

Toward a New Educational Culture - Matching Human Networks with the Technical Architecture

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This paper provides an overview of the implementation and growth of Education Network Australia (EdNA), a national framework for collaboration and co-operation throughout all levels of the Australian education community – involving the participation of schools, vocational education and training, higher education, government departments and professional associations. The guiding principle which underpins this collaboration is maximising the benefits of the Internet for education. The process involves a number of key foci: foremost among these is the accumulation and aggregation of quality content for the purposes of information retrieval and resource discovery; of equal significance, though nowhere nearly as developed, is the focus upon the process of building networks, in bringing together a confluence of interests from 'top-down' government-sponsored agendas, such as copyright and the information economy, with the 'bottom-up' needs and requirements of practitioners in the field.

EdNA Online, a website which acts as a value-added 'gateway', is both a visible product of the EdNA collaboration and a service to its stakeholders. In recognition of the distributed nature of resources and connections available via the Internet, EdNA Online has been established with a distributed and devolved administration capability.

Keywords: **architecture, networks, collaboration, communities, co-operation, infrastructure, national, standards, value-add.**

1 Introduction

In an age where the foundations of a global information infrastructure are being assembled, Education Network Australia (EdNA) has been established on a model of mutual cooperation, consultation and collaboration between government and non-government members of Australia's education and training community. Maximising the benefits of information and communications technologies (and in particular, the Internet) for application throughout the whole of the Australian education sector is EdNA's primary focus. The process of maintaining this focus through collaboration is achieved through continued activation of the very pragmatic agendas of minimising costs and duplication of effort as well as the pursuit of aggregated value. Overall, the evolution of this educational network is driven by a reflexive interdependency: well-established human networks and communities of interest finding expression and utility in a new domain; and, a rapidly evolving technical architecture enabling exploratory and innovative application. A new interdependent educational culture emerges from the resultant synergy.

From its beginnings, in 1994-1995, EdNA was conceived in terms of matching the 'bottom up' needs and experiences of the 'early adopters' of the Internet for education with the capacities of governments to support this endeavour through policy development and

resourcing. At this time, the Australian Academic Research Network (AARNet) had served for about four years as the primary Internet gateway for Australia and was dominated by the interests of universities, who had in fact initiated it. Thus, in October 1994, a report published by the Australian Science and Technology Council (ASTEC) titled '*The Networked Nation*', commissioned 12 months earlier by the then Minister for Science and Technology [1], recommended:

... that the Minister for Employment, Education and Training, in consultation with other relevant Ministers, initiate the establishment of a not-for-profit consortium, involving governments, telecommunications carriers, industry and the research and higher education communities, to provide a national information network for the research and higher education communities and the wider community. [8]

In the formal Response to this report, based upon wide public input, it was stated:

The continuing development within AARNet, the development of other on-line service providers and various other Commonwealth, State and Territory initiatives, is giving rise to a dynamic "community of networks" through a bottom-up user-driven approach, which is responding to opportunities and the demands of particular sectors and communities. This community of networks is characterised by devolution of control, and leaves the way open for creative ideas to emerge from various communities of interest. Nevertheless, Internet will continue to be a key part of the national information services infrastructure. It would be unwise in such a climate to adopt a centralised approach, albeit one in which a range of interested parties are involved, to manage the development of "the national information network". There is a risk that a centrally driven approach would result in the government being locked into inappropriate technologies or services, while the market moves in other directions. [9]

2 The Australian Context

Australia, a continent approximately the size of Europe, has a relatively small population of around 18 million people, the vast majority of whom live in six major cities located around its coastal edges. The remaining population is thinly dispersed throughout the rest of the country. As a result, distance education, open learning, flexible delivery and correspondence courses have been long established as methods of providing educational opportunities, particularly for people in rural and remote areas.

