Automating e-Learning: The Higher Education Revolution

James C Taylor

Vice-President (Global Learning Services)
University of Southern Queensland
Toowoomba, Queensland, 4350, Australia
http://www.usq.edu.au/users/taylorj

Abstract: As educational institutions throughout the world increasingly offer courses via the Internet, a global lifelong learning economy is emerging in which institutions must compete for students worldwide. This competition is especially noticeable in the offering of postgraduate courses aimed at satisfying the continuing professional development needs of practitioners in a wide range of disciplines. Fifth generation distance education (The Intelligent Flexible Learning Model), incorporating the use of automated response systems and reusable learning objects' databases, has the potential to provide students with a valuable pedagogical experience at significantly lower cost than traditional approaches to distance education and conventional face-to-face education. Such e-learning initiatives will be irresistible to students, politicians and the business community alike – the higher education revolution is inexorable.

1 Introduction

Stimulated by the Internet, powerful social, economic and technological forces are revolutionizing traditional concepts of economics, business, and education. Duderstadt [Du01] outlined a number of significant forces driving change in higher education, including the globalization of culture and commerce, the lifelong educational needs of citizens in a knowledge-driven global economy, the exponential growth of new knowledge and new disciplines, and the impact of information and communication technologies. Further, as Quinn [Qu01] pointed out, over 90% of the relevant literature in many technical disciplines, including biotechnology, software engineering and environmental sciences, has been produced since 1985. He also made the point that given the rapidity of worldwide knowledge and technological advance, people cannot (and do not) go back to university for knowledge updates as they once did. Increasingly, neither universities nor individual students can afford the costs (or the time) entailed in taking and presenting traditional classroom instruction.

In the context of such a period of significant change, the Internet will provide the only viable conduit through which corporations and educational institutions, in both developed and developing countries, will be able to provide access to ongoing

opportunities for the continuing professional development of working individuals in a cost-effective manner. The demand for postgraduate, continuing professional development of working adults will far outstrip the higher education needs of school leavers typically associated with the demand for university education at the undergraduate level. Traditional programmatic approaches to higher education may even become obsolete, since it could well be beyond the capacity of universities and colleges to adapt to the rapidly emerging market-driven restructuring of the higher education sector. In the face of such unprecedented societal change, will universities become extinct? While many believe that universities will survive the digital revolution, few deny that universities will experience dramatic change in form and structure as a result of the power of technology-driven change.

2 Technological Development and Globalization

More than sixty years ago, an Austrian economist named Joseph Schumpeter [Sc34] presented a model of development based on a continuous shift in resources from declining to expanding industries. He postulated that every 50 years or so technological revolutions would cause *'gales of creative destruction'* in which old industries would founder and be replaced by new industries. Many technology pundits argue that the information technology revolution could be much more significant than any previous revolution. Certainly, the pace of change is much greater.

It is estimated that the Internet reached 50 million users in 5 years compared with radio that took 38 years to reach the same number, and television, which took 13 years to reach 50 million users [Ha98]. A recent assessment estimated the current global population with Internet access to be 498 million [http://www.cyberatlas.internet.com]. The impact of the Internet is already having a major impact on the growth of international business through massive developments in e-commerce. The process of education will not escape the influence of such significant global developments, especially as the cost of access to information communication technologies continues to fall, a further indicator of the rapid pace of technological change. For the past twenty years, the cost of computer processing has dropped an average of 30% per annum. One estimate suggested that computer power now costs only .001% of what it did in the early 1970s [Wo97]. This decline in costs has also been evident in the telecommunications industry. As Cairncross [Ca97] has predicted, 'The death of distance as a determinant of the cost of communications will probably be the single most important economic force shaping society in the first half of the next century' (p.28).

What does all this mean for higher education institutions? Such questions have no immediately obvious answers, but paradoxically, the death of distance could well lead to the ascendance of distance education through the evolution of all traditional universities into dual mode institutions, which support both on-campus and off-campus students through Internet-based delivery systems. This evolution and the associated rapid emergence of significant numbers of corporate, for-profit online universities will generate increased competition for students and ultimately a global lifelong learning economy.

3 The Emerging Global Lifelong Learning Economy

Competition for students and the associated emergence of the global lifelong learning economy will force institutions to change. Much of this change will be driven by the mighty dollar/euro in the hand of the consumer (the student). As more and more institutions embrace Internet-based delivery, competition for students will become increasingly competitive on a global scale. A number of education portals with extensive online course listings have emerged, including http://www.geteducated.com, http://www.uwex.edu/disted/desites.html, http://www.distance-educator.com, and www.dlcoursefinder.com . The latter site, for example, lists 55,000 courses from a multitude of institutions in 130 countries. The result is that higher education will become increasingly market driven, such that in the near future institutional success will depend primarily on students' perceptions of flexibility of access, quality of service and value for money.

While this trend towards regarding higher education as just another industry is anathema to many senior academics, it is a social reality emanating from the influence of economic rationalism as a political force. Many observers seem to think that the traditional idea of the university, including the inherent value of the unfettered pursuit of knowledge for its own sake, is severely under threat from unrestrained hordes of rampant capitalists eager to make a profit. Such a view is worthy of reflection, but it represents a somewhat simplistic, polarized view of the driving force underlying the commitment of devotees to economic rationalism.

