

Multimedia and the Internet making a Real Difference?

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Abstract

It is argued that strategic planning for higher education must come to terms with the transformative possibilities afforded by ICTs; curriculum and assessment must be subject to radical scrutiny in order to create opportunities that extend beyond replacement of conventional media/methods. Insights are drawn from research and practice on the integration of technologies into the business environment and on how the nature of work and organisations has changed in response to emerging technologies. Six problematic issues are highlighted for educators: ambivalence between a 'teaching' and 'learning', prevalent use of terminology, quality of the multimedia resources, rapid evolution of technologies, the role of evaluation and what it should mean to have a 'personal' computer. The discussion explores the concept of 'good' teaching and asks what it means to be a 'good' student in the context of current ICTs. The elements required in formulating an institutional strategy for ICT deployment are then considered, including the framing of guiding principles, a pragmatic response capable of accommodating diversity of practice, a means of providing a focus for meaningful discourse and rigorous examination of the costs/benefits in providing systems at particular levels of service. The paper concludes that leverage of ICTs can only be achieved when *learning* itself becomes the goal and when students and teachers appropriate the concept of a community of learners.

Keywords

Technology Deployment; Institutional Strategy; Pedagogical Issues

Introduction

In 1985 Postman posed the question: "...does television shape culture or merely reflect it?" and concluded that "... the question has largely disappeared as television has gradually *become* the culture" (p.79). We are fast approaching an analogous conclusion for electronic media, as powerful and versatile digital devices proliferate in the home, school, college and workplace and network infrastructures improve. By the millenium, many students will be coming to college or returning to study as adults already familiar with (or indeed having personal access to) sophisticated technologies and applications, but the question of the educational impact of electronic media has scarcely been addressed. Earlier generations of educational technology have been poorly assimilated into school and college environments, primarily it must be said for economic reasons and their deployment has not contributed in any significant way to strategic educational thinking. In contrast, the same technologies have for some time impacted on practice in corporate training, where attempts to reduce costs and/or to gain efficiencies in training time have been the critical success factors, goals that are arguably consistent with well-defined corporate aims rather more than with broader educational aims. The proliferation of low cost digital technologies radically changes this situation and finds educationalists poorly prepared for meaningful debate.

While perhaps not obvious at first sight, valuable insights for education can be drawn from research and practice on the integration of technologies into the business environment, where existing and emerging technologies underpin very substantial changes in the nature of work and organisations. ICTs are the

enablers of business process re-engineering and it is possible to differentiate successful companies on the degree of integration between their information systems strategy and their business strategy (Ward & Griffiths, 1997, p.549). Educational systems respond at a pace that is understandably slower and not withstanding the visible proliferation in electronic media, there seems to be little evidence to date of *systemic* thinking, much less change (Reigeluth, 1992). Strategic planning for electronic media in educational settings, if it exists at all, tends to be focused on the optimisation of the technology infrastructure and on gaining measurable efficiencies. Deployment of successive generations of educational technology has followed either a cost reduction or at best a tentative value-added approach, leaving curricula and methods of assessment largely unchanged. The imperative for change is not palpable and one must ask why this is the case.

Corporate drive, e.g. to reduce costs, increase productivity and competitiveness, may be more immediate and therefore more responsive to the changes that technology may leverage. However, the impact of technology on the nature and quality of work can be either positive or negative. Zuboff (1988) argues that technology is never neutral in its effect; it may be used to automate or to 'informat' and the quality of work performed by the individual is greatly dependent on which option is pursued. It is reasonable to assume that the impact of technology in education will be similar and in the prevalent ad-hoc conditions, which would appear to preface strategic educational thinking in this area, there is a high risk of succumbing to practices of the 'automate' rather than 'informat' kind. In this context, practice in education would appear to be following a pattern that parallels developments of IS/IT in business, where Strassman (1985) has found that earlier DP (data processing) and MIS (Management Information Systems) systems have indeed led to improved *efficiencies* in clearly defined and measurable areas, while more recent 'Strategic Information Systems' are more problematic in terms of effect. Good managers (not surprisingly) become even better, given powerful and flexible technological tools, but the performance of poor managers deteriorates. And so it will be in education. Studies are already beginning to affirm that 'good' teachers and 'good' students are benefiting to a greater extent from their encounters with electronic media (see e.g. Jacobson et al. 1995).