Culturally, educational growth and reform in Australia has been tied very closely to government agendas. This has been due, in part, to the fact that education has been strongly associated with notions of the public good, no matter what political party has dominance. Well over 80% of education funding in Australia comes from government. In a federated system, the involvement of Federal and State governments in the provision of education and the inevitably need to balance the demands of lobby groups and different levels of government leads to partial educational reforms. Some of the bigger reforms that have taken place, such as those during the 1980s, only affected particular sectors. With the dawning of the so-called 'digital revolution', and specifically the dramatic growth in information technology utilisation in both education and the workplace, there are new prospects for educational reform. There are many terms being used to describe this milieu – the 'information age', the 'digital revolution', the 'knowledge age', the 'networked society' – all of which offer a different 'spin' on the same phenomenon.

While EdNA is not explicitly representative of an educational reform it is nonetheless indicative of the kind of developments likely to proliferate in this next decade or so where

'networking' has new meaning to many more players. It is a manifestation of cultural change facilitated by information and communications technologies (ICTs). Conventional (power) networks will no doubt endure but they will be challenged by the emergence of new networks made possible by ICTs. The organisational pyramids that have been flattening in recent years are being transformed in this process by new architectures. No doubt key power relations and structures will endure throughout the transformation but it is also clear that the opportunities and threats accompanying the usage of ICTs are unprecedented. In educational settings these opportunities and threats pose transformative challenges for the established pedagogical and organisational cultures [5], [7].

As outlined above, the early vision for EdNA was predicated on the engagement of stakeholder groups. However, early emphasis was placed upon a (physical) connectivity initiative which would assist the Schools and Vocational Education and Training (VET) sectors in catching up to the situation of universal high speed access enjoyed by the university sector in its deployment of AARNet. It was well recognised that such a project was necessary and timely, but for governments to deliver educational products and services nationally then costs would have to be contained. While various nominees from each of the systems and sectors gathered to plan the development of the network, development of an online service, initially called the EdNA Directory Service, was also commenced. This took some two years to mature and was formally launched by the Commonwealth in November 1997. The EdNA Directory Service was later renamed EdNA Online in recognition of its wider function of facilitating networking opportunities and provision of interactive services beyond information retrieval and resource discovery.

There have been a number of diverse forces at work contributing to EdNA's development, not all of which are clearly unique to Australia. In sum, the key factors were: the dramatic uptake of Internet usage in Australia since the emergence of the World Wide Web; the deregulation of telecommunications law; a diminishing in public funding for the education sector as a whole; a growing concern throughout the broader community for mechanisms which will protect children from access to unwholesome content and individuals on the Internet; the pursuit of equity of access to information and communications technologies, particularly for people in regional and remote communities; the 'globalisation' of the educational marketplace; the potential to secure a market leverage for collective bargaining of lower prices for computers and connectivity; reducing duplication of effort and adding value to initiatives already underway; and, a significant strengthening of commitment from governments to information technology in education. Throughout this context EdNA has consolidated as a national framework for collaboration between all sectors of the Australian education and training community, a collaboration geared for mutual benefit and focused on the benefits of the Internet for education [5].

The peak body within the EdNA collaboration is MCEETYA (the Ministerial Council for Employment, Education, Training and Youth Affairs) which includes all the Ministers of Education and Training from the six States, two Territories and Commonwealth. Overall co-ordination is effected by Education.Au Limited, a small non-profit company owned by MCEETYA and based in Adelaide, South Australia.

3 Collaboration

Formally speaking, EdNA's collaborative processes have two levels of integration: governmental, covering all Australian States and Territories and the Commonwealth of Australia; and sectoral, covering government and non-government schooling systems, VET

(including adult community education), and higher education. Informally, however, the boundaries of collaborative processes within a network are not so clear cut. Educators, researchers, students, interested groups and individuals also play a lead role. Without the initiative and application of these practitioners and 'early adopters' the collaboration within EdNA is weakened considerably and would be of questionable value [4].