In a recent text, "The Commanding Heights: The Battle between Government and the Marketplace that is Remaking the Modern World", Yergin and Stanislaw [YS98], made the point that in response to the high costs of control and the disillusionment with its intractable problems, governments throughout the world are privatizing by disposing of what amounts to trillions of dollars of assets. They demonstrate that this trend is evident not only in the former Soviet Union, Eastern Europe and China, but also in Western Europe, Asia, Latin America, Africa and the United States. In essence, numerous governments are turning many of their traditional activities over to the marketplace in the belief that such an approach will be a more efficient and effective way to engender benefits to the public. The examples selected by Yergin and Stanislaw [YS98] demonstrate that this is not abstract theory, but an astonishing empirical phenomenon. In the context of mass higher education, governments around the world are reducing financial support. It is evident that the politicians and business leaders, (the "madmen in authority" as they were referred to by John Maynard Keynes), have developed a sincere commitment to a social philosophy based on competition in the free market, which they believe will engender widespread public benefits, including higher quality and more choice at lower cost to the consumer.

It is in this context of the death of distance, the rapid increase in institutions offering courses via the Internet, the growing global influence of economic rationalism and associated user-pays-for-quality-service that higher education will become increasingly

market driven. Such influences will combine to create the global lifelong learning economy, which will act as a catalyst for change. This transition from the Industrial to the Information Age was encapsulated by Dolence and Norris [DN95], who argued that to survive organisations would need to change from rigid, formula driven entities to organisations that were "fast, fluid and flexible"- adjectives not typically used to describe the salient features of universities! Indeed, many universities are still struggling to come to terms with the imminent challenges posed by competition for online students through the emergence of the global lifelong learning economy. Universities with a significant role in distance education, however, are different: they have always been, and will always be, in the vanguard of innovation and institutional change.

4 Models of Distance Education

For many years, universities with a significant commitment to distance and open education institutions have been at the forefront of adopting new technologies to increase access to education and training opportunities. Distance education operations have evolved through the following four generations: first, the Correspondence Model based on print technology; second, the Multi-media Model based on print, audio and video technologies; third, the Telelearning Model, based on applications of telecommunications technologies to provide opportunities for synchronous communication; and fourth, the Flexible Learning Model based on online delivery via the Internet. Although many universities are just beginning to implement fourth generation distance education initiatives, the fifth generation is already emerging based on the further exploitation of new technologies. The fifth generation of distance education is essentially a derivation of the fourth generation, which aims to capitalize on the features of the Internet and the Web. To place the fifth generation Intelligent Flexible Learning Model into a meaningful conceptual framework, it is first worth reviewing briefly certain features of the previous four generations of distance education. Some of the characteristics of the various models of distance education that are relevant to the quality of teaching and learning [Ta95] are summarized in Table 1, along with an indicator of institutional variable costs [TKB93].

Although a detailed cost analysis of various technology/pedagogy interfaces is beyond the scope of the present paper, it is worth noting that prior to the advent of online delivery, variable costs tended to increase or decrease directly (often linearly) with fluctuations in the volume of activity. For example, in second generation distance education delivery, the distribution of packages of self-instructional materials (printed study guides, audiotapes, videotapes, etc) is a variable cost, which varies in direct proportion to the number of students enrolled. In contrast, fifth generation distance education has the potential to decrease significantly the costs associated with providing access to institutional processes and online tuition. Through the development and implementation of: automated courseware production systems, automated academic productivity enhancement systems, and automated business systems, the fifth generation of distance education has the potential to deliver a quantum leap in economies of scale and associated cost-effectiveness.

Models of Distance Education and Associated Delivery Technologies	Characteristics of Delivery Technologies					
	Flexibility			Highly Refined Materials	Advanced Interactive Delivery	Institutional Variable Costs Approaching Zero
	Time	Place	Pace			
FIRST GENERATION - The Correspondence Model						
• Print	Yes	Yes	Yes	Yes	No	No
SECOND GENERATION - The Multi-media Model						
• Print	Yes	Yes	Yes	Yes	No	No
• Audiotape	Yes	Yes	Yes	Yes	No	No
• Videotape	Yes	Yes	Yes	Yes	No	No
• Computer-based learning (eg CML/CAL/IMM)	Yes	Yes	Yes	Yes	Yes	No
• Interactive video (disk and tape)	Yes	Yes	Yes	Yes	Yes	No
THIRD GENERATION - The Telelearning Model						
• Audio-teleconferencing	No	No	No	No	Yes	No
• Videoconferencing	No	No	No	No	Yes	No
• Audio-graphic Communication	No	No	No	Yes	Yes	No
• Broadcast TV/Radio and Audio-teleconferencing	No	No	No	Yes	Yes	No
FOURTH GENERATION - The Flexible Learning Model						
• Interactive multimedia online	Yes	Yes	Yes	Yes	Yes	Yes
• Internet-based access to WWW resources	Yes	Yes	Yes	Yes	Yes	Yes
• Computer mediated communication	Yes	Yes	Yes	Yes	Yes	**No**
FIFTH GENERATION - The Intelligent Flexible Learning Model						
• Interactive multimedia (IMM) online	Yes	Yes	Yes	Yes	Yes	Yes
• Internet-based access to WWW resources	Yes	Yes	Yes	Yes	Yes	Yes
• Computer mediated communication, using automated response systems	Yes	Yes	Yes	Yes	Yes	**Yes**
• Campus portal access to institutional processes and resources	Yes	Yes	Yes	Yes	Yes	**Yes**

Table 1: Models of Distance Education

Effective implementation of fifth generation distance education technology, which entails the automation of administrative and academic student support systems, is likely not only to transform distance education, but also to transform the experience of on campus students. Indeed, the automation of administrative and academic student support systems is likely to be the defining characteristic of higher education systems of the future.

