Proceedings of the Fifth IASTED International Conference
WEB-BASED EDUCATION
January 23-25, 2006, Puerto Vallarta, Mexico

AN EXTRANET IN ACTION: GLOBALLY NETWORKED ACADEMICS AND STUDENTS

Elaine Lawrence, Ury Szewcow and Karla Felix Navarro
University of Technology, Sydney
Australia
{elaine, ury, karla}@it.uts.edu.au

ABSTRACT

The vexed issue of keeping staff and students up-to-date in the fast moving world of internetworking has been exercising the minds of many tertiary institutions for several years. One Australian Faculty of IT has partnered with industry in an attempt to keep the course materials up-to-date and relevant. This has led to major changes in the culture of the faculty as staff too have been trained in the certification subjects and must pass rigorous industry level examinations in order to be qualified to teach the material. This paper describes the programs and reports as well on the results of student surveys which were undertaken to see if the policy was meeting the needs of the students. The paper refers to previous staff surveys as well.

KEY WORDS

industry, academic, education, web, partnership

1. INTRODUCTION

This paper addresses the influences that industry/academic partnerships, more specifically the Cisco Academy Connection, have on Information Technology academics and students. It outlines the impact of global cooperative e-learning networks on academic work practices and change management issues both for staff and the student body. Some of the issues addressed include discussion of the following question. Are Universities improving the quality of IT education practices by ensuring that students and lecturers are kept up-to-date in such a fast moving field of Internetworking? As it currently stands university academics can enter many areas of Information Technology and teach their subject for decades without retraining. This is not possible with the Academy Connection embedded curriculum as staff must constantly upgrade their qualifications as part of the quality assurance agreement with the industry partner. The paper also explores answers to the following questions. Are the students satisfied with the quality of the material delivered in industry based internetworking courses? Is staff willing to cooperate with industry in the development of courseware? Do students want certification as well as university degree?

The influence of this growing area of global, cooperative, collaborative, e-learning organizations on academics and universities remains largely unexplored. The Academy Connection has been chosen because other Information Technology companies as Sun, Hewlett Packard and Adobe have developed courses (Fundamentals of Java Programming, Fundamentals of Unix, IT Fundamentals and Fundamentals of Web Design) which are delivered over the Academy Connection infrastructure. We believe our research provides valuable insights to both academia and industry of the radical changes that are sweeping the tertiary sector as a result of e-learning initiatives. Indeed some industry pundits believe that we are on the precipice of a complete change in the very fabric of academia, as *not only are we talking about different academic staff but we are talking about wider, diverse campuses. E-learning knows no boundaries* [1].

In Section 2 the paper describes the background of the project context while Section 3 outlines the methodology of the paper. The FIT case study is presented in Section 4. Results of two surveys are presented in Section 5 and are discussed. Section 6 points the way to further research questions to be addressed while Section 7 concludes the paper.

2. BACKGROUND OF PROJECT CONTEXT

Our Faculty of Information Technology (FIT) is part of a huge, global collaborative online education experiment (1 million students) that has united academics, technologists and education experts from all over the world in their efforts to provide high quality education in Internetworking. Our Faculty began the postgraduate courses on Internetworking in 1998 and they remain the most successful postgraduate courses despite the IT downturn in 2002. In fact, Internetworking is the one FIT postgraduate course that appears to be immune to this market influence – in 2005 there are 347 full fee paying local and international postgraduate students.

The global networking company Cisco recognized the skills shortage in well-qualified, trained networked

administrators and engineers and set up the Academy Connection, in collaboration with academics, to develop, provide and deliver online, quality training materials. This program is the largest e-learning laboratory in the world and is a working example of industry/academic collaboration. This particular educational model levels the playing field by providing access and opportunity for lifelong learners of all ages in any location [2]. The program utilizes the *Train the Trainers* model as well as tackling the issue of the digital divide [2]. The Academy Connection's Program goal is surprisingly similar to that of the FIT postgraduate Internetworking Program, that is, to address the perceived shortage of networking skills and to achieve that in an environment that supports student-centred learning, critical thinking and problem solving. The authors believe that the Australian networking skills shortage hampered the take up of the Internet, intranets, extranets and the Internet as a business tool here.

