Proceedings of the NACCQ 2000
Wellington NZ www.naccq.ac.nz

Degrees of Information Technology in New Zealand Vocational Institutions

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ABSTRACT

This paper describes the current state of computing degrees. Rather than the usual round-up of courses and EFTS, we thought it appropriate to try to characterise the polytechnic computing degrees and to see what innovative approaches people are taking in development and management. A generalised description was created which was circulated to all degree granting polytechnics. From this, feedback was collated and issues identified. Suggestions are made for areas of worthwhile research.

1. INTRODUCTION

A review of recent publications from the NACCQ suggests that it is timely to attempt to describe the current state of computing degrees in New Zealand polytechnics (and related vocational institutions). In the current proceedings there are papers describing different approaches to teaching and learning, differing approaches to assessment and to facilitating research. With all this activity and effort, we thought it appropriate to take a step back, to try to characterise the Polytechnic computing degrees and to see what innovative approaches people are taking in development and management. It was hoped that we might be able to identify areas that may become ongoing issues so that future conferences might be able to benefit from research into these areas.

It is of note that we are not attempting to describe the 'health' of the courses, this role is covered by academic quality and monitoring processes. Also, we are not attempting to describe or classify the subject matter of the degrees. Nor did we wish to perform a numerical round-up of courses and EFTS, though it is perhaps interesting that there are about 17 computing degrees taught in New Zealand Polytechnics (the 'about' depending on the definition of computing).

2. METHOD

We examined the accreditation documents for four degrees, examined publicity and web-based material for those and others, and made extensive reference to papers from previous NACCQ publications. From this we created a caricature of a polytech computing degree (an amended version is given in the summary).

This generalised description was based around 19 points concerning the approaches used in management, development, structure and delivery of courses. The characterisation was sent to all Polytechnic computing course coordinators with an explanation and a request that "We would be grateful if you could annotate it with areas where you significantly differ or if you are doing something in what might be considered an unusual way". Replies were collated and emergent themes identified. For some of these themes, follow-up discussions took place with respondent institutions.

The work described here was not a quantitative survey, so, while it might be tempting to draw relationships between say, the growth in numbers of students and value placed on research, this temptation has been resisted.

3. RESULTS

Twelve polytechnics responded to the survey. There was no obvious bias in returns related to geographical location, size or age of course, or any other factor that might suggest a non-representative sample. Student numbers ranged from 17 to 500, the majority being 80-150 EFTS and growing 10-20% per year. One institution reported a falling roll. Overall the respondents felt that the generalised picture was a good description of their degrees.

Small classes and personal contact are considered of major importance. One polytechnic uses the phrase "where the tutor knows your name" in their advertising, others report student feedback as confirming this factor. In degrees with higher numbers there is a common use of combined lectures with up to 172 students, however, all institutions have tutorials and practicals of less than 25 students. These smaller classes are taught by lecturers (as opposed to teaching assistants). The larger degrees responded that these small classes are coming under increasing strain as numbers climb. With multiple streams, the limiting factor is the workload of the lecturer. Despite the obvious solution of using cheaper labour to staff these classes, it appears nobody has gone down this route. Different strategies are used to staff classes with lecturing staff. Team teaching is used, with different lecturers being responsible for different sections of a course. They either have a very uneven workload, repeat material, or, as in one case, deliver the material for a single stream for a whole course. The approach whereby lecturers teach a section of the course only works to a maximum of three or four streams, after that even accepting an uneven workload, the heavy times become simply too much and cannot be combined with teaching other classes. At the other end of the scale, respondents reported some very small classes of three or four people. While providing choice in third year subjects, these classes must be financially difficult to justify.

With a few exceptions, degrees are taught in two semesters of 16 or 17 weeks. Teaching takes place during normal 'office hours' although night classes are becoming increasingly common especially for courses of particular interest to industry (eg E-Commerce). Provision is being made for 'independent learning' usually by on-line means although this is backed by structured class time. Only one institution reported using weekend and summer classes. Another reported plans for expanded use of evening classes to provide 30% of EFTS.

All degrees are taught at a single institution (although sometimes on two campuses and several institutions teach variants of two degree structures). One institution reported plans to teach the degree in Malaysia in 2001. All but one responding degree has a monitor appointed by NZQA. The other degree is "self monitoring". A persistent rumour reported is that NZQA is moving away from an playing an active part in the 'five year review'.

