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## Research and Education

# *Health Informatics and Health Management Education at Central Queensland University*

**Abstract:** Health informatics education is relatively new in Australia. It began at Central Queensland University in the early 1990s with the development of postgraduate programs in health administration and information systems. The University has a long tradition of distance education. The adoption of this approach for our combined health informatics and management courses enabled program delivery to students located anywhere in Australia and beyond. This paper describes course development and planned future developments.

**Keywords:** Education, Health Management, Decision Analysis

### 1. Introduction to Central Queensland University

Central Queensland University is best described as a regional university. It is not based in one of the capital cities, nor is it based in an area with a large population base. It is a true university of the tropics, with the largest campus, Rockhampton, being situated on Tropic of Capricorn. There are a number of other campuses located at least 100 km away, some are overseas.

Established in 1967, the university started small, but very quickly found its niche in distance education. This developed around five faculties and a very sophisticated publishing system that produced high-quality printed material combined with a very extensive national system of examination centres. For many years the university developed by serving students in its local region with traditional on-campus activities, and

serving the whole of Australia through distance education.

It may not be apparent to the reader not familiar with Australian geography, but these two areas of focus were quite unusual for traditional universities at the time. Rockhampton, the largest city in the region, has only recently reached a population of 70,000, a population too small to support a university in its own right. On the other hand, the distance education service met the needs of students spread throughout the continent and up to 5,000 km away from the parent campus.

The Business disciplines have always been well represented in the CQU degree programs and by 1990 Information Systems (IS) had evolved as a major discipline within the newly formed Faculty of Business. This faculty also had a long record in graduate education, especially in management and the Master of Business Administration (MBA). This was fertile ground for a graduate information systems program to develop. By 1990 the Faculty offered both Graduate Diplomas and Masters programs in information systems. Partly due to the Faculty they developed in,

and partly due to the nature of the information systems discipline, these programs were designed to benefit students in any industry.

In the late 1980s a Faculty of Health Science was created at CQU to accommodate the transfer of nurse education from hospital-based programs to the university sector. Initially the Faculty developed professionally accredited courses in nurse education at the undergraduate level, but by 1991 there was a desire to expand to postgraduate education.

These events, combined with the appointment of certain personnel in 1991 and 1992, meant that it was a natural progression to focus on the needs of the health industry, and to adapt existing programs to the need of professionals in that industry. This evolution was also accelerated by the fact that the Information Systems postgraduate programs were well developed, but those in Health Science were still embryonic. Management education for the health services was well serviced by other Australian

universities including via distance education, but none of these programs included informatics education. The development of a course which integrated the discipline of health administration with that of information systems was seen as a potential niche market. Furthermore, it was to the advantage of the Faculty of Health Science to develop the Health Informatics programs, as it could use some existing courseware and it helped to support the new Faculty direction into postgraduate health education.

## 2. Development of Health Informatics at CQU

The situation was a typical case of excess capacity (information systems) combining with a recognition of a new educational need in the health industry. Thus, in early 1991 the Department of Information Systems (Faculty of Business) collaborated with the Faculty of Health Science to develop CQU's first program in health informatics, the graduate diploma in Health Administration and Information Systems. This was later extended to a Master's program in the same discipline. Some of the new course materials developed by the Faculty of Health Science specifically for this course were later incorporated as either core or elective units of study in other new postgraduate programs such as the Master of Primary Health Care, Master of Midwifery, Master of Occupational Health & Safety, Master of Advanced Clinical Nursing and the Master of Business Administration (Health Services Management).

At the undergraduate level a Computers in Nursing subject was part of the undergraduate nursing program from the beginning in 1989, first as an elective and later as a compulsory core unit. Indeed these experiences contributed to the view that a postgraduate course incorporating

health informatics was desirable [1]. Following a major curriculum review in 1995 this undergraduate unit was replaced by a core compulsory unit in Health Informatics for all health science undergraduate programs. The Faculty's undergraduate offerings were expanded at that time to include occupational health and safety, human movement science, health promotion and health education, and health informatics and management. Some of these were first implemented in 1996. Implementation of the health informatics and management stream was put on hold pending more evidence of the need for such a course. Details of these experiences are published elsewhere [2]. The problems encountered at CQU mirrored those of the University of Manchester as reported in the 1997 IMIA Yearbook [3].

### 2.1 Graduate Diploma in Health Administration and Information Systems (GDHAIS).

The first program developed was the Graduate Diploma in Health Administration and Information Systems (GDHAIS). It now requires a student to undertake six units of study over a minimum of one year for those studying full time, or a maximum of three years in a structure that requires study across the Health Science, Information Systems and Management disciplines. From the outset, the course coordinator networked with other academics from the Society of Health Administration Programs in Education (SHAPE) and with the Australian College of Health Service Executives.

