New Zealand Open Source Virtual Learning Environment Project - A Case Study in Achieving National Development Goals using Open Educational Resources

Richard Wyles, E-Learning Department at The Open Polytechnic of New Zealand

Abstract
The purpose of this paper is to explore the political economy of open source and open educational resources, by presenting an overview of cogent case study examples that address each of the sub-themes outlined, within an over-arching framework of inter-related initiatives.

The New Zealand Open Source Virtual Learning Environment (NZOSVLE) Project is a consortium-based project, involving twenty higher education institutions, with NZ Government funding focused on developing open source application software for education. The project team adopts, adapts and contributes back code to selected open source communities - currently with a specific focus on Moodle, ELGG and EPrints.

As part of the overall project, Eduforge (www.eduforge.org) was developed to encourage project collaboration. Eduforge is an open access environment designed for the sharing of ideas, research outcomes, open content and open source software for education, and hosts over 100 projects in education from throughout the world.

The growth of the open source movement in education presents developing countries with an opportunity to escape from technological dependence, while also providing a catalyst for innovation and self-determination in distance and technology-mediated learning initiatives. This work is changing approaches to ODL strategy, professional development for tutors, and engagement with learners.

The purpose of this paper is to explore the political economy of open source and open educational resources, by presenting an overview of inter-related projects in New Zealand and how each is a building block to achieving national development goals through technology-mediated learning.

THE CHALLENGE IN CONTEXT
New Zealand is a geographically remote country distant from world markets. The population, at approximately four million, is relatively small and spread across a geographical area comparable to Britain, meaning there is internal geographical remoteness as well as external remoteness.

The geographical spread of the population has been a contributing factor to a large number of education providers. There are 3 Wananga providing further education with a focus on Maori, 8 Universities, 19 Institutes of Technology and Polytechnics, 41 Industry Training Organisations and 266 Private Training Enterprises.

While New Zealand is a developed and prosperous country, the challenges for spreading an inherently limited education budget for the uptake of e-learning has some commonality with other countries. There is uneven access and know-how. Cost is a significant barrier to entry for small organisations, thereby contributing to a digital divide within the education system. Across the system there is significant duplication of investment and activity. Those able to invest in platforms such as BlackBoard and WebCT, while e-learning enabled, have commented on the lack of flexibility, lack of cultural identity and rigid constructs in pedagogy partly due to their inability to innovate with the code base.

ADDRESSING THE CHALLENGE

The growth of the open source movement in education presents New Zealand, and similarly developing countries, with an opportunity to escape from technological dependence, while also providing a catalyst for innovation and self-determination in distance and technology-mediated learning initiatives. In addition to delivering on the promise for an economically sustainable technology investment pathway, significant collaborative initiatives have been enabled through the use of open source technologies.

In 2003, the New Zealand Government designated funding, to be administered by the Tertiary Education Commission, for e-learning capability development initiatives throughout New Zealand spanning a time period of 2004 to 2007. The e-Learning Collaborative Development Fund (eCDF), a contestable funding model available to New Zealand tertiary education organisations, is designed to improve the tertiary education system's capability to deliver e-learning that improves education access and/or quality for learners. In particular the eCDF seeks to encourage a consolidated approach of tertiary education organisations sharing e-learning costs and systems where this is more efficient than individual organisations replicating investment.

NEW ZEALAND OPEN SOURCE VIRTUAL LEARNING ENVIRONMENT (NZOSVLE) PROJECT

The New Zealand Open Source Virtual Learning Environment (NZOSVLE) project is a consortium-based project, involving twenty further and higher education institutions, focused on developing open source application software for education. The project team adopts, adapts and contributes back code to selected open source communities with specific focus on Moodle (Learning Management System), ELGG and EPrints. The virtual learning environment adopts a flexible technical architecture in which individual application components use open standards and are independent, modular, and extendable.

A key distinguishing feature of the project is the collaborative philosophy. This is perhaps best illustrated by there being no intention to develop a brand new e-learning platform. Instead, the project involves selection, integration, adapting, and contributing to existing open source e-learning software freely available from highly regarded open source communities that support software applications with large installation bases. It is our preference to avoid forks in the open source communities. Inevitably a fork results in a smaller community of users to support the application's development.