Representative sectoral and cross-sectoral collaborative committees play a major role in informing EdNA's agenda. In mid 1995, the EdNA Reference Committee (ERC) was established by MCEETYA for the purposes of providing an appropriate forum for direction of the project and to feed back advice on policy matters. It has been chaired by the Commonwealth representative since then and membership is drawn from nominees of the key stakeholders. Currently, the ERC is providing advice to MCEETYA on the educational implications of the National Office for the Information Economy (NOIE) agenda for the 'information economy' [10]. Although EdNA's collaborative committees include a strong policy advisory role to government in areas such as copyright, telecommunications, and the information economy, each sector has also appointed project officers who work with advisory groups with a particular focus on providing direction for the development of EdNA Online.

An example of early collaboration within EdNA was a national computer purchasing contract. This initiative brought together the collective purchasing might of State and Federal governments and had the outcome of driving down the purchasing price of a wide range of computers for the education sector. This manoeuvre established the economic significance of the aggregated effort and clearly secured the education sector as having huge market-place potential, especially from the point of view of the telecommunications and computing industries.

Through the collaborative activity within EdNA the sharing of information and the development of strong sectoral and cross-sectoral networks has contributed to breaking down traditional barriers. In their place there are commitments to sharing knowledge and identifying projects and initiatives where mutual advantage can be achieved.

4 EdNA Online - Functions and Features

EdNA Online, a website which acts as a value-added 'gateway' to the whole of the Australian education sector, is both a visible product of the EdNA collaboration and a service to its stakeholders.

4.1 Resource Discovery

Initially, when known as the 'EdNA Directory Service', EdNA Online functioned primarily as an information storehouse about education and training in Australia, as well as a gateway to quality (evaluated) online resources covering all sectors – higher education, schools, vocational education and training and adult community education.

As an educational gateway to quality online educational content and services EdNA Online now has a database of over 9,000 evaluated, value-added online resources. The value-adding occurs in the process of evaluation whereby descriptive metadata (such as well considered descriptions, keywords, publisher details, and category linkage) is added by experienced personnel with the aim of aiding in targeted retrieval. Linked to this core

database collection are a further 250,000 linked items, indexed from the core collection, which are also available for easy searching. Significant in this process has been an approach which seeks to identify quality rather than employ censorship. The focus on quality has been an important mechanism for achieving visible 'added value'.

A key strategy to the gathering, organising and retrieving of material has also been the formalisation of the EdNA Metadata Standard [11], which is based upon the Dublin Core with nine further elements defined for specific use [6]. The EdNA standard is based upon a minimalist, practical approach and is geared toward achieving interoperability with other resource discovery projects focused on educational content. In the Australian context this is also important because of the significant investment in, and deployment of, Dublin Core metadata by a diversity of communities, particularly the Australian Government. Thus, EdNA has adopted and is supportive of a whole-of-government approach to metadata deployment. In pursuing this approach the EdNA community has also monitored carefully the development of other metadata projects around the world. The most developed among these, apart from the Dublin Core initiative itself, is the Instructional Management Systems (IMS) Project coordinated from the USA [12].

Complementing the metadata work in the development of EdNA Online has been a project based upon providing an automated means of gathering quality items to support the browsing and searching functions on EdNA Online. This process complements the automated indexing function. Known as the Harvesting project, a custom-built robot has been developed to gather resources from accredited sites that have utilised metadata compliant with the EdNA metadata standard. Various phases of roll-out were defined for this project, an effort which took over 12 months of consultation, planning and development to deliver. At the time of writing, stakeholders were still engaged in the testing of phase one which involves the collection of metadata embedded within documents from designated sites. Phase two of the project provides an ongoing process for gathering quality items from registered contributors' repositories of detached metadata. Registered contributors are able to manage the items they contribute through appropriate modifications to the detached metadata. Tools to further support this process in a retrospective manner are also under development and are aimed at promoting a smooth uptake. Natural work-flow that does not interfere with local demands is a key consideration. As the collection of EdNA-compliant metadata builds, the search tools on EdNA Online are being modified in an incremental manner.