3. METHODOLOGY

We present in this paper a Case study that outlines the particular implementation model used by FIT at UTS. Later we report on and discuss the results of two surveys carried out at this university. Other Australian universities such as Queensland University of Technology, Murdoch University and Monash University, have adopted the Academy Connection model with various degrees of enthusiasm, using a range of approaches to deliver the industry based material within traditional courses. A decision was taken at UTS to embed the curriculum into its IT program at both graduate and undergraduate levels. The Graduate programs typically attract practising professionals, international and local graduates and those seeking retraining. The first six months of the graduate program generally fast tracks a student into the essential knowledge and skills of a networking professional. At undergraduate level the courses are pitched to provide essential network knowledge (as compulsory or core subjects) as well as allowing for an internetworking sub major.

Both groups benefit from being in a supportive learning environment as well as being prepared to take industry certification if they so choose [3] [4]. Academics who wish to deliver the material are required to continuously upgrade their qualifications and to become certified technically as Cisco Certified Networking Associates (CCNA) and Cisco Certified Networking Professionals (CCNP) as well as Cisco Certified Academic instructors (CCAI). In 2003/2004 all the Internetworking staff had to undertake retooling for the Cisco material which had been totally rewritten as Version 3. This ongoing retooling is part of the quality assurance agreement made between academics and the Academy Connection.

In [5] Hall argued that an integrated approach to on-line learning and teaching can be used to promote students' critical use, understanding and application of materials. Hall believes this can be liberating for staff and students as long as there is a shared vision and experience upon which to act. Promoting motivation within a supportive and meaningful context is fundamental. This aligned to research carried out in our Faculty by [3] that studied one instance of the implementation of the commercially developed online course placed in the realm of a university environment. There appears to be positive reactions to this mode of delivering complex information to the student body, both from the students and the lecturers alike. Further research carried out by [4] [6] concluded that experiences both from the lecturers' and students' viewpoints have been positive.

The rigid quality assurance of the Academy Connection process requires modified behaviour from academics as they are required to be continually re-skilled in unfamiliar ways. This relationship has had extremely positive outcomes for staff competence with absolutely up-to-date technology and opportunities to transfer the most modern networking concepts in a timely way. [4] concluded that provided there is a sense of participation and ownership of the program as a whole from academics and the global company there will be effective e-education knowledge transfer in a globally cooperative environment. In fact, the authors of this paper were chosen in 2003 to be the authors of the updated CCNA3 Switching Basics and Intermediate Routing online course. Our team was part of a global authoring team from Australia, Ireland and the United States charged with rewriting the CCNA curriculum [7]

In [8] Clark reviewed the literature investigating the efficacy of off-site education as compared to that provided on-site. His conclusion is that electronic conference-based and web-based delivery of educational content can be as effective as traditional classroom-based teaching, assuming the technologic problems sometimes associated with delivering teaching content to off-site locations do not interfere in the learning process. In our implementation of the courses, students are required to do some offsite learning as well, for example, by completing interactive e-labs that allow students to practice on virtual routers. Opportunities also exist for students and alumni of the Academy Connection to program routers and switches using the online simulators such as NetLab and Packet Tracer as well as our own in-house remote online laboratory set up, known as FITnetwork: Network Rack Booking – see Figure 1. Students may book blocks of 2 hour slots and program the routers and switches remotely from their workplace or home. This facility has been popular with the postgraduate students as it allows them 24 * 7 access to a pod of routers and switches.

