

Organizing e-learning in a campus-based university: communities, cultures and complementarities

Carol Russell and Tony Koppi, University of New South Wales

Abstract

As in many other campus-based universities, the use of eLearning in the University of New South Wales (UNSW) has been growing steadily since 2000, at about 30% a year. Now a qualitative change is emerging, in new forms of organized support for eLearning. The accumulation of activity by individual teachers is becoming organized at the institutional level.

There was already central support for individual early adopters of eLearning, and also a few Faculty or Programme-based support units, some well organized. By 2004 the growth in use of eLearning reached the point where an upgrade to the infrastructure and the support services was needed. With this came an opportunity to review and develop the eLearning support, and to take advantage of new software tools.

Creating an organized, coherent eLearning system has involved technical project management, but only as one component. Overall it has been an iterative process of systemic adaptation – neither totally planned top-down nor completely self-organized bottom-up, but a complex mix of both. There have been clashes of departmental culture and misunderstandings to be resolved between IT infrastructure specialists and other service providers.

Communities of practice made new connections across organizational boundaries and prepared the ground for new ways of working. There were formal consultations with heads of academic departments and committees. There were debates about priorities and funding allocation. Individuals and departments resisted change, sometimes with good cause. Administrative rules and practices were challenged. Established workaround practices were exposed. No one person or group has been in control and the leadership roles have been distributed and shifting.

Yet we are beginning to see a coherent institutional eLearning system that is in tune with strategic priorities. Existing eLearning users have transferred to the new learning management system. Departments are organized as groups within which staff are taking on specialized roles, sharing resources and using templates to improve quality and save development time. New groups of users are coming on board. There is one contact point for networked central and local helpdesks, providing a range of user support services. Perhaps most significantly, we are now beginning to formalize ways of dealing with future upgrades, both in terms of technical change management and in terms of communicating and negotiating with users.

This paper interprets these changes in UNSW’s eLearning environment in terms of complex adaptive systems models, drawing on related research in non-university organizational contexts. In particular, the role of diversity and complementarities as part of systemic organizational adaptation explains why some tensions and apparent contradictions will always remain, and that this is a good thing. The resulting insights may help other universities who are also seeking to develop a coherent and effective eLearning service, and are finding that things don’t always go according to plan.

1. Introduction and context

The University of New South Wales (UNSW) in Australia is a large metropolitan campus-based university, with major research and teaching activities in areas such as medicine, commerce, engineering and the applied sciences. UNSW is one of the Group of Eight (Go8) that identify themselves as "Australia's leading universities" (Go8, 2006) and in which campus-based study is the norm, especially at undergraduate level.

