MEDINFO '95

Proceedings of the Eighth World Congress on Medical Informatics
Vancouver Trade & Convention Centre, Vancouver, British Columbia, Canada
23 - 27 July 1995

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PART 2

1995

INTERNATIONAL MEDICAL INFORMATICS ASSOCIATION

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ISBN: 0-9697414-1-3

Printed in Canada

Eighth World Congress on Medical Informatics
Vancouver, British Columbia
Canada, 23-27 July 1995

Section 10

INFORMATICS IN NURSING

Section 10A:

Professional Issues

MEDINFO 95 Proceedings. R.A. Greenes et al. (editors)

Change and Technology in Nursing Education

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In 1989, the Faculty of Health Science (FHS) within the University of Central Queensland (UCQ, now the Central Queensland University) committed itself to a major instructional development project—eventually partly funded by an Australian government National Priority Reserve Fund (NPRF) grant—to develop computer-based learning materials for a new nursing education program. This study, extracted from Zelmer (1993), reports on the management of change within that project.

1. Introduction

As the project and this study progressed, it became increasingly obvious that the participants were involved in changing a system where the most obvious challenge was change itself. The changes experienced were not only technological (which was expected), but also included a redefinition of the nursing education program, new roles and directions for the University, and the necessity for individuals to adapt to management techniques and structures that differed from their previous experiences.

At the beginning of the study, there was little guidance from the literature in answering many of the project's questions. Descriptions of computerization in educational institutions and of the software products and/or tools resulting from a major educational materials development project were plentiful. However:

- There were very few descriptions of the management of the development process itself.
- There was a particular lack of information about the effects of computerization on nurse education, from the viewpoint of nurse educators in Australia.
- There was also a dearth of information about how the introduction of a major instructional development project affects the institution where it is located, and the rationale for and effects of decisions taken to achieve the project's goals.

It is obvious that a multi-year project that pre-commits a significant portion of any Faculty's budget will be perceived differently by different individuals and, perhaps, by the same individuals over time. However, the Associate Dean, who was responsible for the day-to-day implementation of the pre-registration nursing course (the coordinator of what is now the Bachelor of Nursing program), expressed her aims in terms of variety and self-learning:

> *We can provide students with alternative ways of looking at nursing problems and nursing care, so that: 1) we can put some variety into their learning, and 2) we can also utilize staff so that our on-site lecturing staff are involved with the more complex aspects of teaching. The student can get factual information through ... CAL programs. I also think that the students need the opportunity to look at different aspects—do some problem solving with no risk—rather than if they were in a patient care situation. This gives them the opportunity to play out alternatives without any ... neglect to the people that they are caring for. It's one way of making learning more interesting, it's also one way of getting a more efficient approach to teaching, and it also makes students responsible for some of their own learning (Associate Dean, 1990, taped interview, 23 July).*

Technological change, computerization in this instance, seldom occurs so slowly that the participants in the process are not aware of its effects. New ways of working, and new tools for performing existing tasks, are obvious to individuals who have been working for some time using pre-change procedures and tools. It is very difficult, for example, to ignore the appearance of either a new paper form or a computer on a previously paper-covered desk.

Occasionally, institutions have the opportunity to effect a technological change as part of an expansion or evolu-

tionary disruption of the normal operation of the institution. The development of the new Faculty of Health Science was such an opportunity. As a result, the participants in this study were all aware that information technology was to be used in ways that were new—new both for nursing education and for the institution. However, the extent of the changes were not realized until they were examined in relation to the working environment and the participants' roles within that environment. Even then, relatively few of the participants had a broad enough view of the changes to understand how the changes affected others in the institution and whether the changes were ultimately positive or negative. The study participants, particularly if they had been newly recruited to academia for the new tasks, may therefore not have realized the extent to which their newly defined roles were different from previous practice:

- The establishment of the Faculty of Health Science and the Diploma/Bachelor of Nursing program resulted from the shift of pre-registration nursing education in Queensland from hospitals to the university sector in 1990.
- The use of computers for the pre-registration training of nurses at UCQ was the result both of vision and necessity; the lack of adequate resources for a conventional clinical teaching program was a major contributor to the decision to computerize.
- The institution itself was changing from a primarily undergraduate teaching-oriented Institute of Advanced Education to a 'real' university with increased emphasis on research and post-graduate students.

This study does not use the traditional case study paradigm whereby an external agent observes and evaluates. It is a case study within a participant observer paradigm. While it is a descriptive study, the methodology used is primarily qualitative rather than quantitative and depends upon the observations and evaluations of the participants directly involved in the project under study. The author, as the manager of the NPRF funded project, was one of the principal stakeholders and project participants.

