Developing and Implementing a Professional Doctorate in Computing

Donald Joyce and Alison Young
School of Computing and Information Technology
UNITEC Institute of Technology
Private Bag 92025, Auckland, New Zealand
djoyce@unitec.ac.nz,ayoung@unitec.ac.nz

Abstract

This paper describes the processes involved in developing and implementing the Doctor of Computing (DComp) programme at UNITEC Institute of Technology. It is the first professional doctorate in computing to be offered in New Zealand and required a rigorous and prolonged approval and accreditation process, involving a panel of eight people set up by the New Zealand Qualifications Authority (NZQA). The UNITEC development team began (in May 2001) by examining various models for professional doctorates from Australia, England and New Zealand and agreeing on a generic structure that met NZQA requirements and could be applied to a range of academic disciplines. Generic regulations and course outlines were drafted by the team and approved by the UNITEC Academic Board and a 150 page document was sent to NZQA after 12 months of development and refinement. The approval and accreditation process took another seven months and the programme commenced in February 2003. The paper concludes by describing the experience of offering the first of three courses and reflecting on the challenges and rewards of facilitating learning at the highest level of NZQA's "framework".

Keywords: curriculum development, professional doctorate, accreditation

1 Introduction

UNITEC is unique in New Zealand, being a "dual sector" tertiary education institution which is currently recognised as a polytechnic but has applied to be granted university status and offers programmes from level 2 (certificate) to level 10 (doctorate) on the New Zealand Qualifications Authority (NZQA) "framework". Its 17 postgraduate programmes (diplomas, masterates, doctorates) are promoted as being "applied" and focussed on the needs of particular professions and industries.

UNITEC's School of Computing and Information Technology (SCIT) offers three certificate programmes, two bachelor's programmes (in Computing Systems and in Information Systems), a graduate diploma, a postgraduate diploma, a masterate and a professional doctorate, the Doctor of Computing (DComp). The Master of Computing (MComp) programme has been running since February 2000 and more than 200 students have enrolled in MComp courses, with 50 having reached the final stage of writing a dissertation or thesis.

The Master of Computing has several special features:

- Because a large proportion of the students are in full time employment, classes are held at weekends - each 15 credit course meets for four hours on both days of four weekends, four or five weeks apart.
- The first compulsory course is called Impact of IT in Society and requires the students to explore ethical, legal and social issues.
- The second compulsory course is called Managing IT Projects and the third compulsory course is called IT and Strategic Planning.
- The optional courses cover instructional technology, management, multimedia, and networks and there are no database or programming courses.
- No courses have final examinations and all courses have at least one group assignment and at least one individual assignment.

SCIT recognised in 2001 that some MComp graduates would want to advance to doctorate studies and that their needs would best be served by a professional doctorate, involving course work and an applied focus, including the further examination of societal issues (see Adams, 1998, Fielden and Joyce, 2001). When UNITEC's Graduate School decided to develop a generic professional doctorate, the two associate professors of computing (Fielden and Joyce) were appointed to the development team, along with two associate professors of Education, the Dean of the Graduate School and the Director of Academic Development.

2 Development

NZQA requires that professional doctorates consist of 120 credits of level 10 coursework and a 240 credit level 10 thesis. The development team decided to have a 60 credit course which addressed "professional issues" and two 30 credit courses which covered research methods (see Table 1). Full time students will do all three courses in their first year of study, and then spend two years on their theses. Part-timers take the 60 credit course in their first year and the other two in their second year, and then spend three to four years on their theses.