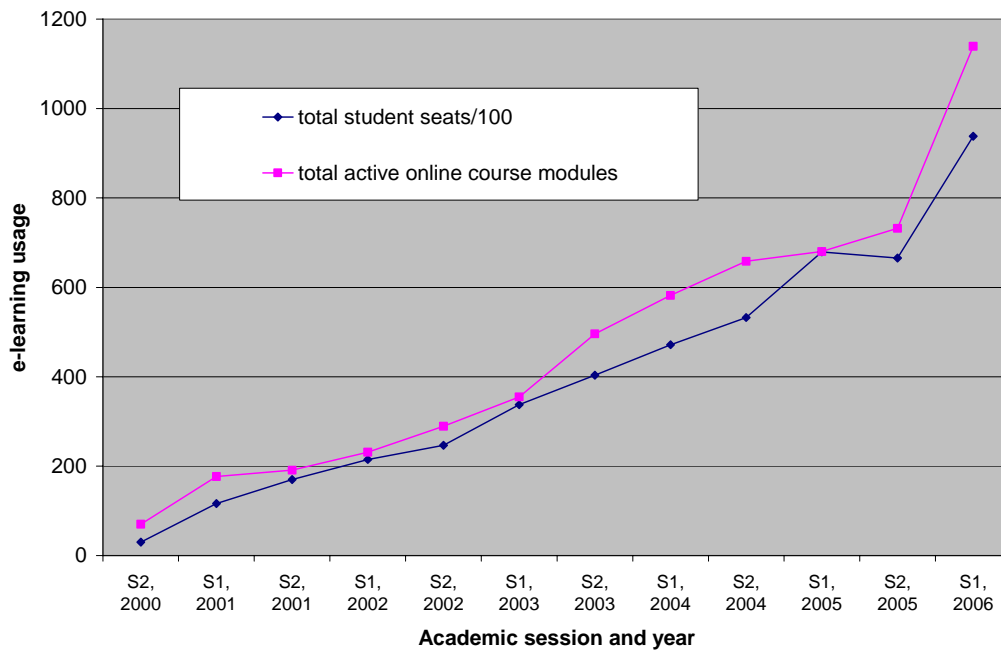


Figure1. eLearning use in UNSW 2000-2006

UNSW's use of online learning, in terms of students enrolled in courses with an online presence, has been rising steadily, from 17,000 online student course registrations in October 2001 to almost 100,000 in 2006 (Figure 1). However, as with other campus universities, the main use of online learning is still largely in web-supported mode (EDTeC, 2005, OECD, 2005) . While a few teachers are using it in innovative ways to enhance student learning, e-learning is mainly used for delivering lecture notes and additional resources. As a result, the quality of student e-learning experience is variable. An Australian Universities Quality Agency (AUQA) audit of the university in 2005 recommended that UNSW needed governance arrangements for the future development of online learning and online courses throughout the University

(AUQA, 2006); indicating that formal organizational systems had still to adapt to e-learning.

By 2004 there was established central support for individual 'early adopters' (Rogers, 2003) of e-learning, coordinated from the Educational Development & Technology Centre (EDTeC), which ran all aspects of the online learning management system, including servers, user support and training, media development and e-learning design and development. Although there were also a few Faculty or Program-based support units, the majority of e-learning support was provided to individual academics who sought it out. Apart from a few adventurous souls, most simply asked for an online course to be set up, and used it in whatever way they chose. Students, when asked what we could do to improve their e-learning experiences, told us 'teach the lecturers how to use it properly' (Koppi, 2004).

However in 2004, the growth in use of e-learning had reached the point where an upgrade to the infrastructure and the support services was needed. With this came an opportunity to review and develop the e-learning support, and to take advantage of new software tools.

The remainder of this paper outlines how we began moving from e-learning services provided ad hoc for individual early adopters to e-learning services that integrate with mainstream UNSW systems. In doing so we have opened up several cans of worms related to assumptions about learning and teaching practices and how to support them. An optimistic interpretation is that the worms are beginning to work their way through the garden and are helping to fertilize the soil for future growth in effective use of blended e-learning on campus. The associated organizational changes can be understood in terms of a model of university learning and teaching as a complex adaptive system.

2. Models of organizational change

The management literature on organizational change includes a wide variety of models. Kezar (2001, pp 25-57 and 79-112), in an overview of organizational change models applied in higher education, categorizes them and describes how each type relates to change in universities. One conclusion of Kezar's analysis is that two types of organizational change model may be applicable in universities.

The first type is social cognition models, which encompass the idea of 'organizational learning' that goes beyond individual knowledge and is embodied in change to formal organizational structures (e.g. Senge et al., 1994, Senge et al., 1999, Cullen, 1999, Hodgkinson, 2000, Argyris, 1999).

The second type of organizational change model is evolutionary models, which if applied in universities have the capacity to explain "complex interplay between internal and external forces" (Kezar, 2001). This interplay can result in a homeostatic response to environmental change such as new technologies. Or it result in adaptive transformation of the whole system. Some writers on e-learning (e.g. Siemens, 2004) and on organizational knowledge creation (Nonaka, 1994) define **organizational learning** as residing not only in individuals and their working relationships (formal and informal, explicit and tacit), but also in the physical infrastructures and

technologies used by the organization. This definition is consistent with biological systems models in which three complementary aspects of the system co-create each other in relation to an external environment. These complementary aspects are process (e.g. metabolism), form (structure, functions, relationships), and material (physical constituents). Similarly organizations have characteristic processes of interaction, departmental structures and material/technological infrastructures.