Respondents confirm emphatically that our graduates are 'do-ers'. All agreed with the statement that "(the degree) has a vocational emphasis, meaning that we argue that what is being taught is closely aligned with the practices of the workplace". The term "work ready" was used by two organisations. We did not ask how this was achieved but respondents contributed that links with industry for projects/assignments were important, especially in the third year. An interesting semantic (or perhaps pedagogical) issue was that despite this point mentioning 'vocational emphasis' several institutions responded with variations on "Yes, but we also try to give a theoretical base, we believe theory and practice gives the best outcome".

Most degrees are Bachelor's degree, with computing as the main focus without majors represented by trailing brackets though there is significant specialisation in the third year. These specialisations are commonly organised into 'threads' ('pathways' or 'majors') running throughout the degree. All degrees have a wide range of subjects, including technical skills along with communication, problem solving and business related topics. The specialisations varying according to the nature of the degree. "IT" degrees have specialisations in variations of computing (e.g. Programming, Databases, Human Computer Interaction). Two organisation reported being an endorsed 'major' within a wider degree structure.

Students in these degrees (and one other) are encouraged to take "electives" which may include science, arts, or business papers from other degrees at that institution. Two institutions reported that specialisation was limited because of low student numbers.

One organisation reported teaching post-graduate computing. This involves a PGDip and Masters. Other organisations reported either "no plans for Masters (yet!!)", or "by 2004", "by 2001", "by 2002", "we hope to develop". With the comments on the relationship between vocational and the balance of theory/practical noted earlier, we suspect there may be a significant debate looming on the definition and scope of a "vocational Masters".

Respondents agreed that their degree had strong links to industry. These links take many forms, "the best way of getting industry contact is through staff research, senior student project and guest lecturers". The value of the industry advisory committees is seen as limited: "PEAC almost defunct" and "…bit of a waste of time…we know more about what is going on in the industry than they do". The involvement of staff in industry research also varies (see below).

The Policy and Practice of assessment is an area that has, in the last year or so, undergone a silent revolution in the IT degrees. The generalised degree was described as "Has an emphasis on practical skills, the assessment is primarily competency-based and resits are supported". For some this description still holds true, however for others:

- "Not competency based assessment and resits are not supported (although re assessment over the summer is possible in certain circumstances.) Assessment is graded",
- "Practical skills still true, but in 2000 (we have) gone over to A B C with 50% pass mark", Main reason is that majority of our students are C+ to B level, and the pass/merit system does not motivate them",
- "NO! We are "capabilities" based. Resits are not available",
- "11 grades (a+ to e), no resits",
- "This year for the first time we have moved from competency-based assessment to an achievement-based scale A to F. This is for several reasons but mainly because we felt that most subjects taught within the (degree) were inappropriate to assess using competency-based methods. It has the full support of our Monitor",
- "Yes – we are staying with the competency model for now…We intend to review our assessment practice at the end of 2000…a norm referenced model with grades and a 50% pass mark", and
- "No we are strong advocates of graded assessment!".

Even those staying with competency based assessment are reworking their assessment policy and practices: "this year we have implemented more stringent conditions for resits e.g. a serious attempt at the first assessment must be made" and "Resits – faculty policy : tutor's decision whether to offer resits".

Lecturing staff in the polytechnic degrees generally have a mix of academic, industry and educational experience. If it is possible to 'average' degrees, then the lecturing staff 'average' a Master's degree. Most have industry experience. One polytechnic pointed to a formal requirement that staff have five years industry experience and reported that this "makes it difficult to find staff (salaries a problem)". It appears that the use of 'people from industry' in lecturing roles is very limited.

Some institutions agreed with the statement "Has staff working a nominal 12 hours contact per teaching week. The justification for "only(!)" 12 hours is that "research outputs are expected from all degree teachers". More often than not, the responses were of the tenor "I wish! most degree staff are on 18 or 14 with research output requirements", "teaching loads are generally too high at 17-18 hours per week" or "14 hours is average with pressure to work higher hours". The workload allocation model is based primarily on contact hours. One institution reported a model that takes into account class size while for others it is possible to "buy time" for research.