5 5th Generation Distance Education: The Emerging e-University

The fifth generation model will not be presented solely as a set of abstract principles, but will be illustrated within the context of the e-University Project, which has been planned thoroughly and is now being implemented gradually at the University of Southern Queensland (USQ). It is worth noting that USQ was the joint winner of the Good Universities Guides' Australian University of the Year 2000-2001 for criteria focused on developing the e-university. The Award, presented by the Prime Minister at Parliament House in Canberra, focussed on the preparation of graduates of both undergraduate and postgraduate courses and the university as a whole for the emerging 'e-world': http://www.usq.edu.au/GUG2000.htm The e-University Project was conceptualized in terms of three fundamental foci: the e-Information repositories, a variety of e-Applications and the e-Interface respectively. A graphic overview of USQ's e-University Project is presented in Figure 1.

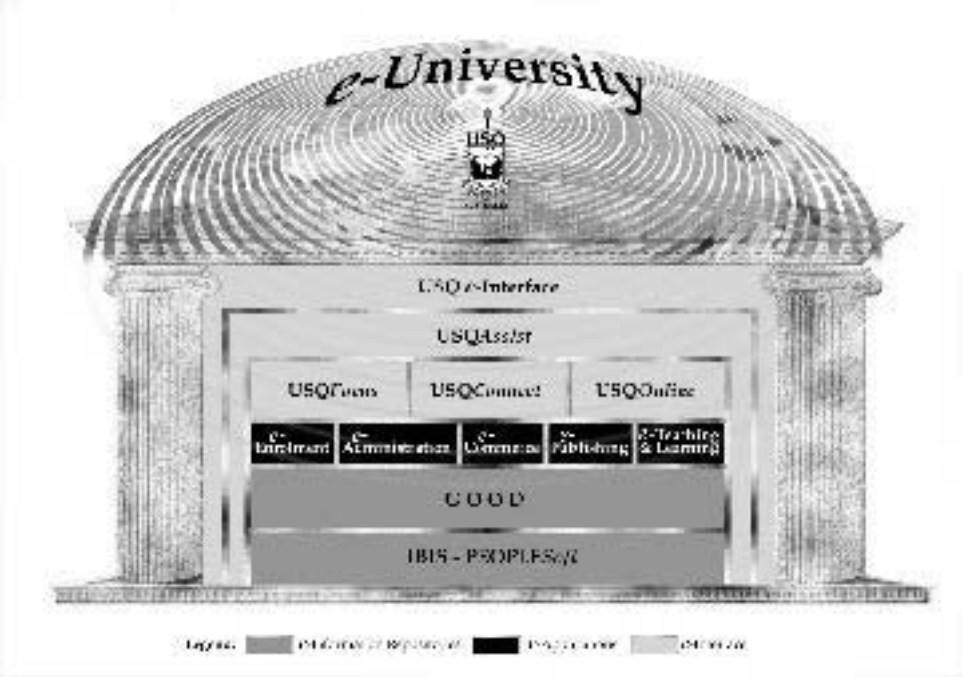

Fig. 1: Overview of USQ's e-University Project.

In mid-1999, USQ selected the PeopleSoft enterprise software to update its existing business systems, which required major updating both in scale and functionality. Implementation of the software was completed early in 2002. The continuing relationship with PeopleSoft will ultimately lead to the implementation of PeopleSoft Version 8.0, which is totally web enabled and therefore entirely consistent with USQ's strategic commitment to the e-University Project. Prior to the implementation of PeopleSoft 8.0, the existing system will provide an essential source of e-information in conjunction with the e-content management system at the heart of the Generic Online Offline Delivery (GOOD) Project, an application developed locally at USQ.

In essence, the e-content management system incorporated in the GOOD Project enables cross-media publishing from a single document source. This means that USQ is able to make courseware available to students in a variety of delivery modes (print, online, CD, DVD, etc.) from a single document source. At the core of the GOOD cross-media production system is a content management system, which provides an integrated document management, workflow and content editing environment. Further, the cross-media publishing process has been automated through the use of standard markup languages. The GOOD project is gradually enabling USQ to replace its resource intensive proprietary production system for courseware with a single document source system based on the XML (Extensible Markup Language) standard. XML-tagged courseware documents are structured within consistent, comprehensive parameters with the substantive content and structure able to be treated discretely from layout and presentation. The document layout is generated by applying XSL (Extensible Stylesheet Language) to the XML-tagged content. While initially focusing on the cross-media production of courseware and the University Handbook, in time, the GOOD system is gradually being applied to numerous other applications across practically every section of the University, including the cross-media publication of Course Information, Admissions and Enrolment documentation and the like.

While the GOOD system provides a critical foundation for the efficient development and delivery of courseware, it also provides an integral "engine" for the provision of a range of e-applications including e-Enrolment, e-Administration, e-Commerce, e-Publishing and not least e-Learning. While the scope of the present paper does not allow for detailed descriptions of all of these e-applications, a more elaborate view of the approach to learner relationship management and e-learning at USQ is warranted, since these activities have major implications for the use of technology to automate certain aspects of interaction with students, ultimately improving cost-effectiveness, reducing the cost to students and potentially increasing access to higher education on a global scale.

6 Learner Relationship Management

The USQ*Assist* initiative is deploying tracking and automation tools to manage the interaction between the University and both its existing and prospective students. As USQ already has a need to provide global learning services to students enrolled in more than 60 countries, the University has to face the challenge of being responsive to client needs 24 hours per day, 7 days per week. The most efficient, cost–effective way to manage the 24 x 7 challenge is to deploy effective automation tools, as opposed to running three shift student service desks or employing online tutors in different continents (although USQ already does the latter). The aim of such a system is to provide effective and efficient service to existing and prospective students at minimal variable cost.

