Distributed Multimedia University: From Vision to Reality

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Abstract

Within decades, the emerging Distributed Multimedia Technology (DMT) will cause major changes in the global economy and in the social and political structures. The inevitable metamorphosis of the 'knowledge industry', which schools and universities are part of, should be particularly dramatic. Short-term economic arguments suggest that the physical and administrative structures defining institutions of higher learning today may soon become redundant as knowledge becomes a fluent commodity for 'just in time' delivery. Opposing this trend is the considerable inertia of the educational system, its internal power structures, and the limited technological knowledge of the educators. Calling for moderation are also theoretical arguments representing traditional academic and moral values.

Keywords

information, infrastructure, multimedia, society, policy, university

1. Introduction

"For the last twenty years, the cost of computing and telecommunications has dropped by 25% per annum. At the same time, the capacity of computer hardware has increased by a factor of four every two years." (Tegart, 1993, p. 38). In the early 90's, the PC has reached the point of being able to process sound and image in real time, starting the age of (personal) multimedia computing. Within a decade or so from now, several national optical fibre networks, the 'information superhighways', will have been laid. Japan, for example, anticipates the "completion of the nationwide optical fibre network by 2010" (PACIS, 1995, p.10), and, in Australia, Telstra alone expects to have wired 4 million households by the year 1999. Meanwhile, the global software industry with Microsoft at the helm, has begun to prepare for this new environment. The much-publicised recent release of Microsoft Windows 95, a new 32 bit PC operating system, focused more on Microsoft's commitment to the superhighway than on the product itself.

These technologies of electronic processing, storage, and communication of data, together supporting global multimedia software applications, provide a technological infrastructure for the emerging global 'information society'. In the context of learning, this infrastructure traditionally goes by names like Interactive Multimedia Technologies (IMT), which are then thought to provide Distributed Multimedia Learning Environments (DMLE) (Pea and Gomez, 1992). To emphasise its global nature and remove the *a priori* focus on learning, a technology-dependent concept, we call it simply Distributed Multimedia Technology (DMT).

The present note offers a perspective on the anticipated impact of DMT on higher education. First, Section 2 relates four common technological views of future 'university learning'. Section 3 then puts the technological vision into the global context of information society models. Finally, in Section 4, the theoretical discussions are brought down to the floor of the university of today.

2. Technological visions

It is usually not hard to think of technological implications of a new technology, as opposed to its economic, social, or other impact. It is easiest to think of the familiar technologies which the new technology replaces. One observes, for example, that electronic data storage may replace paper, celluloid film and magnetic tape, and that telecommunications may render a post office or a video store, redundant. These new technologies give us the Internet, which is not hard to think of in technological terms, even if have little understanding of its potential social impact. Questions such as: how big can the Internet grow? how will it impact scholarly communication patterns? (Mulvaney and Steele, 1993) may have no obvious answers but are tractable if interpreted technologically. One may, for example, generate technological visions of Future University Learning (FUL) in the presence of the Internet. These are not predictions of things to come, but technologically feasible hypothetical scenarios.

2.1 FUL of the 1st kind: business (almost) as usual

This is the university of today where DMT merely enhances traditional educational activity. The 'electronic collaborative classroom' (Marjanovic *et al.*, 1995) and its future multimedia versions, the Computer Aided Learning (CAL) (Cochrane *et al.* 1993; Darby, 1994) and the 'virtual university' projects (Ring and Ring, 1994), are among the early birds of the technology. Notable is the New Media Centers Initiative, a joint industry and academia program in the USA, and reportedly (THE Journal, 1994) expected to involve one hundred university centres worldwide by 1996. The rate of implementation of DMT in the universities is generally not as fast as the technology would allow. Many institutions lack basic multimedia infrastructure such as a campus-wide high-speed data communication network. However, where there is a will (and resources), there seems to be a way, and numerous campus networks are now successfully in use (Reinhardt, 1995).

2.2 FUL of the 2nd kind: the virtual university

Here, students sit in electronic classrooms, access electronic libraries, prepare electronic papers, and pass electronic exams. Educators still teach, mark, certify and administrate, only electronically. This model essentially replicates the old ways with the new technology. This is not unlike thinking of the electronic computer as a very fast abacus. Pushed to the limit, this thinking leads to full Virtual Reality, where, if you are not careful, you could in principle (MBR, 1994) propel yourself back to the stone age by putting on a thinking cap. In Australia's cities, the basic technological infrastructure for the virtual university should be in place by the year 2000. While conceptually fairly straightforward, the task of developing the software and the knowledge bases for this form of university would be daunting and could take decades to implement. Meanwhile, more flexible forms of learning would be likely to take over.