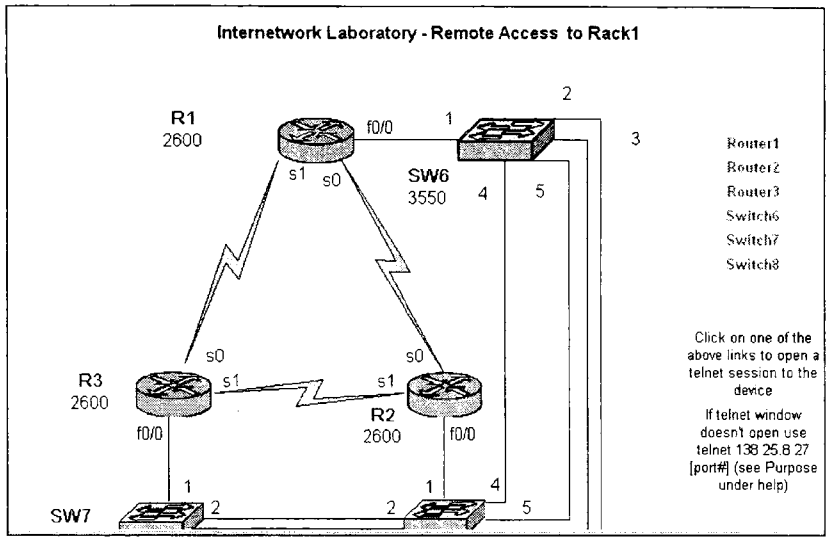

Figure 1. Remote access to Routers and Switches at UTS

4. CASE STUDY: IMPLEMENTATION AT OUR UNIVERSITY

The program uses a blended e-learning approach to the delivery of content, a train the trainer's model, to ensure consistent and quality delivery, and has an educational philosophy that is practice based and experiential. Infrastructure for course management and support of academies are provided [9]. The program also provides a range of courses that can be offered to the public as "short courses". Our university is a regional as well as a Local Academy. A regional academy has specific roles and responsibilities within the program; e.g. support and training of other local academies that deliver the program. The expectation is that such activity would be self-funding. Local Academies deliver courses to students.

Agreements with the Academy Connection industry partner are based on documents that specify roles and responsibilities as well as quality measures. An example is that a person who teaches an academy class should be properly trained, via the academy scheme. Another is a statement about acceptable equipment to student ratios as set out in the Cisco Quality Assurance Plan Version 4.0, 2005. A significant challenge to any practical hands on course is equipment costs and sufficient access, by students, to equipment for skills development.

The Academy Connection supports academies in many ways:

- Substantial equipment discounts.
- Retraining of staff as new technologies are adopted.
- Free Internetworking Operating System (IOS) upgrades.
- E-learning enabled courseware
- Classroom management and assessment infrastructure.

The industry partner, being a major player in the industry, has good insights into the professional space of internetworking and allows us to deliver relevant, up-to-date professional networking courses to students on state of the art equipment. The relationship allows staff, who choose a professional practice profile, the opportunity to stay relevant as a professional in that field.

5. SURVEYS AND DISCUSSION

The Department of Computer Systems offers Academy Connection based courses into the Faculty's undergraduate and postgraduate programs. These courses are designed around a model of a minimum of 70 contact hours. In practice the hours needed to achieve quality outcomes are dependent on students, equipment ratios and teachers. An added benefit is that students are prepared for an industry based certification exam, for example, the Cisco Certified Network Associate (CCNA) or the Cisco Certified Network Professional (CCNP) which they can pursue. The importance of industry-based certifications to IT practitioners is a separate debate which has been addressed in [6]. Students, nevertheless, report on the importance of being able to gain an industry certification, as well as an internetworking degree, to achieve their goals. In February 2004, seventy-seven new, local and international postgraduate internetworking students completed a survey. Seventy two (72) were male and five (5) were female and twenty two had spent more than 3 years in work and of these, 5 had over ten years in the work force. Figure 2 illustrates the responses regarding the importance of an Internetworking degree on their career, salary prospects and job satisfaction whilst Figure 3 shows their attitudes towards industry certification.