When the project was initiated in late 1999, there were 13 toll free telephone numbers and numerous help desk facilities offered by various sections of the University. Each of these services provided a valuable service and collected some useful information, but

there was no systematic recording and processing of enquiries that would enable USQ to be more responsive to satisfying student needs.
The deployment of e-Customer Relationship Management (e-CRM) software (referred to by Milliron and Miles [MM00] as "Learner Relationship Management" (p.60) also known as e-care or e-service) will ultimately enable the use of a single toll free number integrated with an email–based enquiry tracking system that will exploit the fundamental strengths of the Internet in enhancing communication and managing information. Using structured, intelligent databases, the knowledge generated by solving student problems/enquiries is being progressively stored and made available so that, wherever possible, students with equivalent or similar problems can have their enquiries dealt with immediately through the self-help, automated response capacity of the USQ*Assist* system, thereby facilitating effective first point of contact resolution (Fig 2).

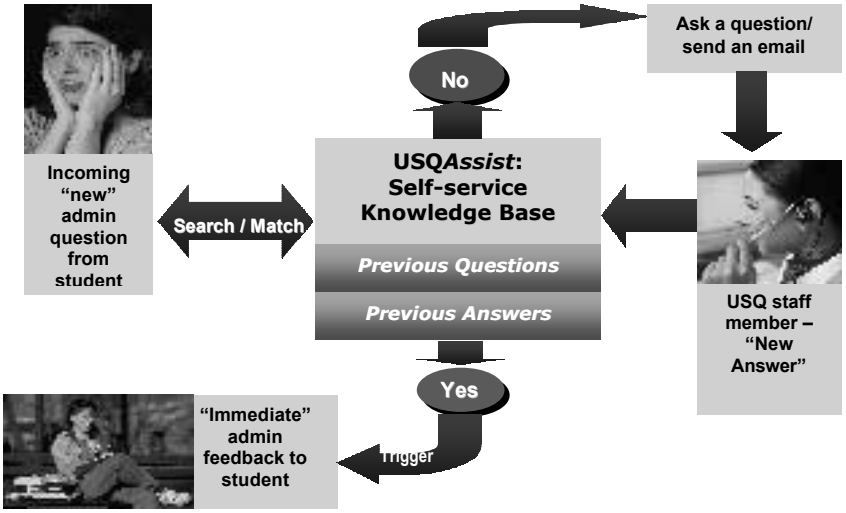

Fig. 2: Schematic Representation of USQ*Assist*

As the dynamic knowledge databases become more comprehensive, enabling personalized, immediate responsiveness to an increasing number of student queries, the institutional variable costs for the provision of effective student support will tend towards zero. The effective use of such technology not only improves the responsiveness of the institution, but also frees up student support personnel to provide personal assistance via email dialogue or telephone as necessary. Further, every interaction is tracked from initiation to resolution, including flexible routing of enquiries based on explicit rules-based escalation protocols to ensure timely and successful responsiveness, and subsequent statistical reporting of system performance. Tracking interactions with prospective students enables the collation of the effectiveness of institutional marketing strategies, an increasingly important strategic issue for universities in the emerging global learning economy, which demands a highly effective public e–Interface with the University.

An associated learner relationship management feature of the fifth generation model is the development of a customizable e-Interface, a campus portal through which students, staff and other stakeholders can engage with the university in a highly interactive and compelling manner. In Norris' [No00] terms, a well designed campus portal will engender "pervasive, perpetual interactivity "(p.6), which will enable universities to provide such efficient service to students that it is likely to build effective, enduring relationships that could last a lifetime. To be successful in the emerging global lifelong learning market, a university needs to create a campus portal that will achieve a degree of interactivity, user friendliness and personalization that does not exist in the vast majority of campus web sites today. The USQ e-interface is being developed through the application of a web services approach [Do02]. The implementation of the approach has entailed the creation of an Internet Systems Design, Development and Integration Team, and an Online Systems Technical Management Committee (OSTMC).

The OSTMC also provides a useful forum to support the implementation of USQ's on campus wireless networking initiative http://www.usq.edu.au/its/wireless This part of the strategic plan emerged from concerns expressed by on campus students that they were becoming increasingly disadvantaged by lack of sufficient access to online resources and services, since the computing laboratories were devoted primarily to the teaching of specialized software applications, often requiring access to "high powered" hardware and software. USQ is now in the second phase of the project, wherein funding has been allocated to enable the installation of wireless hubs that will ensure access to the Internet from about 90% of on-campus locations. The initial successful wireless hub trial conducted in 2000 provided wireless access to the Internet from the Library, the Refectory and the Distance Education Centre. Students gained access to the Internet through laptop computers fitted with a wireless card, providing access at 11Mb using IEEE 802.11b wireless standards. This freedom to have access to the Internet from virtually anywhere on campus is a key feature of providing access to online courseware and services to all students whether on or off campus. The key to the success of such initiatives is, of course, detailed execution and associated, institution-wide organizational development strategies with the aim of ultimately enabling the automation of online teaching and learning support systems.

7 Automating e-Learning

How does it work? In the USQ approach, many teaching staff make use of discussion groups, which entail students posting "reflections" via the asynchronous computer mediated communication (CMC) system. The teaching staff also post comments, which are aimed at engendering student engagement and ensuring that the focus and depth of the online threaded discussions are appropriate to achieve the learning outcomes. In the same vein, members of the teaching staff respond to student questions posted to the discussion group. These contributions are often quite complex and typically serve to enhance the quality of interaction. Development of a detailed response to a searching student query naturally takes time. A positive feature of the system is that the communication is on a "one-to-many" basis, so that all students may benefit, not just the one who asked the initial question. Further, our experience demonstrates that other

students often comment on the issues raised thereby enriching the depth and quality of the dialogue. The value of these contributions is particularly useful where students are giving examples of applications in different cultural contexts. Such interactions may take place in conventional classroom settings, but the difference is that they are ephemeral and not documented for detailed reflection as they are in the CMC system.