2. The Impact of Change

This is a study of change both in individuals and the work place. Many of the nurse educators in the Faculty had never used computers previously and were generally seen by staff in other parts of the institution as having no possible interest in computers. The Dean of Health Science (taped interview, 22 October 1990) recalled that one of the senior administrators expressed this quite clearly in late 1988 or early 1989:

> *We had been at a computer demonstration and I happened to be walking down the path with him afterwards... He was genuinely quite surprised, 'What was I doing there?' I think he put into words what a good many other people thought. 'What is this lady doing here, I mean a nurse with computers?' These are the people from math and science, 'we'd heard that maybe business people are interested in computers, but nursing?'*

Such an attitude, while personally discouraging to the Dean, was likely not unreasonable, given the general state of limited computerization in Australian health institutions and the limited use of computers in nursing education in general. Rogers [1] warned of the problems of introducing innovations and noted that 'it is the *idea* about the new... that is diffused as well as the product itself' [emphasis in original]. Later he specifically refers to the technologist:

> *Many technologists think that advantageous innovations will sell themselves, that the obvious benefits of a new idea will be widely realized by potential adopters, and that the innovation will therefore diffuse rapidly. Unfortunately, this is seldom the case. Most innovations, in fact, diffuse at a surprisingly slow rate* [1].

Change, whether the changing of an attitude or the changing of a practice, is not an instantaneous event. Even with the most successful innovation, some individuals will make the change before others. The majority will accept the change sometime later, and a small group will either be very late adopting or refuse to accept the change.

The implications are clear: For an organiszation to be successful in adopting a new technological innovation, management of the people who will use the innovation is as important as managing the technology itself. The three examples which follow provide an indication of the problems and their effects.

Novices and the Fear of Computers: One of the initial concerns of project designers and staff was the possibility, perhaps even probability, that the nursing staff and students would react negatively towards computers, because they

either feared or did not understand computer technology.

In one sense this concern was unfounded. Many of the staff became very enthusiastic users of computers and the related technology. Their enthusiasm, and their insistence that student assignments must be presented as computer output (primarily word processing), helped overcome many of the students' fears as well.

In another sense, the concerns were well founded. As has been documented in Zelmer [3], the installation of staff and student facilities did not occur smoothly. Hardware often failed to arrive as scheduled or, if it arrived, had to wait upon over-extended Computer Centre technicians for installation. Software 'fixes' sometimes added more problems than did the bugs they were supposed to fix. Because the computer was viewed as an essential tool, and was expected to function *exactly* as promised, students and staff alike were frustrated when the tool did not work properly or responded too slowly.

Some users failed to understand that many of the computer problems were not only universal, but they were also beyond the control of the computer staff to resolve. These students and staff responded as if they felt that the computers or, more often, the computer staff were deliberately sabotaging their work.

Unfortunately, the repeated problems experienced by some of the staff as they struggled with understanding the computer system may have been misunderstood by their more computer literate colleagues. To the extent that some of the problems represented a genuine plea for a better explanation, and to the extent that the computer staff was overwhelmed by their responsibility for maintaining services, the plight of these novice users may have been ignored.

The Network and Electronic Mail: The computers within Health Science have been linked together in a network for sharing files and other resources since the acquisition of the first Macintosh computer; the network, student laboratory, and staff computers have since been upgraded several times.

Electronic mail (email), the computer application that allows staff to exchange messages electronically, was one of the first applications implemented on the staff portion of the Health Science network. Staff use the system to the extent that they identified electronic mail as one of their computer primary applications; students also noted that Health Science staff used the electronic mail system, sometimes in preference to other forms of communication.

We could easily notify all the lecturers of upcoming events, whether it was a BBQ on the Friday, the Ball, or something else that we wanted all the lecturers to attend; it so simple to put it up on email (Health Science student, taped interview, 10 February 1993).

> *It seemed to me that they would read email first, before they would read big signs right in front of them that would nearly trip them over... We did have better attendance when we put things on email. Everybody read them on email, but not everybody read them on noticeboards (Health Science student 1993, taped interview, 10 February).*

The Dean, an early and constant user of electronic mail, provided much of the incentive for establishing a workable system within the Faculty; however, even she was amazed at the degree of acceptance of electronic mail by the staff:

> *I'm just utterly amazed that people have taken to things like the Email system as well as they have, because I thought there might be a lot more resistance... but I haven't really heard [much] opposition (Dean, taped interview, 7 February 1992).*

The use of electronic mail was not without its complications. Successful electronic mail operation requires the network to function reliably and to respond in a specified period of time. As one academic staff member notes, the network quickly becomes a required part of the office and work suffers when the network goes down.

The successive upgrading of the network system is another testimony to the inadequacies of the network at various periods of time. At one point, the academic staff even allocated $14,000 of money that could have been used for staff travel and other benefits to the network upgrade.

The Timing of Change: Managing change requires managing the timing of the changes. When this did not happen, either because of lack of attention to detail within the project or as a result of external forces, the project suffered. Several examples serve to illustrate the scope of the problem.

The Dean has always been a very strong supporter of the use of computers within Health Science and serves as a positive role model for their use. The timing was deliberate, but it was particularly unfortunate that the change in the Dean's office from an IBM/MS-DOS to a Macintosh platform coincided with the mid-1990 move from temporary

quarters to the new Health Science building. As the author's progress report for May 1990 reported:

> *In retrospect the timing was probably wrong, particularly as it became necessary for the two individuals [Dean and Administrative Assistant] to deal with both the change and the non-existent or limited network system for the first several weeks after the move. I would estimate that the CAL team has provided roughly 40 hours of support in this area alone since the move [approximately one month]* [3].