Course Name	Credits
Critical Issues in Professional Practice	60
Advanced Scholarly Inquiry	30
Research Development	30

Table 1: Coursework

The 60 credit course is designed to help students identify their probable research topics, and is assessed by two presentations and a report on critical review and scoping of research opportunities. It is organised around four major themes or threads: Cultural, Economic, Societal and Technical. Each time the course is offered, the issues explored will be determined by the course coordinator, in conjunction with the students, so they are topical and related to one or more of the themes and to the interests of both the staff and the doctoral students. The learning outcomes (UNITEC, 2002) are:

1. Contextualise issues in professional practice historically and philosophically.
   a. Identify leading and emerging issues in professional practice;
   b. Explore and critique the historical context of the issues;
   c. Situate the issues within appropriate philosophical frameworks, including those of Maori.

2. Analyse contemporary perspectives on those issues in professional practice.
   a. Identify current and potential stakeholders, including Maori, in relation to the issues;
   b. Explore and critique stakeholder views on the issues.

3. Critically review applications of theory and/or approaches to a situation in professional practice.
   a. Identify issues surrounding/arising in a particular situation;
   b. Determine and evaluate appropriate theoretical and practical responses to the situation

4. Select and scope a variety of research opportunities in relation to professional practice.

One of the 30 credit courses, Advanced Scholarly Inquiry, is focussed on the construction of literature reviews, which are assessed along with student presentations. It has the following learning outcomes (UNITEC, 2002):

1. Select and scope the research/problem area.
   a. Identify an appropriate professional research topic area;
   b. Specify the research question(s) or issue(s) in this area.

2. Analyse, critique and synthesise literature/information, explaining its relevance to this particular professional area.
   a. Review a wide range of potential sources of information, including Maori sources;
   b. Identify initial criteria of relevance;
   c. Conduct an extensive search of the appropriate sources using identified criteria;
   d. Reflect and refine this approach iteratively.

3. Produce a publishable literature/information review presenting an argument/ position.
   a. Present one or more position(s) or perspective(s) which emerge(s) from the previous stage;
   b. Identify areas for future research

The other 30 credit course, Research Development, deals with the selection of appropriate research methodologies, and is assessed by a presentation and a research proposal. It has the following learning outcomes (UNITEC, 2002):

1. Critically review a range of research approaches.
   a. Identify a range of research approaches, including Kaupapa Maori, applicable to an area of professional practice;
   b. Critique alternative research approaches in terms of their suitability in relation to different types of research questions both with respect to interdisciplinary conceptual frameworks and application to professional areas.

2. Evaluate an approach for its relevance to a specific research question in professional practice.
   a. Identify a research question in professional practice;
   b. Select an approach appropriate to that question considering both conceptual models and computing application area;
   c. Conduct a preliminary appraisal of the likely success of this approach with respect to the research question;
   d. Reflect and refine this approach iteratively.

3. Select research methodologies, tools and techniques appropriate for the chosen approach.

4. Construct a detailed research proposal, using the preliminary topic selection, question(s) and scope identified in the Advanced Scholarly Inquiry course.
   a. Identify the information required and appropriate methods for its acquisition;
   b. Specify the research approach appropriate to the identified topic;
   c. Address ethical issues;
   d. Place the research question in context both in the conceptual and theoretical domain and in the professional area of application.

Students must pass the 60 credit course and obtain at least B- passes in both 30 credit courses before being allowed to register for their theses. This ensures that students do not proceed unless they have demonstrated their readiness to undertake research. Because of bad publicity about "exit qualifications" being seen as "failed doctorates", the team decided not to have any award for students who complete the coursework but not the thesis (Fielden, Joyce and Young, 2002). As in the Master of Computing degree, the Doctor of Computing courses are assessed by presentations and written work, rather than formal examinations.

To enter a professional doctorate programme at UNITEC students must meet two criteria: academic and professional. The development team identified three alternative academic entry standards (UNITEC, 2002):

- a master's degree with at least second class honours
- an honours degree of four years duration with at least an A- grade average and a substantial research project
- an undergraduate degree plus proof of appropriate skills in analysis, thinking skills and data interpretation (through substantial industry reports or other research publications).

