sector coordinate global telecom networks and services.</p> <p>http://www.itu.int/</p>
ITU-T	<p>ITU Telecommunication Standardization Sector (ITU-T)</p> <p>The ITU-T (which supersedes the CCITT) fulfils the purposes of the ITU relating to telecommunications standardisation by studying technical, operating and tariff questions and adopting Recommendations on them with a view to standardizing telecommunications on a worldwide basis.</p> <p>http://www.itu.int/ITU-T/index.html</p>
JTC 1	<p>Joint Technical Committee 1</p> <p>A joint committee of ISO and the IEC responsible for international standards related to information technology.</p> <p>http://www.jtc1.org</p>
JTC 1/SC 36	<p>JTC 1 subcommittee on Learning Technology</p> <p>This recently established group's scope is "standardisation in the area of information technologies that support automation for learners, learning institutions, and learning resources."</p> <p>http://jtc1sc36.org</p>
LTSC	<p>IEEE Learning Technology Standards Committee</p> <p>The LTSC and its Working Groups develop technical standards, recommended practices, and guides to facilitate the development, deployment, maintenance and interoperation of computer implementations of education and training components and systems.</p> <p>http://ltsc.ieee.org</p>
MCEETYA	<p>Ministerial Council on Education, Employment, Training and Youth Affairs</p> <p>Membership of the Council comprises Australian State, Territory, Commonwealth and New Zealand government Ministers with responsibility for the portfolios of education, employment, training and youth affairs.</p> <p>http://www.curriculum.edu.au/mceetya/</p>
metadata	<p>Systems for consistent description of resources to facilitate resource discovery across distributed systems on electronic networks.</p>
NCODE	<p>National Council for Open and Distance Education</p> <p>The peak Australian organisation for institutions engaged in or interested in open, distance and flexible education.</p> <p>http://www.ld.swin.edu.au/ncode/</p>

NCVER	<p>National Centre for Vocational Education Research NCVER is Australia's principal research and evaluation organisation for the vocational education and training sector in Australia. http://www.ncver.edu.au/</p>
network infrastructure	<p>All the hardware components necessary to provide access to online services, including computers, network cabling, servers and telecommunications lines.</p>
NOIE	<p>National Office for the Information Economy NOIE is Australia's lead Commonwealth agency for information economy issues. http://www.noie.gov.au</p>
NTLD	<p>National Teaching and Learning Database The NTLD is the national online catalogue system providing information about and access to online educational content for Australian post-secondary education. (Subsequent to the completion of this report, the project has become the Learning Resource Exchange http://www.lrx.com.au/)</p>
OGO	<p>Office for Government Online OGO develops strategies to encourage a 'whole-of-government' approach to the use of information technology and telecommunications across the Commonwealth. http://www.dcita.gov.au/cgi-bin/trap.pl?path=4211</p>
online	<p>Online means any electronic delivery technology that can be accessed via a computer network. Typically refers to services made available over the Internet, but could also refer to 'in-house' networks, for example a local area network in an education provider and to dial-up services such as videoconferencing.</p>
requirements specification	<p>A description of the functions which are required in a particular area of learning technology and which need to be addressed in a technical standard.</p>
SAG	<p>EdNA Schools Advisory Group The EdNA Schools Advisory Group provides advice to CESCEO, the ERC and the Education.Au Board. http://www.edna.edu.au/edna/aboutedna/schools/SAG.html</p>
SC 36	<p>See: JTC 1/SC 36</p>
Standards Australia	<p>Standards Australia The peak standards setting organisation in Australia and the national representative on international organisations such as ISO and the IEC. http://www.standards.org.au</p>

subject gateway	An Internet site providing access to websites which are relevant to a specific discipline area and are spread over a number of locations.
Toolboxes	<p>ANTA Flexible Delivery Toolboxes</p> <p>A Toolbox is a set of multi-media resources that provides a framework for the development of training programs for online delivery.</p> <p>http://www.anta.gov.au/toolbox/</p>
VET	Vocational Education and Training
VET Preferred Standards Project	<p>Preferred Standards to Support National Cooperation in Applying Technology to VET</p> <p>This is an ANTA funded national project which has developed National Guidelines for Technology which have been endorsed by the ANTA CEOs for adoption in the VET sector.</p> <p>http://www.vicnet.net.au/~neptune</p>
W3C	<p>The World Wide Web Consortium (W3C)</p> <p>The World Wide Web Consortium is a membership based organisation established to “lead the World Wide Web to its full potential by developing common protocols that promote its evolution and ensure its interoperability”.</p> <p>http://www.w3.org/</p>

Attachment B - Details of organisations, projects and standards

Attachment B is supplied as separate document. It can be downloaded from <http://standards.edna.edu.au/reports/>