There have been changes to the programs over time, but nothing that would substantially alter the story being told here. The number of units has changed, and there has been some repackaging. Therefore, to avoid confusion, the development is described in terms of the present structure. The detailed structure and content of all

programs can be found in the CQU Handbook [4] which is accessible via the www.

Where possible, suitable units of study were taken from existing programs, mostly from the MBA and IS programs offered by the Faculty of Business. However, not even this would have been possible without the cooperation of and collaboration between staff from the two faculties. For example, the existing information systems units were used with a change to the assignment and exam content. The underlying concepts did not change. The course objectives (as far as the IS academic was concerned) did not change. However, this content was made much more relevant to the health professional by including health informatics resource materials in the readings, plus case studies, assignments and exam questions that were specific to the health industry. Most if not all students were working full time in the health industry while undertaking this course. As an overall philosophy, students were encouraged to apply their learning in their work situation through the assignments.

The IS academic staff noticed something which was to them unique. The health industry professional undertaking postgraduate study insists on seeing examples, cases and questions taken from their industry. An example such as a database problem expressed in terms of a hospital inventory is far more meaningful and acceptable than an identical problem but expressed in terms of a warehouse or retail inventory. The IS theory may be identical, but the relevance to the industry seems far more important to the health professional than to any other professional or industry grouping.

This effect was noticed in nearly all of the IS units. By way of example, one particular unit offered choices in both assignment and exam questions, with one question being set in the health

industry and the other elsewhere. Nearly all of the GDHAIS students chose to answer the questions set in the health environment. However, half the other students enrolled in general IS courses but taking the same unit also answered that question. In addition, it did not seem to matter what the background of the student was, whether clinical or otherwise, as long as it was set in the health industry environment the student was happy.

Why the difference in attitude? It is not due to any difference in the people involved, and neither is it due to the material being studied as these were identical. The size of the industry as a proportion of GDP, attitudes of health professionals working within it, and the tight focus of some of the health professions, are but a few of the possible reasons. The question is worthy of further research. Whatever the cause, recognizing and meeting the students need helped to promote the curriculum development and the success of the new course. A useful by-product was that the addition of enrichment material, the extra case studies, and resource material added strength and depth to the generic IS curriculum.

**2.2 Masters Programs (Table 1)**

The original target for a Master's program was the Master of Health Administration and Information Systems (MHAIS). In development terms this was a natural extension of the GDHAIS. The MHAIS program now consists of 12 units of study, which may be taken over 18 months to two years of full-time study, or up to six years part-time. The entry requirements for both courses are a bachelors qualification plus two years experience in the industry. The bachelor's degree may be in a non-health field, but must be accompanied by relevant experience.

The program itself is designed to give the student a balanced program of

health sciences, management and information technology. Initially all students were required to undertake a research methods unit plus a four-unit equivalent research project. As the numbers increased this became logically impossible as there were insufficient suitably qualified academics who could supervise such research projects. This did allow time for new unit development which is very time consuming as all are written to suit the external and self-directed mode of study. Since 1998 students have a choice of undertaking a full course work Masters degree or one with a significant research component. The latter is available only to students who achieve a credit average (65% or better). Electives allow the student to concentrate in an area of their choice such as human resource, general or economic management, or informatics.

We began to offer the Master of Business Administration with a Health Services Management specialization in 1996. This degree uses the health management units developed for the GDHAIS and MHAIS degrees to meet the need of professionals and managers in the health industry to gain greater expertise and knowledge for executive and senior management careers. Students with a minimal interest in health informatics can elect to do the GDHAIS and then switch to the MBA where credits for the successfully completed units undertaken for the

GDHAIS are given.

The philosophy underlying the design of the program is the same as that used for the GDHAIS and MHAIS. The theory and many of the problems of management are much the same no matter what the industry, and there is also a significant number of people who require portability between industries. MBAs are a generalist degree, and by building on the firm base that already existed, the MBA(HSM) was able to meet the needs of managers and also provide industry-specific knowledge in areas such as Casemix, Health Economics, Epidemiology and Ethics [5]. All postgraduate programs have proved very successful and attracted a wide range of students from all health professional disciplines and from all sectors within the health industry. Student evaluations have been positive. The courses are seen to be highly relevant in today's health environment. A number of students have reported that the new knowledge gained has assisted in their career progression.