The NZOSVLE Project was designed to strengthen system capability and quality, while simultaneously reducing the total cost of ownership for New Zealand e-learning across tertiary and secondary education, industry and enterprise growth sectors. Many tertiary organisations in New Zealand have less than 2000 students. To date, these organisations have not been able to afford licensing and support of an e-learning environment. A key goal, that has been widely met, has been to lower the barriers to entry in using e-learning technologies. The widespread deployment of Moodle significantly increases the e-learning capabilities of the sector, provides a catalyst for innovation, and accelerates the adoption of e-learning in a manner aligned with national objectives for a knowledge economy.

The result is a significant increase in the e-learning capability of the tertiary education system, in terms of information and communication technology (ICT) tools and knowledge supporting e-learning delivery. The project's output in terms of infrastructure and operational model has enormous potential for international adoption.

Moodle

The work on the Moodle open source learning management system (LMS), in particular, has had an enormous impact across New Zealand's education system with Moodle now the most widely deployed LMS in New Zealand further education sector.

The research and evaluation of open source learning management systems (LMS) took several months in early 2004. All documentation for this process is available from the project space on Eduforge (https://eduforge.org/docman/?group_id=7). Ultimately, three systems were short-listed for full technical evaluation: ATutor, Moodle, and Ilias. These systems were then deployed in a test bed environment for in-depth evaluation from both technology and pedagogical perspectives.

Moodle was selected for its following strengths 1) open and active developer community 2) good system help files and end-user documentation 3) quality of the code and modular system architecture 4) ability to interface with other systems 5) course centric rather than tool centric and 6) flexibility including the ability for instructors to adjust courses on the fly.

Once Moodle was selected, the development team started in earnest has been working on Moodle full-time since June 2004. The first areas of focus were to enhance overall site security and performance. An antivirus tool was integrated as a standard feature. A multi-enrolment plugin was developed for a student management system interface and the ability to create courses from existing courses was developed. It was an intense period of development with over 400 code changes. 2004 saw the first of many large scale deployments in the tertiary education sector. The Open Polytechnic of New Zealand's Moodle site went live in November 2004 and supports upwards of 35,000 learners. Performance improvements were vital for such a large deployment. The Open Polytechnic, Waikato Institute of Technology, Lincoln University and others were now in a position to migrate to Moodle with the confidence that the system would support their students at an enterprise production level. The work started to get noticed internationally and contributed to decisions to adopt Moodle being made at Athabasca University in Canada, and Open University in the United Kingdom.

During 2005 and 2006, the development effort moved towards the feature set with new forum discussion options, feedback module, role play module, an interface to repository and e-portfolio systems. All code development is open source.

A key motivation for considering open source solutions was the need to accommodate alternative pedagogical approaches and different contextual interfaces with an emphasis on Te Reo Maori and Pacific Island cultural requirements. One group of tertiary organisations has focused on contextual interface development of the virtual learning environment, including cultural look and feel themes, creating technical help, pedagogical support files, and tutorial packages, in appropriate languages to assist learners and instructors become familiar with the e-learning environment created.

Collaboration on Support Services
There are two core reasons why the NZOSVLE project established a support service for open source applications in education in New Zealand, delivered by open source specialists Catalyst IT Limited (www.catalyst.net.nz).

Firstly, lack of know-how or organisational cultural barriers remain a barrier to adoption for many organisations. Cost remains a significant factor despite the cost benefits of royalty free open source licensing. Secondly, objections to open source in general often focus on a perceived lack of credibility in comparison to that normally associated with the backing of a large proprietary software vendor.

The NZOSVLE project facilitated the establishment of a shared hosting facility which delivers economies of scale on hardware, hosting, disaster recovery systems, availability of appropriate expertise, bandwidth and 2nd/3rd level support services. By collaborating on shared infrastructure 24 by 7 support, 99.9% uptime service levels are available for mission critical systems at a significantly lower cost than if individual institutions were to set up these systems and services individually.

Elgg and MyPortfolio.ac.nz
The e-portfolio tool is for many a recognised tool employed for a multitude of purposes: employment; assessment; life-long learning; professional development and accreditation of prior learning. While the number of institutions adopting some type of

e-portfolio system is increasing dramatically, there remains questions over how best to engage the learner, and not create yet another e-learning hurdle.