2.3 FUL of the 3rd kind: the seamless learning

This is essentially FUL2 minus its university structure (Kollerbaur, 1995). Knowledge is now a commodity for 'just in time delivery' (Merrill, 1995; Strouver and Bryant, 1987). Anybody can learn anything anytime. The learning happens 'naturally' through interaction with multimedia knowledge structures. The learner's 'knowledge', or rather, the learner's ability to use knowledge repositories for any particular purpose, can now be assessed by the system itself, if so required. Educators are still there to provide guidance, but are mostly busy developing new ways of presenting knowledge.

Technologically, only the software and the structure of its knowledge bases separate FUL2 from FUL3. The seamless learning could be well with us by the year 2010.

2.4 FUL of the 4th kind: the personal electronic mentor

We now add lots of artificial intelligence. The 'student' has now an all-knowing personal mentor, who guides her / him through life. This line of thinking gets psychedelic pretty quickly, with all the usual philosophical pitfalls of AI (Boden, 1990): our conceptual and moral values are actually technology-dependent! We already have prototypes of the 'electronic butler', and the ultimate electronic mentor will remain science fiction for decades to come. Its intermediate versions will develop gradually as AI develops (Hayes-Roth, 1995).

2.5 Meanwhile, in the universities...

What is the FUL-sight of academics today? Taking their present use of the technology as indicator, it seems to lie somewhere between zero and 2.5 on the FUL-scale. On the one hand, Tegart (1993, p. 47), reports a statement that "seventy per cent [of people in the arts] are scared stiff and are just standing waiting on the sidelines. There is a whole generation of people who would prefer to sit out their time without having to learn all this new stuff." On the other hand, physicists (Taubes, 1993) and mathematicians (AMS, 1995) already have made the Internet the dominant medium for their professional communication. On the whole, it is hard to say how much academics know about the DMT and how do they see themselves affected by its proximity. Some investigations could be in order here.

3. The big picture

How realistic are the technological visions of future learning? Would they be compatible with the visions of future commerce, industry, research, or culture? This is a typical 'systems' problem: the society needs to be modelled as a whole, in order to draw conclusions for its educational subsystem. Such thinking is not new. The classical visions of Wiener (1967) have developed into studies of the 'information society' (Martin, 1988; Saxby, 1990) and its subsystems such as economics (OECD, 1987;1991), and, indeed, higher education (Strouver and Bryant, 1987).

3.1 National information infrastructures and technology strategies

With the 'information superhighway' in sight, there is increased sense of urgency to develop national information technology policies (PACIS, 1995) and increased general interest in global information technology issues. For example, in its 1992 report "R & D Basic Plan on SOFT Science and Technology (SST)" (Kijima, 1995), the government of Japan promotes a new discipline, the "SOFT Science and Technology for human beings and society". Indeed, there exist now well-tested methods of operational analysis to study social systems, identifying, in particular, the actors in a game and their various interests and relationships. To our knowledge, however, no such analysis of higher education has ever been made. This is not to say, to take the example of Australia and New Zealand, that there is shortage of government policy documents on education in general (Sallis and McMahon, 1995) or on its information technology related fields (Hudson, 1992).

3.2 Education in the information society

There is no doubt that we are in for big changes. Quoting Sallis and McMahon (1995, p. 14): "Information technology changes forever the 'knowledge game'. It continues to change as 'information superhighways' and multimedia technologies provide ever greater access to knowledge bases.... Instant access to all of the world's knowledge renders the traditional transmission paradigm completely redundant." It is, however, not at all clear what new paradigm should replace the old one.

While many investigate *how to learn with technology?*, alarmingly few ask: *what to learn, given the technology?* and almost no one questions the very *role of learning* in the information society. The present higher education system evolved in a fairly static environment, with its (roughly) five year education cycle only allowing feed-back delayed by five to ten years. Such structure is fundamentally unsuitable in a time of information revolution, and the current 'quality assurance' and 'flexible learning' measures could well be bandaids on a dinosaur.

3.3 The economics of information

Information, whence also knowledge and skills of individuals, has economic value and is therefore subject to market forces. Quoting Strouver and Bryant (1987, p. 81): "For the university ... perhaps the most important aspect of the information revolution is that information itself is increasingly endowed with market value. As a major producer of information, the university is beginning to face serious competition from private producers of information." See also (Cochrane *et al*, 1994) for a related discussion in the Australian context. In fact, information has always had market value but the emerging technology removes the previously considerable physical constraints on its representation, making it now into a commodity for 'just-in-time' delivery (Reinhardt, 1995). Private education providers such as the J3 Learning company are rapidly responding to this fact (J3 standing for "Just in time, Just enough, Just where you want") (Merrill, 1995). The commodity argument speaks in favour of economic feasibility of the FUL3 seamless learning model. This model, however, needs no university structure! Lo and behold, the 'learning' as we know it has now disappeared as well! Remember, the DMT resource is now a global knowledge repository structured for interactive, self-paced access. Eventually, also the certification of knowledge by university degrees may be hard to justify, once the employers are able to assess the applicants' suitability for the job simply by subjecting them to a suitable test on the DMT network!