In biology, **homeostasis** is the response by which organisms make internal adjustments to maintain their equilibrium and the integrity of their function in relation to the physical environment. Traditional universities appear to be responding systemically to e-learning as a disruptive innovation which is creating uncertainty and stress (Rogers, 2003, Laurillard, 2002). A systemic homeostatic response would act to isolate and limit the impact of e-learning rather than adapting the organizational forms and structures to take full advantage of it. The question here is how, in practice, we can shift from homeostasis to adaptive transformation of a university's learning and teaching systems.

Empirical studies of technology-related change in manufacturing industries have applied complex adaptive systems theories in rigorous mathematical models based upon game theory. One analysis develops a mathematical argument to show how any complex human organization will settle into a pattern of **complementarities** in which individuals and departments have adjusted mutually to each others' activities, to create a systemic adaptation to the organization's environment. The significance of this finding is that detailed modelling of individual decisions is not needed in applying the theory to real organizations "so long as the firm's objective can be divided up among a set of complementary effects that extend across sub-units" "even mistaken variations from a plan are less costly when they are coordinated than when they are made independently" Complementarity is symmetrical: "If doing more of x increases the returns from doing more of y, then doing more of y will increase the returns from doing more of x. (Milgrom and Roberts, 1995).

These results explain how homeostasis happens in organizations. Attempting to change one activity or subsystem will result in a mismatch with other activities and subsystems. Loud complaints follow, for quite rational reasons. Things inevitably get worse before they get better, and the immediate response is to reject the change.

Milgrom and Roberts modelled changes in companies that had successfully transferred from mass manufacture to computer-aided flexible manufacturing, and showed that these companies had all made changes in a certain identifiable key areas. Large scale empirical studies across other types of organization have confirmed that successful organizational adaptation requires simultaneous management of complementarities across various aspects of organizational structure and process (Massini and Pettigrew, 2004).

Figure 2 illustrates some of the complementarities related to change in manufacturing technology. Going from mass to flexible manufacturing is associated with changes from centralized hierarchical organization with specialized staff to cross-trained staff working in small autonomous teams

with more frequent communication. Figure 3 translates this to what could be corresponding systems in a university. A complementarities model based on similarity with manufacturing, however, has the limitations of all models and may over-simplify important aspects of campus university teaching. Figure 3 is simply intended to illustrate the general nature of likely interdependencies and not to suggest that what is shown summarizes accurately the key complementarities in university learning and teaching.

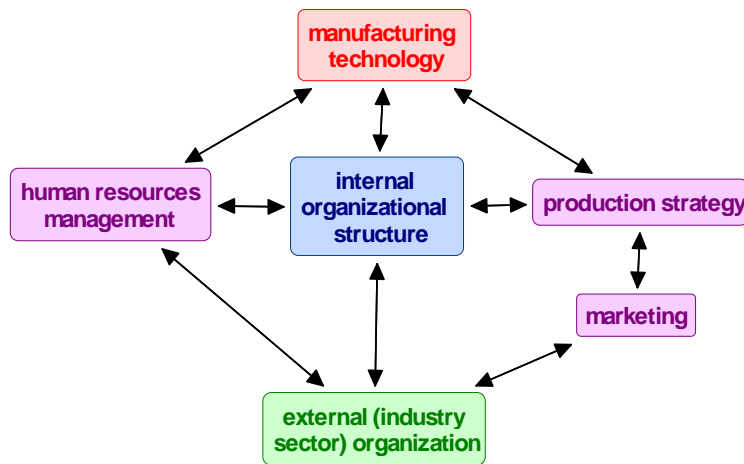


Figure 2. Complementary aspects of organization in manufacturing

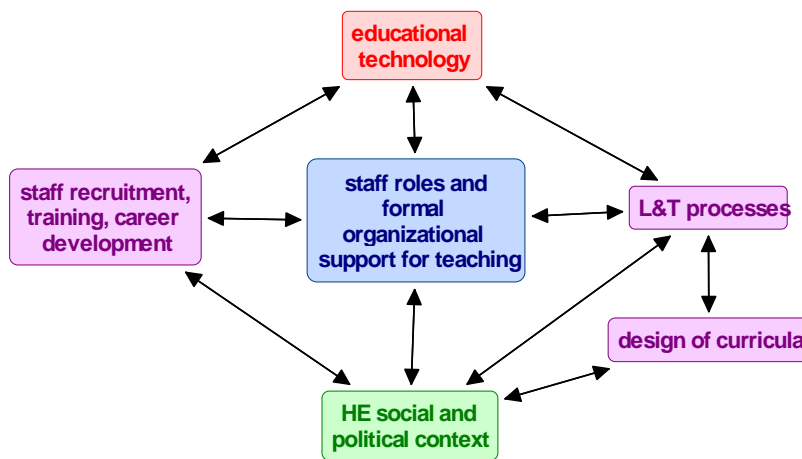


Figure 3. Complementary aspects of university teaching?