The traditional lecture model is giving way to alternative approaches due to innovations with online learning. In some instances, even the very model of a course is experiencing pressure as organisations recognise the significance of less formal learning that happens in communities, in employment situations, and knowledge networks.

In this context, the team at Elgg (www.elgg.org) have an interesting and promising approach. Rather than a narrowly defined e-portfolio their approach is to create a bundle of social networking tools alongside storage, with an appropriate permissions system, for digital artefacts. They term this an "online landscape".

In this sense, Elgg provides a stand-alone system that supports constructivist learning, which is very aligned to the philosophy behind Moodle. Elgg includes blogs and social networking. Social networking allows people to discover new contacts by traversing relationship links between people.

The NZOSVLE team started work on Elgg in late 2005, and similarly to Moodle work the year before, the initial focus was on enhancing the existing platform. The improved Elgg system is simpler for programmers to work on, more secure, more portable and with some functionality improvements.

After the enhancements were completed, MyPortfolio (www.myportfolio.ac.nz) was launched as a national e-portfolio platform using the Elgg system. Instead of separate e-portfolio systems connected to every institution MyPortfolio uses a Shibboleth style solution for single sign-on with the Moodle platform. Development work is ongoing throughout 2006 and into 2007.

Eduforge

Early in the NZOSVLE project, it was recognised there was a need for an online environment for project collaboration. Instead of being focused on a specific project, Eduforge was established as an open access environment designed for the sharing of ideas, research outcomes, open content and open source software for education.

Eduforge (www.eduforge.org) was developed in February 2004, using a combination of customised code from GForge (www.gforge.org), Serendipity (www.s9y.org) and PhpWiki (http://phpwiki.sourceforge.et/phpwiki/). GForge has tools for team collaboration like forums document folders, and source code management tools. On its own it is a great application for software developers. However, the goal with Eduforge was to try to bring software developers and educators into the same space.

First, PhpWiki was integrated which has been particularly useful in requirements gathering and collaborative documentation from the education community. Serendipity is a weblog application. Each project has a blogging tool and in addition Planet Eduforge (http://planet.eduforge.org) was deployed to aggregate news feeds and blogs together into a single combined resource.

As of July 2006, there are 125 hosted projects on Eduforge, with over 1300 registered users on Eduforge from throughout the world. Eduforge generates approximately 1.5 million page views per month and provides a focal point for development, distribution and maintenance of open source software for education.

EXE LEARNING

The eXe project (www.exelearning.org), also funded by the Tertiary Education Commission of New Zealand, has developed an authoring tool to assist teachers to easily publish structured, web based learning content and activities. The thinking behind eXe, conceived by Wayne Mackintosh, is to develop a simple to use tool that assists the instructor to create quality learning design, a balance between content and form. The project team uses the term 'instructional device' to describe a range of customisable pedagogical templates.

Adherence to the principles of interoperability means that eXe is a very useful authoring tool for creating Moodle courses. eXe is open source with a standard GPL license.

OPEN SOURCE LEARNING OBJECT REPOSITORIES

The Open Source Learning Object Repository project is focused on selecting and developing a repository system that will interface and support federated search from Moodle. Candidate repository systems were evaluated on the quality of code, strength of community, and ability to store multiple file formats.

EPrints (www.eprints.org) is designed as an institutional repository for research output. The project team focused on enhancements that would enable Eprints to operate as a dual repository system – research outputs and courseware storage and retrieval.

Code was written to enable EPrints to import SCORM packages, improve versioning functionality, PostgreSQL support for improved scalability, and development of a plug-in architecture for the Moodle system.

OPEN EDUCATIONAL RESOURCES

The objective of the Open Educational Resources project (OER) is to develop courseware that is freely available to all educational institutions in New Zealand and beyond. On the basis of a successful pilot, a further output of the project is to develop a model to initiate future collaborative courseware developments for the benefit of the education sector at a system-wide level.

Course materials are developed as reusable content packages, with the level of granularity for the packages determined for each course to best enable customisation, increase the potential for re-use, and lower the cost of maintenance. Materials will be developed in a mark-up language that enables them to be transformed into different formats, and learning design and technical specifications will include adherence to accessibility standards. Original source files and sample style sheets will be available for download to enable educational organisations to contextualise materials to their particular student audience or delivery model if required.