Electronic media can and should provide a catalyst for debate on the meaning and practice of education. This debate should ideally take place within the framework of what Bruner (1996, p.13) refers to as the 'psycho-cultural' approach to education, which is at once interested in the nature of mind and the nature of culture. It is an approach that attempts to consider the intimate links between the individual and the group and between tools/resources and the circumstances or settings in which they are deployed - in short, the totality of the educational endeavour. Furthermore, electronic media represent the pinnacle of achievement in providing tools to augment the human intellect, amplifying our capacity for information gathering and organisation, for thinking, modelling and 'tinkering' (what Levi-Strauss referred to as 'bricolage', see e.g. Papert, 1980) and for operating in what Salomon refers to as the 'person-plus' mode of distributed cognition (Salomon, Globerson & Perkins, 1991). Electronic media make it possible to extend discourse in a way that is unrestricted in space or time and are assuming central importance in discussion of how educational systems should respond to the growth in interest (espoused if not always enacted) in lifelong learning and flexible/distance learning.

This paper is concerned with how strategic planning for education should proceed in the certain knowledge that electronic media will soon have an all-pervasive presence. As a starting point, we must return to the aims of formal education, which divide into three broad categories:

- Knowledge (fixed) and skills acquisition: competence with tools and techniques;
- Socialisation - induction into the canons of particular communities, disciplines or professions (Bruffee, 1993) and
- Development of intentional learning - making *learning the goal*; developing the individual as a self-organised learner; fostering critical thinking, reflective practice and active open-ended enquiry (Scardamalia et al., 1996); developing a sense of confidence, independence and interdependence.

Balancing these aims, with or without the intervention of today's technology, presents educators with a significant challenge. Tactical decisions we make with regard to methodological approaches reflect both personally held pedagogical beliefs and institutional values. Considered in tandem with familiar resource, organisational and other constraints, they determine to a large extent how we tend to deploy technology (if at all), our expectations about its impact and ultimately the extent to which it is likely that deployment of technology can make a *real* difference. It has, for example, been suggested elsewhere (Devine, 1997) that an increasing demand for (and acceptance of) competence-based curricula has had the effect of locating a disproportionate amount of activity within the first of the above categories, a situation further compounded by the fact that education/training organisations are struggling to cope with ever expanding numbers of students. This inevitably biases technology deployment towards replacement rather than transformative strategies. Table 1 below provides examples of how familiar technology infrastructure/applications can be deployed in support of either replacement or transformative pedagogical strategies.

Application of Technology	Example Strategy:	T/R*
Software tools/templates	Individual/group project work	T

	Exploration, self-reliance, self expression	
Models and Simulations	Facilitating independence, fostering critical	T
	Thinking and 'what if' modelling	
	Value-added illustrative resources e.g.	R
	Published in conjunction with textbook	
Email/computer conferencing	Qualitatively different level of <i>dialogue</i>	T
	Within class group	
	Replacement for routine communications,	R
	Bulletin boards, file/assignment transfer	
Hypermedia Resources	Student access to multiple, linked	T
	Multimedia documents, with ability to	
	Generate/manage links themselves	
	Provision of 'static' information, that may	R
	Be provided using traditional media, (with	
	Perhaps less convenience for the provider)	
CBT(Computer Based Training) or	Automating the didactic process in well-	R
CAL(Computer Assisted Learning)	defined areas, allowing for self-paced	
	And self-directed learning	

Table 1: Examples of Transformative and Replacement strategies in the deployment of electronic media

*T=Transformative

*R=Replacement

Affirming a Vision

Strategic planning for electronic media in education must begin with the articulation of a vision. We could start by returning to basics, re-considering, what we mean by 'good' teaching and what it means to be a 'good' student in the light of the versatile technologies now at our disposal. In the context of educating adults (18+ years, in university, professional and continuing education), we must try to understand how the activities of such teachers and students influence their deployment and use of technology, proceeding from there as a basis for formulation of vision at institutional level. Table 2 articulates one view as to the attributes of 'good' teachers and 'good' students. The challenge is to understand the critical success factors that underpin their activities and to ascertain the extent to which the scope and scale of such activities can be extended to a broader constituency and/or can be leveraged by appropriate deployment of electronic media. As a starting point and sine qua non, teachers must be adequately prepared for the changes that are the inevitable consequence of the proliferation of low-cost information technology

Teachers:	Students:
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Develop student capacity for self-organisation	Make learning the goal - it is its own reward
Challenge students and provide feedback	Are curious
Foster discourse	Are persistent
Respond to challenges from students	Are not necessarily results-driven
Are themselves willing to engage and to learn	Are willing to engage and to learn
Are rigorous and intellectually honest	Are rigorous and intellectually honest
Guide pathways	Are demanding of educational resources
Mentor and support	Have a love of learning: an open-endedness