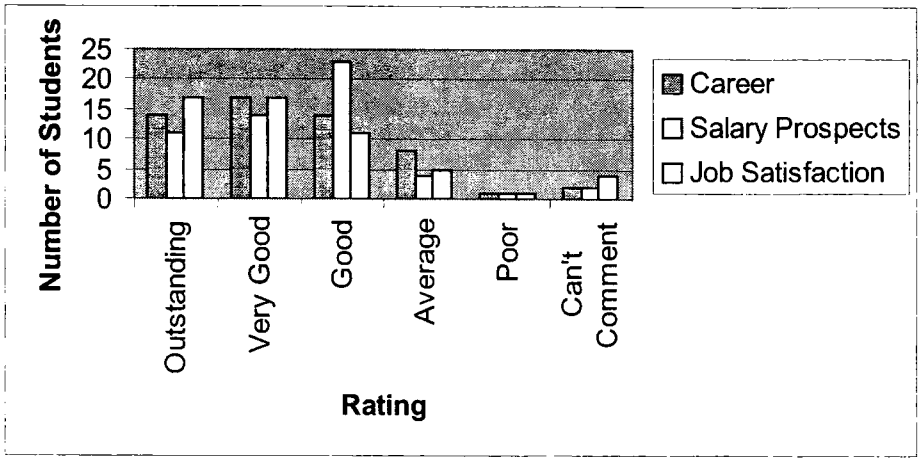

Figure 2 : Importance of an internetworking degree

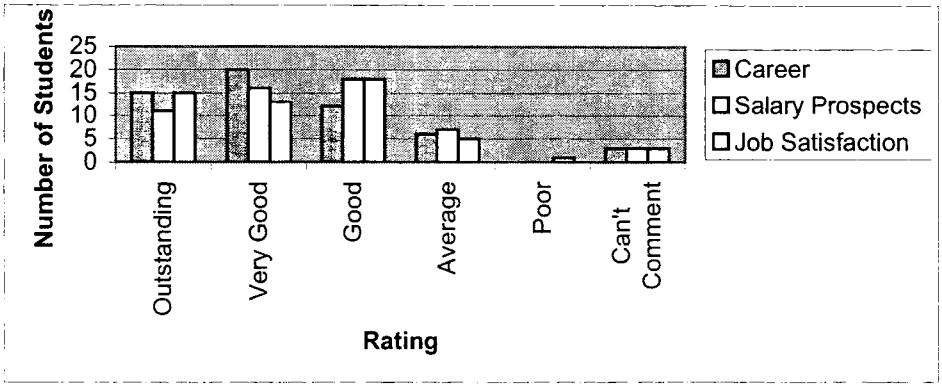

Figure 3: Importance of Industry Based Certification.

For the open ended question *Why did you choose to do an Internetworking qualification?* a sample of the answers are set out in Figure 4. Sample answers to the second open ended question *Why did you choose UTS's FIT course in Internetworking?* are found in Figure 5.

Why did you choose to do an internetworking qualification? Sample Answers

To be a network professional
Mainly for Cisco certificate based on my former internetwork background
More relevant than the MSc as my background is in Unix and networking
To become a CCNP
The course gives preparation for CCNP and MSC degree
Because I want to enhance my internetworking skills
I have very high expectation to gain more skills and knowledge in Internetworking
I am interested in pursuing a career in the Telco industry
I want to specialize in networking
Directly relates to my job
Because internetworking is very important in our country
Work related courses; to get a UTS degree, learn more about internetworking
This course has good demand in IT industry
To improve my job prospects
As my current job relates to internetworking I found that in order to further my internetwork knowledge I should take a postgraduate course
For career change and advancement.

Figure 4. Sample answers to *Why did you choose to do an internetworking qualification?*

Why did you choose UTS's FIT course in Internetworking? Sample Answers

Because it is the most appropriate course for me to the best of my knowledge.
Practical, industry oriented.
Because only UTS offers internetworking course in Sydney
The subjects outlined are closest to my needs
It offers the best of both worlds – a highly regarded university qualification and a respected certification
UTS has a very good reputation in the academic and job market
Practical
UTS has a high knowledge of IT industry
Best Uni in Sydney for IT
Because UTS's facilities and course content very good
Partnership with Cisco so I am not wrong in doing the course at UTS
Good program structure
Because UTS has unique teaching method that can better deliver information to students
UTS provides the best IT facilities

Figure 5. Sample answers to Why did you choose UTS's FIT course in Internetworking?

Combining industry certification, within the framework of academic study, makes for an attractive and economically efficient program for students. At UTS these opportunities have been provided to students at undergraduate level networking (CCNA basic), and at postgraduate level (CCNA Basic and CCNP Advanced/Intermediate) with further options in wireless networking and security available now, and will be introduced in 2006.

The Academy Connection recommended learning model, is experiential, practice and laboratory based, discursive and advocates the guide by the side teaching model This is in keeping with the way professionals learn. This teaching and learning philosophy fits most neatly in a classroom where a workshop approach is used. Portions of contact time are devoted to presentations, self paced learning using e-materials, group and whole class discussion, and discovery through laboratory work. The expert is a guide who nurtures effective learning.