In addition students must have at least three years of appropriate professional experience, usually in responsible positions. This requirement ensures that students are able to benefit from (and contribute to) the Critical Issues in Professional Practice course and undertake a thesis that not only makes "a significant, original contribution to knowledge", but also "contributes to enhanced understanding in relation to professional practice" (UNITEC, 2002).

3 Approval

When any New Zealand tertiary education institution other than a university wants to offer a degree programme it must apply to the NZQA for approval (of the degree) and accreditation (of the institution). NZQA appoints an advisory panel, consisting of an independent chair, an NZQA quality analyst, two industry representatives and four senior academics - two nominated by the New Zealand Vice Chancellors' Committee (NZVCC), one from an institution offering a similar programme and one from the applicant institution.

The DComp panel included two members of the MComp panel (one from industry and the other from an Australian university offering professional doctorates), a professor of computer science, a professor of geography who had made a study of professional doctorates (and supervised a computing PhD), and a person with a PhD who had worked in universities before becoming a computer consultant. They received a 150 page proposal in May 2002 and responded with 18 pages of feedback (concerning assessment, content, delivery, library, regulations, staffing and the title) a month later.

The panel spent 48 hours at UNITEC, meeting the development team, advisory committee, senior managers and potential students. They identified four requirements (concerning assessment, content, objectives and regulations) that would have to be met before they could recommend approval. Their concerns about delivery, library, staffing and the title had been met during the visit by:

- explanations about the weekend classes and electronic support of course work and research (already used for MComp)
- demonstration of the library resources
- provision of CVs of overseas academics who were likely to contribute to the programme as visiting professors.
- information that Australian doctorates of Information Technology consist of level 8 masters coursework and a thesis which makes up half or less of the total credits.

Within a month of their visit, the panel received the 52 page UNITEC response and spent the next two months debating whether their requirements had been met. Even after they had recommended that approval and accreditation be granted, there was another stage to the process. The NZQA Academic Committee was not willing to endorse the panel's recommendations until the admission and assessment regulations were tightened even further and UNITEC provided more evidence of research and supervision capability. Finally, seven months after the proposal was originally submitted to NZQA, UNITEC was given permission to accept a limited number of students in 2003 with a review of this limit to be conducted by the NZQA monitor (who was a panel member) at the end of the first year.

4 Implementation

Of the 19 applications in the first year, 12 were acceptable, four did not meet the academic criteria (the third entry standard had been raised to require a postgraduate diploma rather than a bachelor's degree) and three did not have enough suitable work experience. Only four of the acceptable applicants were ready to start in February and one of them decided not to enrol. Most applicants had at least 10 years of appropriate professional experience (two had more than 20).

Class meetings have been held on nine weekends spread over nine months. Most weekends have involved six to eight hours of presentation by a visiting professor, presentations by students and a "reflection and integration" session led by the programme director. Other sessions have been led by two consultants and five UNITEC staff - the CEO, the Dean of the Graduate School, the Professor of Business Ethics, the Head of SCIT and the DComp Programme Director. The visiting professors have come from Iowa, Melbourne, Monterrey (Mexico), Tennessee and Virginia. The final two weekends were devoted to assessing student presentations (see below).

Topics covered in the first seven weekends included:

- Historical and philosophical context
- Values, liabilities and responsibilities
- Ethics and professionalism
- Impact of IT on indigenous peoples
- Women in the computing profession
- E-democracy
- Expert systems
- Extreme programming
- Emerging technologies in e-commerce
- Health informatics
- Globalisation, logistics and e-business
- Software development impact statements

The sessions on ethics and professionalism also involved research into the codes of conduct of computing professionals, which resulted in a joint staff-student publication (Joyce, Blackshaw, King and Muller, 2003) which analysed 27 codes, spanning 17 countries and 24 professional associations or societies.