Table 2: Characteristics of 'good' teachers and 'good' students

A shift in emphasis towards *learner-centredness* and *facilitation of learning* has been evident in recent years and is well-supported in the literature (see e.g. Wilson & Cole, 1991, Farnham-Diggory, 1994). In this regard, 'apprenticeship' and 'situated learning' models and their usefulness in philosophically underpinning computer-supported learning environments have also been widely discussed (see e.g. Bednar et al. 1992 and the August 1994 special edition of the 'Educational Technology' journal). While much emphasis has been put on students' emulation of 'expert' practice as a means of developing knowledge and competence in particular subject areas, surprisingly, no attention has been paid to how students might model the learning/scholarly/research/reflective activities of expert tutors. It would seem that the role of 'good' teachers is largely overlooked in terms of what they can contribute to the development in their students of an intentional learning stance. The concept of a *community of learners*, as a model for an institution of higher education, deserves greater attention.

There are of course barriers to the innovative deployment of electronic media, but they are as often rooted in the immutability of particular educational institutions or systems as in constraints on financial or physical resources. Positive and negative influencing factors are summarised in Table 3.

Positive Factors	Negative Factors
Ease of access to information and resources	Access uneven - risk of marginalisation
Unique attributes of multimedia	Fixed, information-laden curricula
Complex tools available on the desktop	Over-emphasis on skills/competence
Improved information management tools	Risk of information overload
Potential for re-invigoration of curricula	Robustness and reliability of service uneven
Re-focussing of teacher/student relationships	Large class sizes - pressure to 'automate'
Scope for institutional innovation and renewal	Integration with minimal impact/innovation

Table 3: Positive and negative factors relating to deployment of electronic media

The concept of resource-based learning is implicit in many strategies for deployment of electronic media, particularly Internet and the world wide web. A capacity for self-organisation and confident self-direction is required of students, if they are to make effective use of resource-based or self-instructional materials (whether in electronic or conventional format). Developing intentional learning, i.e. making *learning* the goal, is a necessary but frequently neglected, aspect of pedagogical strategy, as is the nature of the response required of the teacher in such situations. Debate, inclusive of students and teachers (some will wish to be styled trainers or tutors), and those concerned with educational management and policy making will help to make explicit our understanding of education, to clarify practices and to focus critical scrutiny of

technology-supported innovation. It is essential that this debate be conducted with openness and honesty and that the penchant for rationalising our actions to align them with our espoused theories (Argyris & Schön 1974) is recognised and constantly challenged. Six issues are presented below, which are germane to such a debate, offering a challenge to those concerned with designing, developing and deploying multimedia systems and to those who may be concerned with institutional planning for such systems. The issues concern the ambivalence between a 'teaching' and 'learning' focus, our use of terminology, the quality of the multimedia resources currently at our disposal, how we contend with rapid development of the technologies, the role of evaluation in informing our judgements and, finally, what it should mean to have a 'personal' computer. This is followed by consideration of the elements required for the development and implementation of a strategy for technology deployment at institutional level.

Six Issues

Ambivalence: 'Teaching' or 'Learning' with Technology?

Increased access to electronic media and its improved functionality has provided renewed impetus for the age-old debate on behaviourist vs. constructivist approaches to education. Early applications of computers in education (1970s) adopted the supplantive 'computer as teacher' approach, firmly rooted in behaviourist approaches to learning. This lineage extends to the present day in the form of highly-structured Computer Based Training (CBT) or, if you are uncomfortable with that term, Computer Assisted Learning (CAL), extended with machine intelligence to 'Intelligent Tutoring Systems' (ITS). The CBT/CAL approach dovetails rather well with the development of competence-based curricula. On the other hand, constructivist approaches, generally regarded as difficult, even impractical, to implement, have regained ground as computers are increasingly deployed in ways that support 'knowledge work', communication and collaboration, typically mediated by the teacher or tutor. The emphasis is on the process with outcomes that are more open-ended and consequently more difficult to measure. Learner-centredness has a very different meaning in the behaviourist and constructivist traditions; 'interactivity' or 'self-direction' in multimedia environments is not synonymous with self-organisation, and is often identified with self-containedness, as students are left to their own devices to work with self-study resources. The resources themselves may be problematic given the ease with which multimedia materials can be produced and distributed either by CD-ROM or via the Internet and the often poor design of such materials. In the constructivist paradigm, self-organisation is allied to interdependence and the role of teachers, tutors and fellow students as mediators of learners' activities assumes greater rather than diminished importance. How these issues are presented says much about the answers we may find and largely determines the particular version of curricular innovation that will be sought through the deployment of technology.