At present, the effective use of CMC is presently constrained in an important way. It is still a function of what Daniel [Da99] recently referred to as the "cottage-industry model", which entails the traditional working practices of universities, wherein the same academic staff member usually does everything, including teaching, providing academic support and assessment for a group of students. In effect, the current applications of fourth generation Internet-based delivery tend to generate resource allocation models similar to tutorial-based on campus teaching. Indeed, it is still a fear of many academics initiating an online teaching program that they will be overwhelmed by email requesting support from individual students. While such fears can be allayed by the use of "one-to-many" communication systems such as bulletin boards, mailing lists and threaded discussions, the underlying resource model is not significantly different from conventional on campus teaching, with a staff member being necessary to manage groups of approximately 20 students to maintain a reasonable quality of interaction and academic support. In contrast, the fifth generation Intelligent Flexible Learning Model has the potential to deliver major economies of scale in managing teaching and academic support through the exploitation of automated response systems (Fig 3).

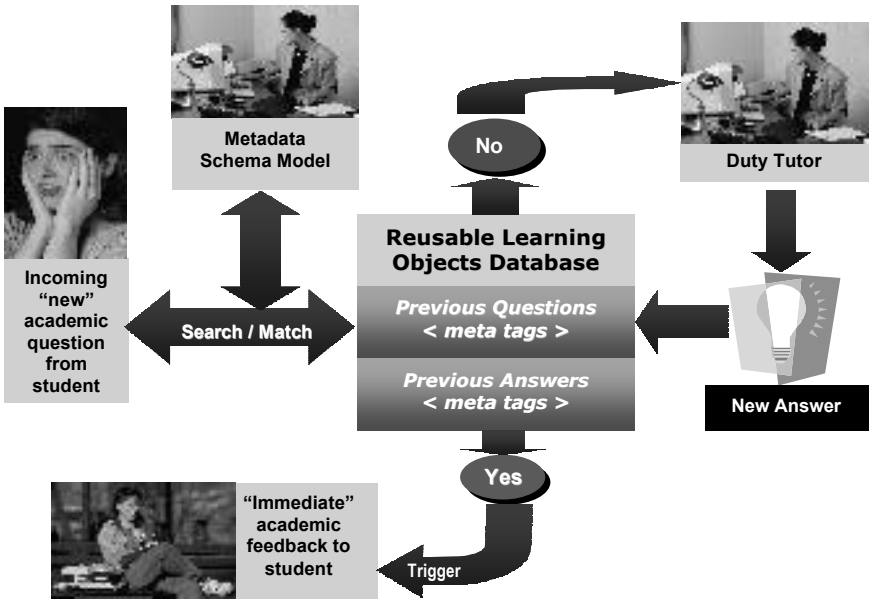

Fig. 3: Schematic representation of USQ's 5th Generation Academic Productivity Enhancement System

Our work at USQ has reached the point, where we have tested the 5th Generation Academic Productivity Enhancement prototype. Upon receipt of an electronic query

from a student, the staff member references the incoming question to a metadata schema model which has been devised for the course in question; the search engine then seeks an appropriate match with a previously asked question, which if successful, triggers a potential range of answers to the current question without further human intervention. At this stage of development, the design of the system entails a tutor checking the validity of the match between the current question and the answers generated from the database before forwarding to the students with a single click of the mouse. Such a quality control mechanism may become redundant in the future. If no appropriate match is discovered in the database of previously answered questions, the query is automatically routed to the relevant tutor for an appropriate response, which is then added to the database with a single point and click. Depending on the pedagogical design of the course, these responses can be directed to the whole cohort of students, to groups of students, or to individuals. The system has the advantage of providing more-or-less immediate pedagogical advice to students, a significant increase in institutional responsiveness, at minimal variable cost. It is worth noting that this system is not just aimed at reducing costs, USQ has a research program producing empirical evidence aimed at to validating the potential pedagogical efficacy of the approach, as illustrated by the following brief discussion of underlying instructional design theory and an associated exemplary investigation.

8 Pedagogical Underpinnings of 5th Generation Distance Education

New technologies are often used in ways that are strongly influenced by the dominant extant pedagogy, referred to by Laurillard [La02] as the traditional transmission model: "The academic world has called each new technological device – word processing, interactive video, hypertext, multimedia, the Web-into the service of the transmission model of learning" (p. 20). This tendency is evident in many examples of online teaching in which lecture notes, possibly supplemented by PowerPoint slides, are often equated with e-Learning to the disgust of the instructional design intelligentsia, who want to emphasise the socio-cultural, constructivist dimensions of online education through the extensive use of mechanisms for synchronous and/or asynchronous communication available via the Internet. The opportunity for online teaching and learning to enhance pedagogical efficacy through a move from the transmission model to the transaction model has yet to be realised on a wide scale.

Using the Internet as a mode of delivery will not automatically improve student learning. In efforts to determine an appropriate approach to online teaching and learning, there is a need to acknowledge the importance of the complex interplay of different epistemologies, modes of thinking and associated types of subject matter in different academic disciplines, different educational objectives for courses of study, and not least the extant levels of expertise of the student target audience. It is clear that significant differences in online pedagogical approaches will be necessary for K-12, undergraduate, postgraduate and continuing professional development students. A detailed discussion of all of these issues is beyond the scope of the present paper, which will concentrate only on postgraduate/continuing professional development, an application of online teaching and learning that has proven to be particularly efficacious at the University of Southern

Queensland (USQ). Pedagogical considerations will be illustrated through reference to Course FET8601 ("Teaching Online") that is part of USQ's Master of Online Education degree. It is worth noting that Course FET8601 does not entail a hybrid combination of delivery modes, but is available solely and entirely online.