Countering this vision of impending doom of the university learning are two arguments, one economical and one moral in nature. The first one is that the market forces are local and thus myopic, and the university and its graduates should show the way rather than follow orders. To satisfy 'industry needs' one first needs to know what these needs are, and, as any salesperson can tell us: 'wants' and 'needs' are in general not the same. The second argument puts into question the economic utility as the sole value indicator. In many countries, for example, university education is 'free' by political choice, enabling people to learn for the sheer learning pleasure or in substitute for work in times of high unemployment.

3.4 Meanwhile, in the universities...

Until recently, there had been no signs of loss of students in the higher education system. On the contrary, the total number of students in the Australian higher education grew by 70% between 1980 and 1992 while the Australian labour force grew only by 29% (Dwyer, 1992). This trend was consistent with the continuing transition of Australia towards an information society. In the last two years, however, there was "an unexpected fall in the demand for university places" (Nicolls, 1995, p. 12), with a drop of 4.4% in 1994 and a further drop of 8% in 1995 in the number of 'school-leaver applicants' in Australia.

Education institutions have been responding to the market forces by making its education more 'flexible', both in content and delivery. The success of 'distance education' (thirty eight providers are listed in the 1994 directory for Tertiary Distance Education and Open Learning in Australia) and the recent 'flexible learning' initiatives, bear witness. Note, however, that the prevailing information technology in distance education dates back to the days of Gutenberg (ACR, 1992; Kinnaman, 1995).

Our current poor understanding of the economics of knowledge is strongly felt in the universities, as the system is desperately trying to develop measures of economic value of its education.

Example 1. One such value measure, called 'quality', is particularly favoured in government campaigns. The term is used, however, more as a token of general goodness, than in any operational sense of quality control. Neither the defining benchmarks, nor the resources required to attain them, have ever been fully clarified. Example 2. The task of evaluating education is passed on to students, who 'evaluate' their educators, then and there. But how could the students know the value of the received education for their future careers? Example 3. Universities are repeatedly 're-structured' internally to increase their 'performance'. It is not clear, however, with respect to what values the performance is to be measured.

4. The political reality

As predicted by Wiener (1967), information technology greatly impacts on the economic value of individuals to society, resulting in redistribution of means (Bjorn-Andersen *et al.*, 1982). In recognition of this phenomenon, the highly 'unionised' Scandinavian countries, Denmark, Norway and Sweden, have established their own approach to information systems development, since called the Trade Unionist Approach (Iivari and Hirscheim, 1992). This is essentially an approach of 'collective resource' and 'cooperative design', whereby systems are developed according to negotiated consensus.

4.1 To cooperate or not to cooperate

Denmark, for example, has taken a consensus approach to the development of its national information technology strategy, and, as a result, "the Prime Minister has defined IT as one of his three key policy areas" (PACIS, 1995, p. 11). By comparison, the Australian Prime Minister recently announced "the implementation of a national strategy" (PACIS, 1995, p. 10). Was there any public consultation? Where is the badly-needed debate on DMT and the Australian education? One is tempted to conclude that the problems have been effectively passed down to the level of the individual universities to be solved together with all the other problems in the 'enterprise bargaining' process. Such conclusion is consistent with the spirit of the important Hudson report (Hudson, 1992), subsequently endorsed by the Government, which seems to see university education (in the general area of information technology) as driven entirely by market demand.

4.2 Meanwhile, in the universities...

Judging by the absence of debate on the topic, academics do not seem to realise the proximity of impact of the DMT. All can see that the existing technology modifies curricula and their methods of delivery, but few realise that the technology currently developed may put to the test the very institution of university.

Systematic, honest and open debate is essential. Given the information technology developments, what will the university learning be like in 5, 10, 15 or more years time? What should the resources be spent on in preparation for the impact? Shall we perfect present teaching methods in search of an esoteric teaching 'quality', or shall we prepare for the new technological media which will render present forms of teaching redundant in a few years time? Incidentally, powerful electronic tools for groupwork support (Iijima and Tsuda, 1995; Jessup and Valacich, 1993; Spriggs, 1994) and readily available and could prove instrumental in organising the debate.

5. Conclusion

The seriousness of the problems facing the universities in the coming decades is apparent. It is also apparent, that these problems cannot be solved in isolation from their much broader social context. In the words of Congressman George E. Brown, Jr. (1995, p. 768), speaking at a recent meeting of the

American Association for the Advancement of Science: "Our challenge for the twenty-first century must be no less than building a new human culture. ... Guiding us in this work should be basic principles of justice and harmony ... (Mohandas) Gandhi urged us to avoid the seven social sins which he described as politics without principle, wealth without work, commerce without morality, pleasure without conscience, education without character, science without humanity, and worship without sacrifice. To fail at this will put ... all of us as individuals and as a society, adrift without guidance in a time of major change."

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