Program leaders monitor the program for which they are responsible. In late 2003, students were surveyed and asked to express their satisfaction with internetworking subjects . A table from the survey is below: In the figure, Academy Connection based courses are clustered at the top right i.e. being of most value and relevance.

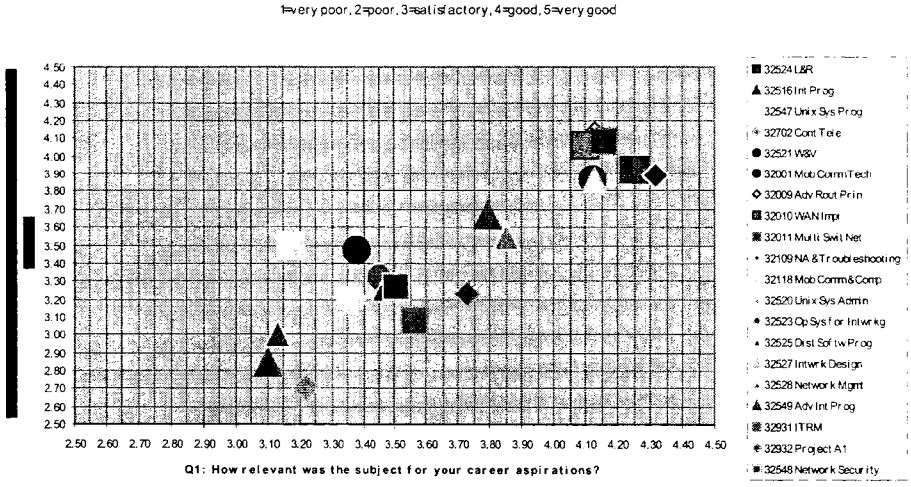

Figure 6: Value and Relevance of subjects in Postgraduate Internetworking Course

5.1 DISCUSSION

Collaborative technologies have attracted wide community interest during the past decade in office environments, in collaborative design work, and more recently, in the development of social infrastructures through peer-to-peer (P2P) technologies [10]

Networking is becoming an effective innovation technique and surveys from the OECD have shown:

- Collaborating firms are more innovative than non-collaborating ones.
- Combinations of streamlined business processes, flatter organizational hierarchies, continuous training and skill acquisition assist innovation and improved performance [11].

Issues of global complexity and inter-disciplinary harmonisation requirements (e.g. in technical education), where scientific knowledge has to be aligned with professional practice, and with process knowledge in particular, have focussed commercial research on the discovery of new network modalities. Key outcomes of this research have had a direct impact on *killer applications* such as E-Learning. In particular, global information markets, that require the capabilities of many technologies for effective solution frameworks, require collaborative knowledge management [12]. The global, international Extranet that is the Academy Connection could be used as a possible exemplar for the *e-education of Knowledge Technologists*, both academics and students. It follows on from previous research into worldwide Extranets such as the International Standards Organization's (ISO) extranet. This federation of national standards bodies from more than 120 countries required technology, for managing the development, maintenance and distribution of over 11,000 ISO standards in English, French and Russian. At any one time, there are about 7,000 projects and around 200,000 people contributing to ISO standards development [13].

Industry and academia alike have found that decisions about learning infrastructure do not come easily. According to the organizers of one e-learning project, their project is aimed at assisting managers who *lack the time to assess the situation fully, see beyond the hype, and confidently choose the best solutions and providers for their particular situation. Things change every day. Chaos reigns* [14]. However, there is agreement by many firms that E-learning is an option that provides a real competitive edge which helps maximize intellectual capital [15] (Koprowski, 2000). There is also recognition of the fact that E-learning must be integrated into ongoing training processes in companies and viewed as an adjunct to face-to-face classroom instruction. This fits in with the Academy Connection *Guide by the Side* model of e-learning.