In Course FET8601, the essential features of the pedagogical environment (which will be demonstrated during the Conference presentation) support a learning process that is interactive, non-linear and collaborative. These features include the use of an interactive study chart as a basic navigational tool, which sets the broad parameters of the subject matter content to be investigated, and lists a number of exemplary references. References are electronic and hot linked via specific URLs. Additionally, the students are free to surf the Web for supplementary teaching-learning resources that meet their specific needs. The interaction with courseware materials is, however, only one element of the interactivity built into the USQ pedagogical approach. Interaction with other students, teaching staff and other experts, who act as mentors, is achieved through the use of CMC, primarily through the deployment of asynchronous discussion groups. Students are encouraged, and at times required, to communicate through various electronic discussion groups, established for specific content areas as well as for informal social interaction. Central to this approach is the effective use of asynchronous CMC as the mechanism for facilitating effective social and intellectual engagement among participants.

It is worth noting that there is a qualitative difference between a traditional on-campus tutorial (real-time verbal communication) and computer conferencing (asynchronous written communication) with the reflective and precise nature of the latter being very different from the spontaneous and less structured nature of oral discourse in either a face-to-face, videoconference or audio teleconference context. As Garrison [Ga97] highlighted, "The reflective and explicit nature of the written word is a disciplined and rigorous form of thinking and communicating ..... it allows time for reflection and, thereby, facilitates learners making connections amongst ideas and constructing coherent knowledge structures" (p.5). Computer conferencing is therefore not just another technology; it has the potential to shift the emphasis in distance education from the essentially independent learner of the Correspondence Model to the interdependent learner of the Flexible Learning Model. This fundamental shift highlights the potential for ongoing meaningful social engagement among students, an approach consistent with such theorists as Brown and Duguid [BD00], who emphasised the importance of regarding learning as a social act: "Practice is an effective teacher, and community of practice an ideal learning environment" (p.127).

Facilitating the meaningful engagement of students in a reflective community of practice provided the essential theoretical orientation of the pedagogical approach adopted in Course FET8601. This orientation is consistent with the pedagogical framework developed by Hung and Chen [HC01], who delineated a number of web-based design principles derived from an analysis and synthesis of the literature on learning through participation in communities of practice [BCD89], Vygotskian thought [Vy78], [Vy81] and situated cognition [LW91]. Lave and Wenger [LW91] emphasised the importance of the social context in which the learner is immersed, and learning as legitimate peripheral participation in a community of practice. In the online context, "legitimate peripheral

participation" in general parlance has become associated with the term "lurker", which is defined as one of the "silent majority" in an electronic forum; one who posts occasionally or not at all but is known to read the group's postings regularly (The Jargon dictionary, 2002). Is learning through peripheral participation really legitimate? Do students actually learn from peripheral participation in online communities of practice?

There is clearly a significant opportunity for theory development and associated empirical research in this area. One of the benefits of conducting research in an online environment is the record keeping functionality of many web-based applications, including the learning management system used by USQ. The course statistics collected can be a rich source of data for empirical research related to the generation of participation profiles that track the engagement of students and staff in online teaching and learning environments. For example, a review of selected descriptive statistics associated with the teaching of Course FET8601 can generate insight into the peripheral participation issue, while at the same time providing a useful perspective on the demands on the teacher to facilitate the engagement of students in the social construction of knowledge through meaningful participation in the discussion forum.

9 Empirical Evidence

A general overview of the interactions generated by 43 students and two staff members in Course FET8601 throughout Semester 1, 2001 (a period of 16 weeks) demonstrated that communication between people accounted for approximately 75% of the interactions, whereas gaining access to study materials constituted about 25% of the interactions. These statistics also demonstrated that the cohort of students made the most of the flexibility of online learning opportunities by accessing the site throughout the semester each day of the week, and every hour of the day - a genuine 24 x 7 operation.

As a simple starting point, it is possible to represent the "General Engagement Ratio" between teaching staff and students as a simple ratio of approximately 1:8, with the teaching staff constituting 11.4% of total interactions with the website and students the remaining 88.6%. The meaningfulness of these interactions would, of course, require a more granular, qualitative analysis, whereas the present paper is concerned primarily with gaining insights from a quantitative perspective.

A major pedagogical feature of Course FET8601 is required participation in the Discussion Board, including the posting of at least two reflections, and one critique of the work of other students. Such asynchronous communication underpins the "Community of Practice" instructional design rationale of the course. From this perspective, it is also possible to compute the "Asynchronous Communication Engagement Ratio" (the ACE ratio), a potentially useful indicator of meaningful participation in the online teaching–learning environment. In the present course context, the teaching staff reviewed the Discussion Board on 1246 Occasions (Course leader: 782, Tutor: 464) a total of 18.96% of all hits, compared to the students, who visited the Discussion Board on 5324 occasions (81.04%), an ACE ratio of approximately 1:4. An analysis of the number of actual messages posted to the Discussion Board demonstrates that staff contributed 271 postings

(25.4%) compared to 796 postings (74.6%) by students, a ratio of approximately 1:3. Such descriptive statistics provide an interesting point of departure for a more detailed analysis of different patterns of student participation in online learning.