Nominated subject matter experts academically and technically moderate materials. Each course development includes a showcase example of how they can be set-up for use in a learning management system.

At an infrastructural level this project builds upon the Open Source Learning Object Repository and NZOSVLE projects by using EPrints and Moodle respectively. All courseware outputs will be accessible via www.repository.ac.nz and come under a Creative Commons license.

OPEN ACCESS REPOSITORIES IN NEW ZEALAND

The Open Access Repositories in New Zealand (OARINZ) project will implement a national network of open access repositories for publicly funded research and teaching repositories during 2006 and 2007. New Zealand research institutions will have the necessary infrastructure and know-how to enable them to join with the global research community to establish a network of Institutional Repositories, into which authors deposit copies of their research outputs. This gives authors a way to make their research results available to anyone with Internet access. Anyone can search the full texts of deposited outputs in their field of research interest, wherever these are held. By putting research outputs in a repository, authors will enhance the visibility and impact not just of their research, but that of the whole New Zealand research sector.

NATIONAL E-LEARNING NETWORK

The e-Learning Networked Education Pilot is developing a network-based strategy to achieve more co-operative and strategic implementation of e-learning courses across multiple institutions. This development will be underpinned by open source, open standards and open educational resources delivered by the NZOSVLE, OSLOR, OER and OARINZ projects. At a technical level, the use of open source and open standards is

enabling the development of an e-learning network to harness collaborative tutoring and learning at a system-wide level.

Widespread involvement by tertiary education providers in the NZOSVLE, OSLOR, OER and OARINZ projects is resulting in increased collaboration across e-learning academic programmes, for both learners and professional development. However, fully online or predominantly online course delivery remains outside of the organisational cultures of most educational institutions in New Zealand, including specialist distance learning providers. Instead, there are many pockets of high value activity unevenly spread across the sector. A networked, collaborative environment for teachers, learners and organisations will help harness the synergies from an innovative and geographically spread community of practitioners. This work is changing approaches to open and distance learning strategy, professional development for tutors, and engagement with learners.

Students, enrolled at their regional further education institution, will be able to supplement their programme with access to e-learning based delivery from another institution via an online, networked environment. The pilot programme will develop a portfolio of e-learning offerings that complements those of each network partner and optimises options for learners, including the provision of clear stair-casing pathways.

Networked e-learning provision is strongly student centred by enabling learners to study at more than one organisation. Consortium partners will co-ordinate the selection of the networked online portfolio to actively avoid cannibalising core provision, avoid the inefficiencies and risk of duplication and thereby complement and strengthen regional offerings with a student centred approach.

CONCLUSION

The open educational resources movement holds great promise for delivering cost effective e-learning infrastructure, increased innovation in our education and greater levels of collaboration in its delivery, at a system-wide level.

The commitment to open standards, modular, flexible and extensible architecture underpins the systems framework of the NZOSVLE and interrelated open source projects in New Zealand. A key strength of these projects lies in the philosophy of building upon established, well regarded open source projects. The intent is to contribute to and harness the synergy from a collaborative, international community of expertise. The result is a virtual learning environment raised to a new level of competitiveness with proprietary alternatives and a catalyst for further innovation across the sector.

The interwoven open source projects have set the foundations for continuing innovations in education delivery and have enabled the potential for deeper levels of collaboration across consortia and networks between industry and education.

The National E-Learning Network is the first step in that process. To date, the combined open source initiatives have far reaching implications for New Zealand's e-learning environment and knowledge economy. The intent of the e-Learning Network is to extend these outcomes and leverage related projects to deliver increased e-learning capability across the education system, efficiently and cost-effectively. This direction heralds a fundamental shift in the educational design and delivery of open and distance learning in New Zealand.

FOOTNOTES

1. Shibboleth is standards-based, open source middleware software which provides single sign-on across or within organisational boundaries. See http://shibboleth.internet2.edu/
2. Sharable Content Object Reference Model (SCORM) is a set of standards for e-learning course materials to communicate to their host environment – typically Learning Management System. The standard uses Extensible Mark-up Language (XML).

3. PostgreSQL is a sophisticated open source object-relational database management system.

Back to Papers