A significant number of our students has a nursing background. Others come from all health professional disciplines and from the IT industry but are now working in the health sector. Students work in the full range of health environments operating in Australia. We have a small number of overseas students. As a result of significant turmoil in the health industry, which

Table 1. Postgraduate courses focusing on Health Informatics and Management

Course Title	Abbreviation	Content
Master of Health Administration and Informations Systems	MHAIS	12 units, two years
Master of Business Administration (Health Services Management)	MBA(HSM)	12 units, two years
Graduate Diploma	GDHAIS	6 units, one year

has particular impact on middle level and senior management staff who make up most of our student population, a significant number of students has taken study leave for up to one year which is extending the length of time required to graduate. This is reflected by the number of graduates relative to the number of students enrolled, as shown in Table 2.

Table 2 shows that the demand for entry into these courses has steadily increased. At this stage the cost of these courses is subsidised by the Australian Government for its citizens.

ment of the health administration and information systems programs was done using previously developed general management and information systems education programs. This was combined with a commensurate development of health industry specific curricula. This method of curriculum development has a number of advantages, including the speed of development, speed of program delivery, freeing up time for ongoing development, the sharing of electives between courses, and avoiding unnecessary duplication.

learned concepts and principles in their own area of interest. This strategy has ensured a consistency of standards across educational programs and industry relevance of course content. Combining programs where possible has allowed CQU to deliver high quality education that is specific to Health Industry needs, but that also provides variety and choices for students.

Sharing of electives across programs has meant that students in any program have access to units contained in others. Any MBA or MinfSys student can include units from the MHAIS as their electives, and many do. In the same way, the MHAIS students have access to a wide range of general management and IS units from which to choose their electives. This also overcomes the problem of variations in prior informatics knowledge and experience amongst our students. Novices in informatics must choose units which cover basic IS concepts and principles, whereas students with a computing and IS background can choose advanced IS units of study and/or concentrate on the health units offered. Thus the university provides structure and maintains educational standards, whilst allowing the student to fine tune the content of their degree to meet their own unique educational and vocational needs. Lastly, by avoiding unnecessary duplication CQU has achieved considerable efficiencies in the delivery of these programs. The choice of units offered are shown in Table 3.

Other postgraduate units that can be taken as electives are available but those listed represent those required and recommended as well as those most commonly selected.

The SHAPE membership directory [6] lists 15 Australian universities as providing education relevant to administrators and managers in the health industry. CQU offers one of the

Table 2. Number of students enrolled and graduated by course per year.

Year	New & Continuing students			Graduates	
	GDHAIS	MHAIS	MBA(HSM)	GDHAIS	MHAIS
1992	27				
1993	65				
1994	75	2		8	
1995	71	14		18	
1996	94	22	8	9	
1997	108	38	34	17	2
<b>Total Graduates</b>				<b>52</b>	<b>2</b>

This does, however, place a cap on the number of student places. This varies from year to year subject to demand for all courses within the university, which is primarily concerned with filling the total number of available subsidised places for the university as a whole. We can, however, offer additional places to those wishing to pay the full fee which is tax deductible. The fee structure in 1998 is such that there is no financial incentive to seek a subsidised place for those in the higher income brackets.

### 3. Discussion

As stated previously, the develop-

There was a firm basis initially provided by the Master of Information Systems (MinfSys) and the associated Graduate Diploma programs. The same structure was used for the health informatics courses which were based on industry specific needs once identified. Where possible existing units of study were used supplemented with health industry specific material where required. It is our belief that this has served the students well by providing a non-industry approach to topics such as databases and networks but allowing for highly focused and industry unique units on topics such as casemix, performance measurement, and health information science. All units provide opportunities for the student to apply

Table 3. Study topics available for students to choose from as per course structure requirements.

Information System Units of Study	Management and Related Units of Study
Health Information Science	Management of Health Services
Special Topic in Information Systems A & B	Managing in a Dynamic Environment
Information Systems Overview	Organisational analysis
Information Systems Development	Integrating Organisational Processes
Database Development & Management	Human Resource Management
Digital Telecommunications & Networks	Health Economics
Information Systems Project Planning & Management	Performance Measurement in Health Care
Information Systems Management	Using Casemix Data for Decision Support
Management and Design of Advanced Systems	Accounting Information for Decision making
Systems Management Rights & Responsibilities	Strategic Cost Management
Systems Management Policy	Health Planning, Policy & Program Evaluation
Decision Support & Intelligent Systems	Research Methodologies
	Philosophy, Ethics & Health Care
	Health Statistics & Epidemiology

most focused, and at the same time, the most comprehensive set of programs at the graduate level and is the only program integrating informatics. Some other universities now do offer single units in information systems as part of their health service management program.

#### 4. Where we are Now?

In January 1998, CQU transformed itself into five new faculties, three of which are now involved in these programs. The new faculties are the Faculty of Business & Law, the Faculty of Arts, Health & Sciences, and the Faculty of Informatics and Communication. In Arts, Health and Sciences, the School of Nursing & Health Studies offers courses in the broad discipline areas of clinical nursing and midwifery. Business & Law offers the MBA, including the MBA(HSM). The School of Mathematical and Decision Sciences in the Faculty of Informatics and Communication manages the GDHAIS and MHAIS and cooperates with both of these other faculties in delivering all aspects of Health Management and Health Informatics programs.