10 The Workers, The Lurkers and The Shirkers

A more granular analysis of participation in the Discussion Board provided useful evidence on peripheral participation by examining the number of times individuals accessed the Discussion Board and the number of times individuals actually posted contributions to the forum. Following an analysis of various participation profiles, the total group was divided into the following three sub-groups that differed in terms of their participation patterns in accessing, and contributing to, the Discussion Board: the Proactive Participation Group (N = 14), the Peripheral Participation Group (N =17) and the Parsimonious Participation Group (N = 12) respectively. Such differentiation between student sub-groups was relatively arbitrary, but was based on genuinely distinctive participation profiles. For example, the Proactive Participation Group ("The Workers") contained students who contributed an above average number of postings to the Discussion Board and also visited that part of the site regularly. These students were continuously involved in discussions and were often among the first to post a message, and to respond quickly to other messages, thereby creating "threads" of ongoing dialogue between students. In contrast, the Peripheral Participation Group ("The Lurkers") included students who contributed less than the average number of postings to the Discussion Board, but at the same time participated regularly in the discussion in "read only" mode. Finally, the Parsimonious Participation Group ("The Shirkers") contributed only one third of the average number of postings or less to the Discussion Board, and similarly visited this part of the site on less than fifty percent of the group average.

Did these extremely variable patterns of participation prove to be useful predictors of academic performance? As an initial indicator of the value of pursuing this question in a more inferential manner, the descriptive statistics providing an overview of participation and performance for workers, lurkers and shirkers respectively are presented in Tables 2, 3 and 4.

Participant No.	Gender	Age	Country of Birth	Discussion Board	Post Message	Study Material	Total Inter-actions (hits)	Grade
6	M	29	Germany	196	20	11	787	A
7	M	57	Canada	523	49	40	1200	B
10	M	39	USA	83	30	30	299	B
12	F	41	UK	96	35	36	404	C
13	F	44	Australia	126	21	30	410	B
14	M	46	New Zealand	325	179	47	992	A
16	M	43	Canada	93	24	87	476	A
18	F	38	Canada	102	28	49	349	B
21	F	48	Australia	136	30	39	492	B
22	F	37	Australia	321	20	34	951	A
35	M	43	Australia	184	26	44	652	B
38	M	50	Australia	267	23	30	817	HD
42	M	41	Australia	105	31	22	521	B
43	F	44	Australia	141	19	47	554	A
			Totals	**2698**	**535**	**546**	**8904**	
14 participants: 33% of cohort								

Table 2: Proactive Participation and Performance in Online Teaching and Learning (The Workers)

Participant No.	Gender	Age	Country of Birth	Discussion Board	Post Message	Study Material	Total Inter-actions (hits)	Grade
1	F	49	Scotland	153	14	28	759	A
3	F	25	Australia	80	13	28	401	A
9	M	32	Canada	81	9	16	324	A
11	F	49	Australia	191	17	26	532	B
15	F	56	Philippines	182	12	33	648	B
17	M	43	Canada	218	17	78	1019	A
19	M	43	Australia	185	16	45	407	A
20	F	33	Australia	113	8	47	720	B
24	F	46	Australia	180	8	32	729	C
26	M	35	Australia	57	16	16	265	A
28	F	29	Malaysia	39	7	16	169	C
29	F	41	Australia	83	15	29	406	HD
32	M	30	Australia	131	14	26	552	B
33	F	50	Australia	250	9	49	581	B
36	F	31	China	142	13	34	700	A
37	M	43	Australia	33	8	23	235	B
41	F	31	Australia	81	17	33	376	B
			Totals	**2199**	**213**	**559**	**8823**	
17 participants: 39% of cohort								

Table 3: Peripheral Participation and Performance in Online Teaching and Learning (The Lurkers)

Participant No.	Gender	Age	Country of Birth	Discussion Board	Post Message	Study Material	Total Inter-actions (hits)	Grade
2	F	41	Australia	31	6	13	203	B
4	F	42	Australia	16	3	45	153	F
5	F	52	Australia	81	6	33	411	B
8	F	37	Australia	10	4	3	25	IDM
23	M	43	USA	20	3	4	52	IDM
25	F	55	UK	30	3	48	268	IDM
30	M	34	Malaysia	23	1	26	91	IDM
31	F	29	Philippines	86	4	25	293	IDM
34	M	28	Australia	40	4	27	343	B
29	M	39	Australia	42	6	60	383	B
40	F	44	Australia	36	5	81	310	IDM
44	F	22	Australia	12	3	26	111	IDM
			Totals	**427**	**48**	**391**	**2643**	
12 participants: 28% of cohort								

Table 4: Parsimonious Participation and Performance in Online Teaching and Learning (The Shirkers)

A generic overview of the participation and performance of the three sub-groups is presented in Table 5.

Student Sub-Groups	Average Number: Discussion Board Hits	Average Number: Messages Posted	Average: GPA
The Workers	193	38	5.43
The Lurkers	129	13	5.41
The Shirkers	36	4	4.30

Table 5: Overview of Participation and Performance

11 Discussion

The instructional design rationale of the present exemplary investigation, which was based primarily on the principles of situated cognition, appears to have engendered meaningful engagement in a professional community of practice for the majority of the postgraduate student target audience. It is clear, however, that there were quite different patterns of student interaction, which seem to be related to performance. The 14 workers (Proactive Participation Sub-group) attained an average GPA of 5.43, while the 17 lurkers (Peripheral Participation Sub-group) attained an average GPA of 5.41. Significantly, 7 of the 12 shirkers (Parsimonious Participation Sub-group) did not complete their assessment, while the remaining five achieved an average GPA of 4.3. Given that the academic performance of the lurkers was on average not much less than that of the workers, it seems reasonable to suggest that the notion of learning through legitimate peripheral participation is indeed efficacious. Further, the apparent efficacy of learning as legitimate peripheral participation reflected in the success of the lurkers in the

present case study augurs well for the use of USQ's 5th generation academic productivity enhancement system, and ultimately online teaching facilitated (perhaps solely) by intelligent reusable learning objects' databases.