The main value of the model shown in Figure 3 is that it helps to explain the scope of the changes needed for successful integration of effective e-learning university learning and teaching. While many large-scale distance universities have been able to integrate e-learning into mainstream learning and teaching, traditional campus universities are finding it harder (OECD, 2005). Distance universities could be considered as analogous to mass manufacturing companies who reorganize and shift to flexible manufacturing technologies.

Traditional campus universities have various departmental tribes and territories (Becher and Trowler, 2001). Classroom teaching knowledge is largely individual, tacit and discipline-specific in nature, drawing on teachers' own experience as learners (Trowler and Cooper, 2002, Salomon, 1998, Brown and Roberts, 2000). The integration of e-learning in a traditional campus university may therefore be analogous to moving a series of craft-based cottage industries into a 21st century flexible manufacturing system.

3. The real experience

If the principle of complementarities applies to university learning and teaching systems then effective integration of e-learning could require coordinated change in more than technical and administration systems, and in the practices of individual teachers. Introducing an integrated e-learning system in UNSW threw up several examples of the general interdependencies shown in Figure 3.

The best laid plans ...

To start building an integrated institutional e-learning system, EDTeC began a collaboration with UNSW IT Services. An eLearning Steering Committee was set up to oversee the project, funding was allocated, and we began planning. This was where the first cultural difference became evident. EDTeC had built up its services in response to demand from individual academics or specific projects. Now we were now embroiled in discussions with systems architects, business analysts, IT project management protocols and IT project managers. Everything had to be designed in advance and budgeted for; involving requirements gathering, copious documentation and numerous planning meetings. And of course the planning costs themselves also had to be planned and budgeted for.

EDTeC suggested some guiding principles for the process, based upon an e-learning analogy with Maslow's hierarchy. This is illustrated in Figure 4: start with the high level learning and teaching needs, as defined in UNSW learning and teaching strategy documents, work out what services are needed to support these, then work down to confirming learning management system (LMS), other software and infrastructure (servers and network architecture) that these services would be built upon. So far, so good.

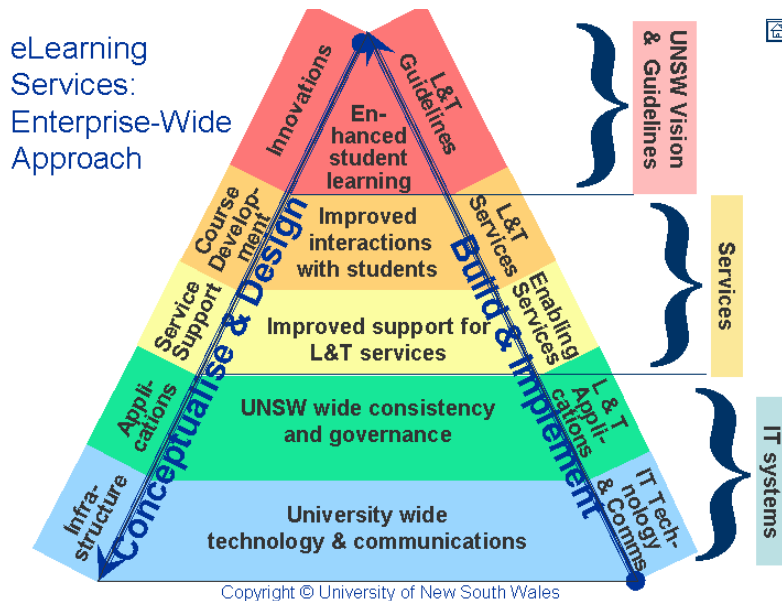


Figure 4 The overall plan for developing integrated e-learning in UNSW

EDTeC's role was to ensure that the new system was able to meet the university's educational needs. To do this we:

- drew up and 'socialized' (a piece of jargon picked up from our IT colleagues) a mapping of learning and teaching quality criteria onto specific capacities required in the new systems
- organized one cohort in our Innovative Teaching and Educational Technology (ITET) Fellowship program to act as guineapigs and test out the proposed LMS environment as developers and teachers
- planned the roll-out of the new system to user groups in different Faculties
- argued for, and had accepted by the eLearning Steering Committee, compulsory training for all users, on the grounds that the helpdesk could not cope with individual demands from the influx of new users, and that students were already complaining that teachers didn't know how to use the old LMS effectively
- consulted with academic units to let them know what was happening and what their options were; and to customize training and LMS set-up to meet their needs
- bought, compiled and adapted training resources, and developed a training program
- recruited extra staff to deal with the sudden increase in training and support workload while the new LMS was being introduced.

All this was work that we could anticipate. What we did not anticipate was the tensions that arose between our tradition of flexibility in negotiating services to accommodate academic needs, and the IT Services practice of planning and budgeting in advance, on the basis of industry-standard protocols. We also had to negotiate with administrative systems on the exchange of student and staff data. This was far more than a technical transfer of data, so although

EDTeC's role was to support effective e-learning pedagogy, we found we had to engage with numerous other functions.

The boring bits

One example of where pedagogical, administrative and IT systems priorities clashed was in the development of middleware to link the student and staff enrolment systems with the LMS, incorporating rules for access to online courses.

Software development

While administrative software development was clearly an IT Services responsibility, the complexity of the associated educational issues meant that EDTeC had to become involved, and eventually took over liaison with the external software developer. The IT professionals had insufficient understanding of how of an LMS would actually be used by academic departments.

Workarounds in staff and student enrolments

Use of the old LMS had been largely unregulated, with academics able to enrol students and staff directly. Now we were building in rules about who could have access to which type of online course and when. In this we were guided by our colleagues in student administration, who were concerned about accurate reporting of student enrolments and progress.

It was only when we began working with real cases we realised how many workarounds existed with the current systems. The standard staff and student administration processes built into the mainstream systems did not account for the current variety of users and timetables. Access to campus classrooms and to the old LMS did not need to tie in with formal enrolments and timetables, but the new LMS does. Instead of e-learning adding to flexibility of study options, it looked as if it was going to detract from flexibility. For example, sessional staff and postgraduate students could not easily be added ad hoc as students or teachers to an undergraduate online course.

We questioned the need for so many workarounds. For example a widespread practice is that sessional teaching staff (tutors) are put into HR systems only after they have started work and are due to be paid. Faculties are therefore in the habit of leaving the paperwork for sessional staff appointments until a week or so after the start of semester. This practice denies tutors access to email services, information, training and support resources when they most need it. The need to give tutors e-learning access and training has encouraged better practice, confirming sessional staff appointments several weeks before the start of semester, so that the tutors feel part of the University teaching community and have help in preparing for teaching. However, for Faculty administrators who are perhaps trying to match tutor appointments with uncertain student numbers, this can be extra hassle at a busy time.

Similar issues arose in relation to student enrolments in part-time postgraduate and professional development programs, which often do not follow standard timetables for academic sessions and assessment scheduling.

Tying online access to mainstream systems meant that some students could now be denied access unless special arrangements are made.

Basic IT support services

EDTeC had originally operated its own helpdesk for e-learning. From 2005, all e-learning support enquiries were directed to a central IT service desk. This allows for better management of basic system access and password queries, and means that EDTeC staff can concentrate on our core role of supporting the educational aspects of e-learning. However, EDTeC has a continuing role in briefing service desk staff on the needs of e-learning users.

Now that the LMS is run from centrally managed servers, the installation and testing of new or upgraded software are also a matter for continual negotiation and renegotiation of priorities and timing. We have not just been able to leave it entirely to the IT people.

Outcomes

We are beginning to see a coherent institutional e-learning system that is in tune with strategic priorities. Existing e-learning users have transferred to the new learning management system. Departments are organized as groups within which staff are taking on specialized roles, sharing resources and using templates to improve quality and save e-learning development time. New groups of users are coming on board. There is one contact point for networked central and local helpdesks, providing a range of user support services.