Like most online content services, two main options for information retrieval and resource discovery have been established for EdNA Online – browsing and searching. However, often there is a disjunction between these two methods and so a project initiated late in 1998 has enabled a major overhaul of both the technical architecture and the user interface. For well over 12 months, stakeholders expressed the desire to move toward an integrated browse and search capability although progressing this was consistently thwarted by a complex back-end technical architecture. In the initial stages of development (1996-1997) the dynamic rendering of the category tree from information held in the database clearly had some advantages, enabling new categories to be developed as needed. As the database of resources grew it became very clear that such processes of dynamically displaying a category tree were ultimately a disincentive for users to explore, or drill-down, to any depth through the browse option because of excessive processing time. Adopting the concept of a 'multiplicity of pathways' based on an integrated browse-search approach has enabled a more modular architecture to be developed where resource discovery is more

flexibly situated within a context of other processes. This development effort is known as the Pathways project.

A major revelation in the development of the Pathways project has been the pivotal role that semantics (in the form of a controlled vocabulary) plays and that classifying or indexing information for Web delivery has particular requirements. Development of Pathways also enables a user-centred approach to the development of semantic linkages which can then be shared with others as educational objects. Thus, for example, students learning about acoustics in the context of music might generate and share topics of interest with students of physics learning about waves and students of auditory systems.

4.2 Interactive Services

Building on this solid foundation as a service delivering quality content for resource discovery EdNA Online has also developed a range of interactive services such as email-based discussion groups, noticeboards (currently dominated by conference announcements and collaborative projects but also customisable for any purpose) and a facility which allows for suggested items (allowing for inclusion of metadata enrichment). There are currently over 140 discussion groups hosted for the education community, 45 of which are archived. There are weekly 'push' services such as the 'What's New' email alert service, 'EdNA News and Views', and a monthly 'New in Early Childhood' email alert service.

The concept of interactivity is also clearly evident in the implementation of the Pathways project where individuals and groups can build, save and share semantic networks which are themselves collections of educational resources. Thus, it can be seen in recent and proposed development projects that interactivity is considered at the design level itself and not just as a 'service'.

4.3 Distributed Administration

It is important to reiterate that collaboration and cooperation across and within all Australian education and training sectors is also facilitated in the distributed administrative model developed by EdNA Online. For many users of the service this would not be apparent because it is a behind-the-scenes activity. It is, however, central to the overall EdNA process – a process concerned with building an appropriate online infrastructure consistent with an open networking environment. Some would argue that as a means for spreading 'ownership' of the process, distributed administration is a successful driver.

Distributed administration currently implemented on EdNA Online is defined in terms of allocation of permissions through individual and group access for specific roles (such as database item maintenance, category maintenance, noticeboards maintenance, dead-links reporting, majordomo maintenance, publishing, and feedback management). In this implementation, individuals are members of groups. A 'Common group' has been set up for some functions and is based on the notion of 'the commons' where a shared responsibility and trust is required. However, dependency on trust is not within certain limits and so while the public presentation of EdNA endeavors to effect 'transparent' processes it would be clearly foolhardy to expose database management to the general public!

There is a key point in this – in strengthening a structure which allows for distributed input and ownership EdNA is contributing to the development of an educational culture which is itself rich in educational practice. While EdNA Online functions as a 'central' point of

focus, or hub, in the EdNA endeavour it is a clear example of where an aggregation of goodwill is made explicit. As such, EdNA is a *network* and EdNA Online thus operates as a conduit, as a networking facilitator.

Since mid 1998 there has been some piloting of prototypes for a new enhanced distributed administration system which will allow for easier management through modularisation of the system. This system is based on the Lightweight Directory Access Protocol (LDAP). In monitoring the development of projects which share some commonality with EdNA, specifically in the area of distributed database searching, Project Isaac (which utilises LDAP) has been identified as an excellent model for this approach [2].

4.4 EdNA Online – Strategic Considerations

In broad terms, it is a shared wish of EdNA stakeholders to achieve and maintain a ‘best fit’ between the national collaborative framework and the continued system implementation of EdNA Online. Key technical principles of portability, scalability, open component-ware and interoperability are the main reference points. If this is achieved then it will translate into broadening the current services available through EdNA Online to include easy publishing as well as the sharing of information resources not originally prepared for Web consumption. Examples of this might include sharing of strategic planning documents prepared in schools of similar size and resources. Already, a sophisticated distributed publishing service is provided to schools and TAFEs in the Australian State of New South Wales through the Department of Education and Training. Where such local initiatives move forward faster than the deployment of services on EdNA Online there is the benefit of real-world testing and trialling within the distributed environment.