Health Science had moved into the building before construction was fully completed. In the May progress report, the author noted that university maintenance staff, while inspecting the new building, had repeatedly, and without advance warning, cycled power on and off, with the result that computing services were lost.

> *We are still not sure whether there has been some equipment damage, however it appears that network integrity is lost in such a situation* [3].

The university loses electrical power service severely enough to result in the loss of network services, a minimum of three to four times per year. As a result of these experiences, Health Science eventually purchased the university's first uninterruptable power supply for its local area network server. After this purchase, Health Science has consistently been the first building to have its network services restored following such an outage. Power failures still disrupt the Health Science network, typically resulting in the loss of unsaved work on individual machines, but the integrity of the network is normally maintained.

The slow delivery, or non-delivery, of ordered hardware and software was another perennial problem. In the early months of the project, orders were frequently delayed within the university itself. The 'proper' procedure for ordering computer equipment included gaining the approval of a standing Computer Advisory Committee at its monthly meeting. This procedure was modified to allow the Director of the Computer Centre to approve purchases, but delays to explain the purpose of even routine purchases led the Faculty to gain approval to bypass the system for its Macintosh purchases.

Deciding when to lead the edge of technological development is another problem. When Apple, for example, increased the capacity of its 3.5" floppy disk drives in 1990, it became easier for a user to operate a stand-alone, single disk drive computer. Stand-alone single low-capacity disk drive computers were the norm in Health Science. Since the need for economy, the ability to easily recover from power failures, or even the desire to take the machine home, required single disk operational; upgrading from machines to high capacity floppy drives was easy to justify.

3. Checklist for Avoiding Failure

The guidelines which follow, distilled from the literature on technology change and the experiences of this study, should assist the technology project planner to develop an implementation that meets the needs of the eventual users:

- Anticipate failure.
- Goals must be explicit.
- Projects will always take more resources than anticipated.
- Plan for change.
- Quality control may be everything.
- Finally, the author, while working as an adult educator for many years, acquired a reputation for always having a contingency plan—a viable program alternative in case something went wrong.

Often, the disaster never occurred and the backup plan was not required. Sometimes, the extra planning resulted in the contingency plan being switched for the original plan; however, the extra planning was never wasted as a better planned program and a more confident implementation resulted.

4. Conclusion

The development of a project funded by external monies is often constrained by the limitations imposed, either by the funding agency or the initial budget request. In retrospect, this Project, while always constrained for funds, was fortunate in that it achieved reasonable funding for non-staffing resources. Project participants never had to wait very

long to obtain the computer hardware or software they *required* to perform their computer-based activities; yet the Project seldom had excess or under-utilized facilities.

This can be attributed to the initial Project design, the guidance provided by the Advisory Committee, the extensive use of Computing Project students as technical support staff, and the supplementary funding provided through the Faculty and UCQ.

The Project also benefited from the dedicated performance of staff who assumed workloads that exceeded normal expectations. The initial and continuing staffing decisions resulted in the time management skills of participants becoming a major constraint on this project. Almost all of the project staff, for example, were full-time university staff or students holding part-time appointments with the project; this necessitated their 'juggling' other work assignments with project activities and deadlines.

The reality of the university, and perhaps any institutional setting, is that a particular project team will usually only get one opportunity to perform. Since each project requires a unique mix of expertise and skills, a project team seldom lasts beyond a single project. Staff may also leave the institution, change jobs within the institution, or otherwise leave the project environment.

This constantly changing mix of staff and experience has positive aspects in that skills learned are transferred to other projects, but it can also have negative aspects if the staff has been unable to learn from their mistakes.

The ability to learn from mistakes is particularly important within an educational institution, as the consequences of failure may be apparent for several semesters. The 'clients' of the university are the students who will enroll in the future as well as those currently enrolled. Thus, if a project fails to meet its deadlines, budget, or other milestones, the impact often extends beyond the project to both current and future students and their learning.

Most evaluators would agree that it takes a number of years to assess the impact of projects involving technological change, and that the lasting results will only be apparent after a change of personnel, particularly project leadership. On that basis, it will be several years before we can be sure of success; however, it is apparent, as this study is being written, that the Health Science staff have taken ownership of the CAL/CML activities:

- All of the staff and students use computers regularly
- Many of the staff *are* involved in developing computer-based instructional materials
- Some staff are using the available tools to develop courseware that is very different from standard Health Science materials.

From its own budget, the Faculty also funds computer support positions and infrastructure (hardware, software, and network) upgrading. It is budgeting for an additional student lab and has begun investigating multimedia applications.

5. References

[1] Rogers, Everett M. *Diffusion of Innovations,* 1st edition. New York: The Free Press (1962)

[2] Rogers, Everett M. *Diffusion of Innovations,* 3rd edition. New York: The Free Press, Third Edition (1983).

[3] Zelmer A. C. Lynn. *The Impact of the Introduction of Computers into the Faculty of Health Science: A case study of organizational change.* PhD thesis, Brisbane: University of Queensland (1993).