Communities and contacts

EDTeC has used its relationships with individuals and communities throughout the University to help communicate informally and start discussions about formal arrangements. Between 2001 and 2005 around 75 ITET Fellows worked with us closely in cross-discipline groups. They form a network of contacts across the University, which has been invaluable in keeping us in touch with learning and teaching needs. Faculty-based educational developers also meet informally across disciplines, and share ideas with us. All of these people have helped prepare the ground for more formal approaches to academic departments to discuss changes related to e-learning. It is hard to see how the rollout of the new LMS could have been implemented without this informal dimension and links to local knowledge of academic departments.

Enrolments and identity

The student and staff enrolment issues have partly resolved by finding local solutions. However, the whole basis of access to University systems has now been referred to a separate Identity Management Project. Again though, the initial brief for this project focused on data structure without questioning assumptions about the organizational processes the data is required to support.

Students and staff are no longer related to one main campus, and they may not visit any campus. There are professional communities from which we

recruit part-time and temporary teachers and students, in varying roles and for varying periods. Highschool students and their parents also join University programs for short periods and need access to e-learning and other University resources and activities. Even the full-time undergraduate student is highly likely to be working part-time (McInnes and Hartley, 2002). The UNSW eLearning Services have the potential to support all these varying needs. But we still have some work to do.

Reorganization of e-learning support

EDTeC had developed in parallel with a separate Learning and Teaching Unit, with whom we collaborated. However, the provision of support for classroom and online learning through two separate departments was hampering the integration of e-learning into mainstream teaching practice. In 2006, our new Deputy Vice Chancellor (Academic) decided that the two departments should be merged. The merger will be completed during 2007. The division of e-learning support responsibilities between the new unit and IT services is not yet clear.

What is clear is that e-learning is to be an integral part of curriculum development. Whether this overcomes academic reluctance to engage with e-learning remains to be seen. However, there are some promising signs. The number of academic staff who have completed training in use of the LMS is continuing to rise. Several new integrated e-learning tools are being introduced and supported at institutional level, in collaboration with academic departments. Within academic departments there is increasing acceptance of teamwork with support staff in managing the student e-learning experience. All of this points to a move beyond individual early adopters into the 'early majority' phase where there is a critical mass who are becoming better organized (Rogers, 2003).

Management of future e-learning innovations

As part of the e-learning support reorganization discussions we are again referring to a version of the UNSW eLearning Services hierarchy model shown in Figure 4. We are still in the process of establishing how operational support can allow not only for established services, but also for e-learning research and innovation. At one level this is as mundane as making sure there is a 'sandpit' server space for testing new educational software. This is something that has previously been done informally, devolved and self-organized in various departments, sometimes funded by ad hoc research grants. If e-learning is to become a mainstream educational activity in the University, incorporating current technologies, then we need to establish more formal pathways that allow e-learning research and development to move into our mainstream systems.

We are now beginning to formalize ways of dealing with future upgrades, both in terms of technical change management and in terms of communicating and negotiating with users.

4. Analysis and interpretation

The experience of building enterprise-wide eLearning services in UNSW has shown many of the complementarities indicated in Figure 3. The descriptions given above are only a few examples of what is a much more complex and comprehensive set of interdependences. Figure 5 summarises some of the systemic complementarities that we came across in implementing the UNSW eLearning program.

We are seeing a move away from individual lecturers all working on separate e-learning courses, as early adopters, with the majority choosing not to spend extra time developing new methods. Now we have organized groups who are able to set up shared systems and use support staff instead of the lecturers doing everything themselves. In a research-intensive university like UNSW, many lecturers are reluctant to put a lot of extra effort into innovative teaching. Organized teaching support systems and technologies mean that the quality of the student experience is less dependent on the efforts and initiative of individual lecturers.

In an environment where universities are required to work with professional and local communities, and are accountable to governments for use of teaching-related funding, they are no longer ivory towers for full-time scholars. The design of e-learning provision, and all the other aspects of learning and teaching with which it interacts, therefore has to embody and support many more types of relationship with members of external communities; not just the traditional model of full-time academics teaching full-time campus-based students.