Respondents agreed with the generalised degree that "Has staff whose biggest complaint is not enough time to do research but there doesn't appear to be obvious solutions to this. We like to claim to 'encourage research' but this is difficult to do or quantify". One replied that research is limited "because they lack a research culture". Another hinted that research was not a priority, "Yes, teaching load and variety is high, most tutors want to spend max time in developing their subjects and papers for obvious/immediate student benefit". Despite this, some degrees are proud of their output: "we believe that (per capita) we have the best research record (in both quality and quantity) in the polytech". Others gave ways in which research is supported, largely variations on "apply for research support" including reduced load, research assistant, and funding priority for degrees.

We did not ask whether all staff are involved in research, but responses suggest that this varies greatly

from "IS output at (institution) was high in 1999 as all staff encouraged to present at NACCQ" through to "only one with interest in IT pedagogy, only one in software development (programming)". One argued that the "best staff in this regard are ex-university people with ongoing research records…we're hoping they can drag the rest of us along with them".

These two areas, IT pedagogy and applied research and development are the focus of research carried out by the degree staff (and, increasingly, students). Almost all respondents argued that the applied research was more dominant than pedagogical research. This appears to run counter to the evidence. With even a quick count of papers in NACCQ proceedings and journal shows an overwhelming majority of pedagogical papers, there must be a lot of papers on applied research papers being published elsewhere (or not at all). We should perhaps not be surprised by a focus on IT pedagogy, after all, Dijkstra (1998) argues that computing is the hardest thing humans have ever done, so what is wrong with a concern for how to teach it? The quality of research may also vary, one organisation reported that "Everyone doing papers for NACCQ. Our monitor thinks this laudable, but still baby stuff".

Most degrees reported that they are developing new courses (units/paper/modules) or significantly reviewing existing ones at a rate of about 2 per year. This rate varies according to the age of the degree. One institution reported that this review "is done without much method". Some joint development appears to be ongoing, particularly within wider inter-Polytechnic arrangements.

Polytechnic degrees are usually taught in departments that have 'stepping-stone' or 'feeder courses' (eg CBS, CIT), run by departments offering the degree. In the past these courses have had staff overlapping with the degree (and some still do), however, this appears to be changing: "in the past, there has been significant overlapping of staff teaching on the degree and our CBC/DipBC/NDBC programmes. We believe that this is not a good thing, and this year there is almost no overlap". This change is not without difficultly as this respondent continues "…the categorisation of our staff into 'degree' and 'non-degree' teachers is open to the criticism that we will create a "them and Us" situation. It hasn't happened yet but we are monitoring it closely as, obviously, we wouldn't want that to occur". Some polytechnics offer other qualifications as exit points from their degrees.

It is clear that the polytechnic computing degree has a different market from the traditional university school-leavers. While the percentages vary, our students include:

- 29ish ex-technician
- 40ish trades wanting a less physical job
- International students
- School leavers, a wide range of abilities but with a long 'tail'
- Graduates of stepping stone courses
- New immigrants with overseas qualifications
- People in work force (mainly night classes)
- Mature professionals with a general business background wanting a change of career
- Mothers looking to re-enter workforce, often start part-time, often have prior qualifications
- Trying again after failing in university environment 21ish
- A large gender imbalance-favouring males although more often than not the women are the better students.

Depending on the structure of the organisation, degrees are managed by a head of school/department or programme manager/academic leader, often within a wider department. These people usually have a minor role in teaching. Some are engaged in research but others find that they "have no time for research", "No time for research, but should" At least two are within larger departments where the head has "no interest in IT or IT research". There are a variety of structures and roles reported including full responsibility, semi-autonomy, hierarchical systems where the discipline is managed at the lowest level, and matrix systems where the staff and subjects are managed by different people (or at least roles – they often end up the same person).