12 Conclusion

In many universities the development of web-based initiatives is not systemic, but is often the result of random acts of innovation initiated by risk-taking individual academics. In contrast, the implementation of the e-University Project at USQ is strategically planned, systematically integrated and institutionally comprehensive. At USQ, the move to the online environment was a natural step for an institution with a history of almost 25 years of commitment to innovation in distance education. The increasingly central role of web-enabled information and communications technologies in USQ operations is supported by an organizational culture capable of sustaining innovation on a corporate, rather than individual, basis. USQ's institution-wide approach reflects one element of the corporate mission statement: "To be a leader in flexible learning and the use of information and communications technologies".

As a case study, the USQ experience exemplifies the institution–wide corporate approach necessary for an organization to become "fast, flexible and fluid" as it strives to develop the capacity to implement fifth generation distance education. The fifth generation (Intelligent Flexible Learning Model) of distance education, incorporating the use of automated response systems and intelligent reusable learning objects' databases in the context of Internet-based delivery, has the potential to provide students with a valuable, personalized pedagogical experience at noticeably lower cost than traditional approaches to distance education and conventional face-to-face education.

While previous generations of distance education are essentially a function of resource allocation parameters based on the traditional cottage industry model, the fifth generation based on automated response systems has the potential not only to improve economies of scale but also to improve the pedagogical quality and responsiveness of service to students. If this can be achieved on a sufficiently large scale, then tuition costs can be significantly lowered, thereby engendering much greater access to higher education opportunities to many students throughout the world, who presently cannot afford to pay current prices. In effect, fifth generation distance education is not only less expensive, it also provides students with better quality tuition and more effective pedagogical and administrative support services. In the context of the emerging global lifelong learning economy, the fifth generation is likely to be irresistible to students, politicians and the business community alike. The Intelligent Flexible Learning Model based on the judicious deployment of automated response systems is the inexorable future of higher education.

Bibliography

[BCD89] Brown, Collins & Duguid (1989). "Situated cognition and the culture of learning", *Educational Researcher*, 18, 1, 32-42.

[BD00] Brown JS & Duguid P (2000). *The social life of information*. Cambridge, MA: Harvard Business School.

[Ca97] Cairncross, F (1997). "The death of distance". In O. Morton, (Ed.), Exploiting the Information Age. London: Profile Books.

[Da99] Daniel, J (1999). "Distance learning in the era of networks: What are the key technologies?" Paper presented at the Pan Commonwealth Forum on Open Learning, Brunei, 1-5 March.

[Do02] Dobson, P (2002). Web Services. Internal University of Southern Queensland Report, USQ, Australia.

[DN95] Dolence, MG & Norris, DM (1995). "Transforming Higher Education: A Vision for Learning in the 21st Century". Society for College and University Planning (SCUP), Ann Arbor, MI.

[Du01] Duderstadt, JJ (2001). "Leading Higher Education in an Era of Rapid Change." Presentation at the Midwestern Higher Education Commission, Kansas City, USA, November.

[Ga97] Garrison, R (1997). "Computer conferencing: The post-industrial age of distance education". Open Learning, 12, 2, 3-11.

[Ha98] Hayes, H (1998). "Models for scholarly publishing in the 20th century". Online-Ed, 22 May.

[HC01] Hung, D.W.L & Chen, D. (2001). Situated Cognition, Vygotskian Thought and Learning from the Communities of Practice Perspective: Implications for the Design of Web-Based e-Learning. Education Media International. 38,1,4-12.

[La02] Laurillard D (2002). "Rethinking teaching for the knowledge society". Educause Review, January/February.

[LW91] Lave J & Wenger E (1991). Situated Learning: Legitimate Peripheral Participation. Cambridge: Cambridge University Press.

[MM00] Milliron, MD & Miles, CL (2000). "Education in a digital democracy: Leading the change for learning about, with, and beyond technology." Educause Review, November/December.

[No00] Norris, DM (2000). "E-Business and Higher Education Marketplaces". Strategic Initiatives, Inc.

[Qu01] Quinn, JB (2001). "Services and Technology: Revolutionizing Economics, Business and Education". Educause Review, 36, 4.

[Su34] Schumpeter, JA (1934). "Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle". USA: Harvard University Press.

[Ta95] Taylor, JC (1995). 'Distance education technologies: The fourth generation'. Australian Journal of Educational Technology, 11, 2, 1-7.

[TKB93] Taylor, JC, Kemp, JE & Burgess, JV (1993). Mixed-mode approaches to industry training: Staff attitudes and cost effectiveness. Report produced for the Department of Employment, Education and Training's Evaluations and Investigations Program, Canberra.

[Vy78] Vygotsky, L.S. (1978). Mind in Society. Cambridge, MA: Harvard University Press

[Vy81] Vygotsky, LS (1981). "The development of higher mental functions". In Wertsch, JV (Ed), The Concept of Activity in Soviet Psychology. New York: Sharpe.

[Wo97] Woodall, P (1997). "Making waves". In O. Morton, (Ed.), Exploiting the Information Age. London: Profile Books.

[YS98] Yergin, D and Stanislaw, J (1998). The Commanding Heights: The Battle Between Government and the Marketplace that is Remaking the Modern World. UK: Simon & Schuster.

Electronic References

[The Jargon Dictionary: http://info.astrian.net/jargon/]

http://www.cyberatlas.internet.com

http://www.geteducated.com

http://www.uwex.edu/disted/desites.html

http://www.distance-educator.com

www.dlcoursefinder.com

http://www.usq.edu.au/GUG2000.htm

http://www.usq.edu.au/its/wireless