The reflection and integration sessions have been used to discuss the format of the programme and assessment processes, and to relate the presentations to each other and to the students' own reading and work experience. The student presentations were initially related to the topic of the previous weekend and restricted to 20 minutes. As the course progressed, the presentations lengthened to 60 minutes, the topics became focussed on the students' research interests and the evaluation evolved from informal self and peer feedback to the point where marks were awarded by a panel of academics using the criteria shown in table 2. These criteria were developed progressively by the programme director and students in the light of experience.

Criteria	%
Presentation Slides (Layout, Words, Visuals) Speech and movement Attention and interest	20
Content Lead in Definitions Context Questions/Results Flow and Structure	20
Analysis Reflection on Data Generalisation of theory to practice Application of data to theory and practice Implications	40
References Support (10) Range (5) Format (5)	20

Table 2: Marking Schedule

5 Conclusion

It became obvious during the NZQA panel visit that UNITEC's decision to develop a generic professional doctorate, with regulations and course outlines that were not discipline-specific, raised many questions that took considerable effort to answer to the panel's satisfaction. "Indeed all of the requirements imposed by the panel were related to this decision" (Joyce, 2003). However, a lot of "homework" was done by the development team before and after the panel visit to ensure the responses were satisfactory.

UNITEC staff found it frustrating that one panel member persisted in calling the DComp a PhD and comparing it to traditional Computer Science doctorates, but this was balanced by having another panel member who had made a study of professional doctorates and was well aware of the differences. The final frustration was to have the NZQA Academic Committee revisit some of the issues that the NZQA panel had satisfied itself about, and then impose a limit on enrolment.

It was very helpful that we met the panel after seven semesters of running the MComp programme and having completed supervision of two MComp dissertations. Apart from establishing our credibility as providers of postgraduate computing programmes, it also meant that the panel could meet an enthusiastic MComp graduate,

for whom the DComp was the obvious next step. It was also very helpful that we were able to tell the NZQA Academic Committee that we had just appointed a staff member who had completed successful supervision of three doctoral theses and numerous masterate dissertations.

The first author, who is the DComp programme director, has concluded from the first year's experience with DComp that professional doctorates have many advantages over the traditional "research-only" doctorate that he completed thirty years ago. Students benefit significantly from having multiple inputs (from UNITEC staff, visiting professors, consultants and, not least, each other) and a structured programme of study. They particularly enjoy "expanding their horizons" and being able to bring their many years of professional experience to bear on a wide range of topics. As a consequence, class discussions have been at a very high intellectual level.

The greatest challenges have been meeting the students' wide range of interests and facilitating the integration of

the many and varied inputs. Lesser challenges have concerned the logistics of scheduling the visiting professors and other presenters, and avoiding clashes with the students' other commitments, which included teaching MComp courses, presenting at conferences and undertaking an aid project in Peru!

6 References

Adams, C. (1998): Doctorates in IS: Time for a Rethink. *Proceedings of the IFIP WG8.2 & 8.6 Working Conference*, Helsinki, Finland, 541-548.

Fielden, K. and Joyce, D. (2001): What would a professional doctorate look like? *Proceedings of 14th Annual Conference of the National Advisory Committee on Computing Qualifications,* Napier, New Zealand, 437.

Fielden, K., Joyce, D. and Young, A. (2002): Meeting the demands of the knowledge economy: Setting up a professional doctorate in computing. *Proceedings of Eighth Biennial Conference on Professional Doctorates*, Brisbane, Australia, 185.

Joyce, D., Blackshaw, B., King, C. and Muller, L. (2003): Codes of Conduct for Computing Professionals: an International Comparison. *Proceedings of 16th Annual Conference of the National Advisory Committee on Computing Qualifications*, Palmerston North, New Zealand, 71-78.

Joyce, D. (2003): Doctoring the Profession. *Proceedings of 16th Annual Conference of the National Advisory Committee on Computing Qualifications*, Palmerston North, New Zealand, 299-302.

UNITEC (2002): *Submission to NZQA for Approval and Accreditation of Doctor of Computing (Professional Doctorate)*. Auckland: UNITEC Institute of Technology.