Fortunately, the history of these programs is already one of multi faculty. Many of the academic staff involved in these programs contributed to the one and only Australian health informatics textbook [7]. A cross faculty and multidisciplinary program committee is about to be established to manage all health informatics and health service management educational programs. Importantly though, for the first time the authors of this paper and originators of these programs are in the same school. This will improve coordination and development, but will not reduce the need to work cooperatively with other academics in the university.

#### 5. Health and Nursing Informatics Research Programs

Research programs can take a number of forms, and range from a minor dissertation as part of a course work degree such as the MHAIS or MinfSys, through a Masters by research, to a Doctorate.

The minor dissertation represents five units of the 12 unit program. One of those units teaches research methods. It also provides a highly

structured approach to the development of a research proposal. This provides an excellent introduction to the processes and rigors of research for all students. It is also a good foundation for those who wish to enroll in a Doctorate (PhD) program, and is accepted by CQU as a qualification for entry into such a program.

Like all Australian universities the PhD program is a university degree, by research only, and is externally examined. Any coursework undertaken has no bearing directly on the final result but this is tailored to suit each individual student based on background and proposed research topic. The three external examiners, who see only the thesis prepared by the student, determine the result. One student successfully completed the PhD program in 1996, another three are currently enrolled, two of these are nurses studying part-time and external, the third is studying full-time on campus and was awarded a full stipend. Another student is enrolled in a Masters of Health Science research degree focusing on nursing informatics. These numbers are expected to increase once we have more graduates from the Masters programs, although a number of enquiries have come from

Table 4. Courses which may include Health or Nursing Informatics and Management content.

Course Title	Abbreviation	Content
Doctor of philosophy	PhD	Research. Examination by thesis only.
Master of Information Systems Graduate Diploma of Information	MInfSys	12 units, two years
Systems Management	GDMIS	6 units, one year

elsewhere. General information for research students is also available on the CQU web site [8].

## 6. The Future of Health Informatics at CQU

Under consideration now is the possibility of establishing a Centre for Health and Nursing Informatics. Sponsored by the Faculty of Informatics & Communication, such a Centre would provide both focus and impetus for future developments in research, new educational programs including short courses, new educational delivery methods, inter-university and international collaboration to the benefit of our students. We urgently need to improve health and nursing informatics educational opportunities for post-registration and postgraduate nursing students. Little is happening in this area by other Australian universities. We should not lose our window of opportunity.

Research opportunities have been improved greatly with the formation of the new faculty, and the bringing together of staff from Health, IS, IT, including multimedia and mathematical sciences to form a group interested in the promotion of Health Informatics education and research. Topics of interest to these staff include casemix, application of IS to management problems in the health industry, industry

and health discipline specific applications (such as nursing information, patient dependency, decision support and expert systems), and management support systems in the industry (including the application of group support systems). One of the authors was also a member of the team investigating the changing roles and careers of Australian and New Zealand health service managers [9].

Financial support for research has been adequate to date but is expected to improve. The authors gained a national competitive grant in 1994 for work on application of casemix [10], one of the authors was awarded a major consultancy project for Queensland Health in the area of patient/nurse dependency in 1995 [11] and internal funding has been adequate to date for other projects. We have a close relationship with a major teaching hospital in Brisbane where much of this latter type of research is being conducted. A current project investigating the relationship between nursing skill mix, patient acuity and outcomes is primarily using data routinely collected. As a side project we are documenting the difficulties encountered in obtaining complete and quality patient-related data from existing information systems.

## 7. Conclusion

The lessons learnt are those which

are common to many organizations in the 1990s. One needs to keep the needs of the customer in tight focus. One needs to cooperate and collaborate with academic staff from related disciplines within the organization, compete externally (not easy in an academic institution); look for major efficiencies, and not let minor efficiencies get in the way of a good program; keep the parent disciplines involved to avoid Health Informatics programs becoming totally health industry focused; and extend or redevelop existing theory and practice for these parent disciplines or specifically to suit the health informatics discipline.

Lastly, the programs at CQU offer considerable diversity to the potential student looking for a graduate education in Health and Nursing Informatics or Health Administration and Management. Within that focus the needs of both clinicians and non-clinicians are met. The range of programs and electives provides both structure and flexibility, allowing the students to reach the goals they have identified, goals that will provide both personal fulfillment and useful staff members for their organization. The provision of all programs via distance education has further contributed to the breakdown of barriers, such as shift work and geographical isolation, to professional development.

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