The terminology we use

Further evidence of implicit pedagogical beliefs can be adduced by reference to the language used to describe the applications of electronic media. Here the schools of thought represent outcomes-oriented and process-oriented approaches. The metaphor of travel is used in both cases, but the contrast is stark. Table 4 advances a lexicon that can be derived from this metaphor, suggesting that language used in the context of electronic media can be revealing as to the mindset of the author.

Outcomes-oriented	Process-oriented
Superhighways	Pathways
Uniformity	Diversity
Speed/bandwidth, on/off ramps	Byways
Travel	Journey
'Doing business'	Experiences
'hits'	'less' may be 'more'
Information	Narrative
Contact	Communication

Table 4: Use of a 'travel' metaphor in the context of electronic media

To extend the metaphor, one may question the relative merits of simply 'getting there' or of making the journey. Today's global traveller is struck by the familiar if efficient and shrinking world of airport lounges, shopping malls and of a vast uniformity of commercial outlets, consumer goods and services. It remains for the intrepid traveller to choose the route, which in Robert Frost's immortal words is, 'the one less travelled by'.

How interesting and engaging are multimedia resources?

Current realisations of multimedia, CD-ROM or Internet, illustrate the very best and very worst of educational practice. Best practice evolves slowly; Negroponte (1995, p.65) believes that "...today's best

multimedia titles are high-production-value renditions of less well-made but seminal experiments [conducted in the early 1980s]". But what of those less well-made? Whether the resulting 'product' is highly structured (e.g. typical CBT/CAL applications) or loosely structured (e.g. hypermedia), the experience for the learner using it may in fact be disappointingly passive or even dull, once the initial novelty factor has worn off. Proponents of active learning will readily understand that the real fun and engagement is in the doing, but the multimedia developer may paradoxically deny that same sense of engagement to the individual learner. Fun and challenge in the making does not, unfortunately, always equate with fun and challenge in the using. The high level of 'interactivity' as students browse, play (or simply become bored), is far from what educators would actually wish to achieve, i.e. real engagement with the subject of study, meaningful tasks, discourse and reflection. The pitfalls in designing good multimedia, indeed any educational resource, are not new of course; Dewey, writing in 1916, had no time for adding "some feature of seductiveness to materials otherwise indifferent" (1966 ed., p.126). The sound-bite, videoclip and the short chunk of text, almost without our knowing it, have become part of the multimedia canon. Simultaneous attention to multiple media formats is considered routine and attention spans are diminishing. Enthusiasts would do well to reflect on the experiences of novices, using multimedia resources for the first time, what Birkerts (1994, p.151) refers to as that sense of "waiting patiently for the empowering rush that ought to come when worlds open upon other worlds and old limits collapse."; on his own assertion, he is still waiting and, furthermore, he fears that "our electronic conditioning may leave us unfit for the rigours of stationary words on a page" (p.197). Making sense of what we know, getting it organised in our heads takes time and reflection; Bruner (1996, p.129) remarks that the "... enemy of reflection is the breakneck pace - the thousand pictures". Exemplars, multimedia applications that harness the arguably unique attributes of this medium, are still relatively few, often to be found in the games/entertainment domain. Many educational multimedia developments replicate what can be done by other means, often with little or no perceptible added value. It is salutary to take note of Cohn's commentary on medical practice, where he argues that a "...rapid proliferation of advanced and costly technologies is occurring while knowledge of what truly makes patients well remains the missing element" (cited Ulmer, 1994, p.29). Many innovative educators remain reluctant to embrace multimedia technologies; those who do, almost invariably engage *with* their students in designing and creating simple, but elegant multimedia projects. The fun and learning is in the doing!

Multimedia - a technology 'bandwagon' ?

Have you ever noticed that we never seem to be able to get it right, *now*, with today's technology! There is always the need for the next version of the software to fix that niggly problem, or a more powerful workstation or faster communications. Technical considerations tend to dictate the agenda for multimedia design groups to an extent that must make educators feel uncomfortable to say the least. Design compromises are often based on the known technical performance characteristics of the workstations and communications infrastructure. Commenting on the march of technology and its apparent lack of real pedagogical influence, Clark (1994, p.8) remarks that "we too often act as if we believe that each new delivery technology requires a new theory of learning and performance. Thus we 'reinvent the wheel' constantly but inadequately." The 'what best', in terms of content and delivery strategy, is replaced by the 'how best' of the technology. There is also a constant tension between breadth and depth of content; costs of multimedia design and development are so high that recovering costs frequently means producing generic material, often sacrificing what might have been *special* for a bland, mass-market 'product'.