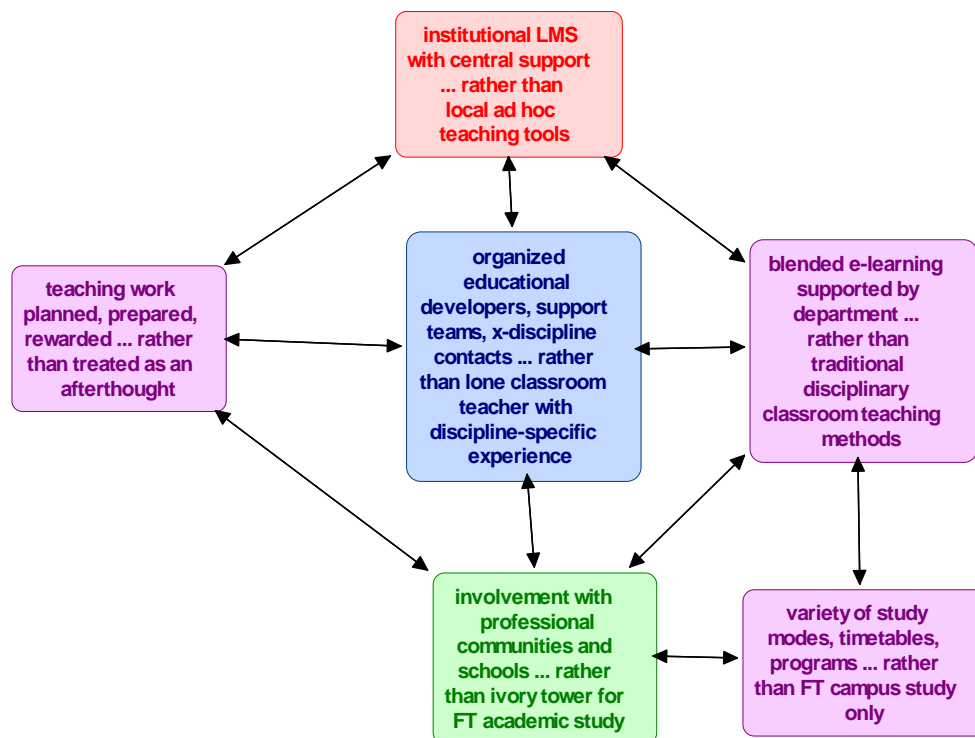


Figure 5. Changes forming complementarities with UNSW eLearning

In UNSW, creating an organized, coherent e-learning system has involved technical project management, but only as one component. Overall it has been an iterative process of systemic adaptation – neither totally planned top-down nor completely self-organized bottom-up, but a complex mix of both. There have been clashes of departmental culture and misunderstandings to be resolved between IT infrastructure specialists and other service providers.

Communities of practice made new connections across organizational boundaries and prepared the ground for new ways of working. There were formal consultations with heads of academic departments and committees. There were debates about priorities and funding allocation. Individuals and departments resisted change, sometimes with good cause. Administrative rules and practices were challenged. Established workaround practices were exposed. No one person or group has been in control and the leadership roles have been distributed and shifting.

E-learning is helping UNSW to meet student needs and expectations that have changed considerably over the last few decades; not as a single initiative that drives others, or as a reactive response, but as part of a broader systemic adaptation involving mutual interaction with other university activities. Some of these activities were already responding piecemeal to external change (e.g. the workarounds in student and staff enrolments). Others were lagging (e.g. mainstream classroom teachers reluctant to sacrifice research time to develop innovative teaching). Now a qualitative change is emerging, in new forms of organized support for e-learning. The accumulation of activity by individual teachers is becoming organized at the departmental and institutional level.

5. Conclusions

Applying complex adaptive systems analysis to the UNSW eLearning Program shows that the theory has some relevance in practice. Although this is a specific instance at a particular point in time, the general principles could be applied elsewhere. The UNSW case study supports findings from management research, that complementarities are a fundamental pattern of human organization. The specific interdependencies we found in UNSW may not occur in other universities, but there will be some, possibly in the same areas depicted in Figure 3. As we found out, complementarities may be invisible, in the form of tacit organizational knowledge embodied in procedures, relationships, assumptions and infrastructures, and therefore likely to be overlooked even in the best-laid plans.