Specifically, some of this best-fit will mean developing further interactivity at the design level of EdNA Online as well as in extending the services provided such as introducing Web-based forums hosting. This approach recognises that ‘interactivity’, apart from being an over-worked ‘buzzword’, is a means as well as an end in itself. Seen in these terms, interactivity is also about engagement. Networks flourish by engaging interfaces that beckon participation.

Internationally, initiatives such as IMS (Instructional Management Systems), are gaining closer attention in Australia. The Australian IMS Centre has now been established at the University of New England and it is working within the EdNA framework. These and other strategies currently being considered by EdNA point to exploiting opportunities intrinsic to an infrastructure that properly supports a ‘network society’. Such an infrastructure is dependent on communication processes which provide opportunity for mutual benefit.

5 Conclusion

Through the use of information and communications technologies Australia is bringing diverse educational communities together to add value in the delivery of education in Australia. EdNA’s collaborative model has proven its durability and is exercising considerable leverage by successfully integrating the interests and activities of all Australian education sectors and systems. The evolution of EdNA is driven by a reflexive interdependency where well-established human networks and communities of interest find expression and utility in a new domain while a rapidly evolving technical architecture

enables exploratory and innovative application. A new educational culture is beginning to emerge where synergy is evident in this interdependency.

Key challenges for the future will be to extend partnership arrangements and continue to involve new groups of educators, both national and international.

References

- [1] Crean, S. "Ministerial Media Release", April 6, Department of Employment, Education and Training, Canberra (1995).
- [2] Lukas, C. & Roszkowski, M. "The Isaac Network: LDAP and Distributed Metadata for Resource Discovery", University of Wisconsin-Madison, IEEE (1999).
<http://computer.org/conferen/proceed/meta/1999/papers/46/clukas.html>
- [3] Mason, J., Dellit, J., Adcock, G., & Ip, A. EdNA Online and the Propagation of Value-Add, Proceedings of the 5th Australian AusWeb conference, pp. 369-378 (1999).
- [4] Mason, J. "Groupware, Community, and Meta-Networks: The Collaborative Framework of EdNA", in Toru Ishida (ed.), Community Computing and Support Systems, LNCS 1519, pp. 126-137, Springer, Verlag (1998).
- [5] Mason, J. & Dellit, J. "Collaboration, Co-operation and Cultural Change: EdNA's Potential - Planning for Progress, Partnership and Prophecy", in C. McBeath and R. Atkinson (Eds.), Planning for Progress, Partnership & Profit. Proceedings EdTech98, pp. 137-141, Perth: Australian Society for Educational Technology (1998).
- [6] Mason, J. & Ip, A. "EdNA, Higher Education and Metadata Implementation", in R. Corderoy (ed.), ASCILITE '98 - FlexibilitY: The Next Wave?. Proceedings of the 15th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE), pp. 487-494, University of Wollongong (1998).
- [7] West, R. & Review Committee. "Learning for Life, final report - Review of Higher Education Financing & Policy", DEETYA, Commonwealth of Australia: Canberra (1998).
- [8] Australian Science and Technology Council, "The Networked Nation", (1994).
<http://www.dist.gov.au/science/astec/astec/netnatn/contents.html>
- [9] Australian Science and Technology Council, "Response to: The Networked Nation", (1994). <http://www.dist.gov.au/science/astec/astec/netnatn/response.html>
- [10] National Office for the Information Economy, "Strategy Documents" (1999).
<http://www.noie.gov.au/docs/strategy/index.html>
- [11] Education Network Australia, "The EdNA Metadata Standard", (1998).
<http://www.edna.edu.au/EdNA/>
- [12] Instructional Management Systems (IMS) Project (1999). <http://www.imsproject.org>

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