6. FUTURE WORK

In our follow up research, we aim to develop:

- An understanding of what has been termed the potential **corporatization** of academics and universities via industry/academic relationships for the development and dissemination of information products.
- An insight into whether these new alliances and working relations are in fact completely changing the fabric of academia - namely the development of a new type of university academic – one who will need completely different skills in order to work with industry, using up-to-date technology in a global learning environment.
- A framework to assist universities, as employers of academics, to understand what impacts these **global cooperative learning networks** will have on academics, both positive and negative. In many organizations, ***networks of innovation***, for sharing formal and informal know-how are becoming the rule [11] (Wilkins et al, 2000). Will academics be comfortable with this model? [16] states that while professors care about teaching, their highest priorities are their own research and the approbation of their colleagues.
- A framework for a Collaborative Extranet solution as an exemplar of the required knowledge management solution to the professional practice issues of such industry partnerships as they relate to academics within the University context.

7. CONCLUSION

Collaboration with the Academy Connection has helped ensure the success of the Internetworking program and has contributed to improving the networking research profile of the Department of Computing Systems. The relationship has also allowed the Department to serve the community with short courses in Networking. As can be seen from the surveys the students are enthusiastic and the continuing numbers of students attracted to the courses shows that our department is providing what the students want. An added bonus is the quality assurance program that ensures that our staff has up-to-date skill sets.

REFERENCES

[1] Scope, P. 2002, Email to researcher. (on file with researcher)

[2] e-Learning (2004) http://www.cisco.com/en/US/learning/netacad/academy/index.html

[3] Felix Navarro, K. (2002) *Converging our Sensorial and Digital Networks in Education* Conference Proceedings of the The 6th World Multi-Conference on Systemics, Cybernetics and Informatics, SCI 2002, Florida

[4] Lawrence E., Szewcow, U. & Felix Navarro K. (2003) *e-Education: Implications for Knowledge Transfer via Global Co-operative Education* , Sixth International Conference on Computer Based Learning in Science,

University of Cyprus, Nicosia, Cyprus, 5 - 10 July 2003, pp 131 – 141

[5] Hall, R. (2002). *Aligning Learning, Teaching and Assessment Using the Web:An Evaluation of Pedagogic Approaches.* British Journal of Educational Technology. 33(2):149-158, 2002 Mar.

[6] Lawrence, E., Garner, B. & Newton, S. (2004) *Global e-Learning System for Knowledge Workers: A Successful Industry/Academic Partnership*, 1st European Conference on e-Learning and management Education, Teaching Is and IS for Teaching: March 19 Milan

[7] Lawrence, E. Szewcow, U., Felix Navarro, K, Gormley, P. (2003) *Cisco Certified Network Associate (CCNA3) v3 Online Course,* Cisco World Wide Education.

[8] Clark, G. T.(2001*) Education Problems and Web-based Teaching: How it Impacts Dental Educators.* Journal of the American College of Dentists.68 (3):25-34, 2001.

[9] Cisco Training Guidelines (2004) *Networking Academy Instructor Training guidelines*, http://www.cisco.com/en/US/learning/netacad/get_involved /BecomeAnInstructor.html

[10] Global Applications of Collaborative Technology Special Issue of *Communications of the ACM*, Dec. 2001, Vol. 44, No. 12

[11] Wilkins, L., Swatman, P.M.C & Castleman, T. (2000) *Electronic Commerce as Innovation – a Framework for Interpretative Analysis*, 13th International Bled Electronic Commerce Conference, June 19-21, 2000, page 108.

[12] Garner, B., Lawrence, E. & Culjak, G. (2001) *Interdisciplinary research into Collaborative Knowledge Management.*, Developing a Dynamic, Integrative, Multi-Disciplinary Research Agenda in E-Commerce/E-Business, IPIP 8 Conference, Salsburg, June 2001p 297-299

[13] ISO builds worldwide Extranet with Livelink, http://www.opentext.com/customers/case_studies/livelink _case_study_iso.pdf

[14] Salopek, J.J. (1999) *Good Scouts* Training and Development, Vol 53, 6, USA

[15] Koprowski, G. (2000) *Companies blend e-learning into their business strategies to maximize Intellectual Capital,* Issue 801, Online learning: The competitive edge, Informationweek, Manhasset, Aug 28, 2000

[16] Schank, R. (2001)Log on Education: Revolutionizing the Traditional Classroom Course, Commmunications of the ACM, December 2001/Vol 44, No 12.