This insight may help universities who are seeking to develop a coherent and effective e-learning service, and are finding that things don't always go according to plan. It is necessary to identify and work with the complementarities that inevitably exist in any organized system, and to coordinate change in different functional areas. In UNSW some of the interdependencies were not apparent until we tried to implement a change. Perfect planning is not possible, and the best we can do is to be flexible, to persist and to communicate widely. This will challenge traditional administrative and IT management cultures, which, quite rationally, seek to predict and control in order to provide reliable services. Interplay and mutual

accommodation between differing value systems and priorities is an inherent part of a university's internal response to an external HE environment that is presenting 'supercomplex' challenges (Barnett, 2000).

References

- ARGYRIS, C. (1999) *On Organizational Learning* ,, Oxford UK, Blackwell.
- AUQA (2006) Report of an Audit of The University of New South Wales. Melbourne, Australian Universities Quality Agency.
- BARNETT, R. (2000) *Realizing the University in an age of supercomplexity*, Society for Research into Higher Education and Open University Press.
- BECHER, T. & TROWLER, P. R. (2001) *Academic Tribes and Territories*, Buckingham, UK, Society for Research into Higher Education & Open University Press.
- BROWN, T. & ROBERTS, L. (2000) Memories are made of this: Temporality and practitioner research. *British Educational Research Journal*; Oxford, 26, 649.
- CULLEN, J. (1999) Socially constructed learning: a commentary on the concept of the learning organization. *The Learning Organization*, 6, 45.
- EDTEC (2005) Internal reporting on usage of the UNSW online learning management system. Sydney, UNSW.
- GO8 (2006) Go8 website - <http://www.go8.edu.au/>. The Group of Eight Secretariat.
- HODGKINSON, M. (2000) Managerial perceptions of barriers to becoming a "learning organization". *The Learning Organization*, 7, 156.
- KEZAR, A. (2001) Understanding and facilitating organizational change in the 21st century: recent research and conceptualizations. *ASHE-ERIC Higher Education Report*. Washington DC, ASHE-ERIC.
- KOPPI, T. (2004) Internal report on a survey of UNSW students on their eLearning experiences. Sydney, University of New South Wales.
- LAURILLARD, D. (2002) *Rethinking University Teaching: a conversational framework for the effective use of learning technologies*, London, Routledge Falmer.
- MASSINI, S. & PETTIGREW, A. (2004) Complementarities in Organizational Innovation and Performance. IN PETTIGREW, A., WHITTINGTON, R., MELIN, L., SANCHEZ-RUNDE, C., BOSCH, F. A. J. V. D. & NUMAGAMI, T. (Eds.) *Innovative forms of organizing*. London, Sage.
- MCINNES, C. & HARTLEY, R. (2002) Managing Study and Work: the impact of full-time study and paid work on the undergraduate experience in Australian Universities. Canberra, Commonwealth Dept of Education, Science and Training.
- MILGROM, P. & ROBERTS, J. (1995) Complementarities and fit: strategy, structure and organizational change in manufacturing. *Journal of Accounting and Economics*, 19, 179-208.

- NONAKA, I. (1994) A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*, 5, 14-37.
- OECD (2005) *E-learning in tertiary education*, Paris, Organization for Economic Co-operation and Development.
- ROGERS, E. M. (2003) *Diffusion of Innovations*, New York, Simon & Schuster.
- SALOMON, G. (1998) Technology's promises and dangers in a psychological and educational context. *Theory into Practice; Columbus*, 37, 4-10.
- SENGE, A., ROBERTS, C., ROSS, R., ROTH, G., SMITH, B. & KLEINER, A. (1999) *The Dance of Change: the challenges of sustaining momentum in learning organizations*, London, Nicholas Brealey.
- SENGE, P., KLEINER, A., ROBERTS, C., ROSS, R. & SMITH, B. (1994) *The Fifth Discipline Fieldbook: strategies and tools for building a learning organization*, London, Nicholas Brealey.
- SIEMENS, G. (2004) Connectivism: a learning theory for the digital age. elearnsapce.
- TROWLER, P. & COOPER, A. (2002) Teaching and Learning Regimes: implicit theories and recurrent practices in the enhancement of teaching and learning through educational development programmes. *Higher Education Research & Development*, 21, 221-240.