A Polytechnic Computing Degree…	Potential ongoing issues
Is taught in small classes (<20) where the friendly personal contact with experienced staff is considered one of the main competitive advantages.	Maintaining this approach may be difficult as courses grow and pressure mounts to increase EFTS while reducing costs.
Has most teaching is onsite in two semesters of 15-17 weeks, Monday to Friday 8am-5pm though are beginning to explore alternative options particularly 'independent learning'.	
Has a vocational emphasis, meaning that we argue that what is being taught is closely aligned with the practices of the workplace. Our graduates are considered 'do-ers' or 'work ready'.	Mix of practice and theory within a vocational degree
Most are Bachelor's degree, with computing as the main focus although some are part of larger degree structures. There is significant specialisation in the third year and these form 'threads' throughout the degree. There are plans in place to develop higher qualifications, only institution is delivering post-grad IT.	Meaning of 'vocational Masters'. Specialisation when classes become very small.
Has around 100 EFTS, mostly full time, and is growing at about 15% per year.	
Has a wide range of subjects including technical skills, communication, problem solving and business related topics.	
Maintains strong links to industry. These links take the form of guest lecturers, senior student projects, and staff research and consulting.	Status and value of industry advisory committees (eg PEACS)
Is taught by a single institution.	
Has an emphasis on practical skills	An area of major change. In the past year or so there has been a radical shift from the assessment being primarily competency-based with support for resits largely to achievement based grading. (see Plimmer 2000a,b, McCurdy 2000)
Is accredited by NZQA and monitored by them with six monthly/yearly visits.	One degree is self monitoring and reviewing and this may become more common. Is there a role for the NACCQ in assisting/facilitating this process?
Is taught predominantly by fulltime staff with an 'average' of a Masters degree. Staff generally have a mix of academic, industry and educational experience.	Difficulty of attracting staff with this mix. Little use of 'people from industry' in lecturing role.
Has staff working a nominal 12 hours contact per teaching week. The workload allocation model is based primarily on contact hours.	It is widely recognised (by respondents) that 14+ hours contact time is too high for degree lecturers (especially with long semesters). This pressure will increase.

Has staff whose biggest complaint is not enough time to do research but there doesn't appear to be obvious solutions to this. We like to claim to "encourage research' but this is difficult to do or quantify.	A wide range of responses to the issue of encouragement suggests a divergence of opinion on the value of research. There are also different interpretations of the mix of staff – some have all staff researching, others a few. A study on the different methods of encouragement would be valuable.
Has staff who are developing research interests with an emphasis on pedagogy of IT teaching, and a smaller but increasing interest in applied research and development.	Some institutions should be (and are) proud of their research while others are not convinced by their own quality. Others still are not interested. Many institutions point to a focus on applied research but there is not much evidence of output or results.
Has a programme of developing new courses (units/paper/modules) or significantly reviewing existing ones at a rate of about 2 per year.	
Has stepping-stone or feeder courses (eg CBS, CIT), run by departments offering the degree. There is overlap of staff although degree staff are becoming increasingly dedicated (to teaching the degree)	Relationship between degrees and non-degree courses may be a little shaky in terms of staff and course arrangements
Has a different market from the traditional university school-leavers. Students include ex-technicians, trades wanting a less physical job, international students, school leavers - a wide range of abilities but with a long 'tail', graduates of stepping stone courses, new immigrants with overseas qualifications, people in work force, mature professionals with a general business background wanting a change of career, mothers looking to re-enter workforce, trying again after failing in university environment.	Success factors and growth potential of different areas (Joyce 2000) Gender imbalance
Is managed by a head (of school/dept/whatever) who has about a 1/3 teaching role and is actively involved in research.	Some HODs have little interest in IT, IT teaching or IT research. All are under pressure.

4. SUMMARY

The table opposite presents a summary of approaches in the management of our IT degrees. Papers in the current proceedings that may help in these issues are also shown.

In completing this paper we have some concerns that we may have documented the status of the degree course in each site but not the health of the course. This may falsely represent a course as being a good course when it is not being taught well. In many things, what is done is part of it only, what is more important is how it is done. We sense some things from the responses:

- A good course that the respondent is confident of
- A good course well taught
- A poorer course that needs some work done to it
- A good course being poorly taught
- Respondents not happy with what they are doing and blaming "the system".

Such issues may form a paper next year. What also came out was a high degree of change underway in most degree courses so that no two years could be classified as being the same. Content of modules, tools used, teaching staff, access to tutors, modules in course

all appear to change quite frequently. The impact of this constant change would be worthy of consideration. We did also not examine moderation (though see Miller [2000]), attempt to examine the core competencies covered by IT degrees in terms of market expectations of graduates. In addition to the ongoing issues identified above, these would make for useful research.

This paper has described a characterisation of the New Zealand IT degrees taught in vocational institutions. It is it hoped that this paper will provoke useful discussion and perhaps some research into the areas that we have identified as ongoing issues.

5. REFERENCES

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