Evaluation: 'real' students in 'real' situations: how much do we know?

One of the most significant challenges is the scaling up of strategies and applications of educational media, building on innovations that have been successfully piloted, but we are not yet well-informed to face such decisions. Much of what passes as evaluation is limited in both scope and scale, with results that could not be reasonably generalised to a wider body of users in a real-world situation. All too rarely do we hear about the follow-up from pilots; one wonders if there is any in many cases. Moving on tends to mean adoption of the next wave of emerging technology, rather than consolidating and perhaps scaling up experiences with those that are attaining relative maturity. Many practical difficulties have also to be overcome, if the multimedia learning environment is to become an integral aspect of wider curricula. Already, dramatic escalation in the demand for access to personal workstations and for local and Internet connectivity is precipitating a crisis in many schools and colleges; expectation exceeds all reasonable attempts to provide technical support for staff and students. Once students are *required* to use electronic media, the service level needs to be benchmarked in terms of access to workstations, transmission bandwidth and overall robustness and reliability of systems; otherwise preoccupation with solving immediate practical, technical problems tends to obscure serious consideration of the underlying pedagogical issues, those relating to innovation in curricula and methods of assessment and the management of innovation and change. It is imperative to extend beyond the limited questions that can be addressed in pilot or highly controlled studies, particularly those involving CBT/CAL applications, where the dominant behaviourist paradigm is concerned with the identification of clear (though frequently limited) and measurable objectives. Action research is a particularly valuable approach, particularly when extended to whole class or programme groups. It would be opportune at this time to invest in longitudinal studies of students' experiences with electronic media, taking account of the totality of their expectations and experiences with educational technologies, at home, in school or in the workplace. There is scope for a wider acceptance of the potential of what Eisner has referred to as a connoisseurship approach, valuing the experience of the individual expert. Qualitative evaluation methods must stand as an alternative or as a necessary complement to the dominant quantitative evaluation paradigm.

How personal is the 'personal' computer?

Inadequate access to a 'personal' computer is arguably no better than no access at all. We could infer that, under the conditions that prevail in many educational institutions at this time, a significant proportion of students at all levels may not derive any real benefit from their encounters with computers. The aspiration must be directed towards individually owned portable PCs, optimised for individual use. If this seems a fanciful argument, consider the endless wasted hours that students spend queuing to use batteries of pre-configured PC workstations in computer laboratories, an environment wholly unsuited to concentration or reflection and where the task in hand is often routine (e.g. word-processing and printing a previously handwritten assignment). Vanevar Bush in his seminal article 'As we may think' (1943) envisaged individuals owning a 'Memex' which would operate as "...an enlarged intimate supplement" to their memory and intellect; students must regard today's electronic media in a similar way - an intimate extension of self, a vehicle of discovery, organisation, communication and self-expression. (It is not possible to advance the argument for the individual, personalised computer without regard to the consequent issue of privilege and the possible marginalisation of those unable to afford their own machines at current price levels; that is another issue, no less important).

Approaching an institutional strategy for deployment of electronic media

Strategic planning for the deployment of electronic media in education, divorced from a vision of the educational mission, has little chance of success. In a business context, strategic IS/IT planning starts with a rigorous analysis of the business and the environment in which it is operating and a preparedness to subject processes to constant scrutiny and change. Educational institutions will need to approach planning for electronic media with a greater degree of openness than has been the case to date. It is suggested that four elements are required: the framing of guiding principles, a pragmatic response capable of accommodating diversity of practice, a means of providing a focus for meaningful cross-faculty and inter-institutional discourse and a rigorous examination of the costs/benefits in developing and operating particular systems at particular levels of service.

Focus

Experiences in the deployment of electronic media (both within the institution and reported elsewhere) should inform overall institutional strategy. Equally, specific plans for deployment of electronic media should reflect institutional pedagogical values, aims and objectives. A haphazard approach, based on pockets of enthusiasm or opportunistic development, is insufficient. Deployment is most successful in situations where it is a response to clearly articulated needs or aims, consistent with the mission and positioning of the institution. Typical examples would include:

- widening access to programmes by providing greater flexibility to students, enabling them to follow courses with remote access to resources and tutors
- outreach: delivering programmes beyond immediate geographic catchment of the institution or continuing education programmes directly to the workplace
- facilitating collaborative working with other institutions, sharing of resources and academic expertise
- providing students with access to high quality multimedia resources, including simulations of complex phenomena
- fostering learner autonomy, an approach to learning where students take responsibility for their learning and will be helped to move gradually towards interdependence

Pragmatic Response

Strategy for integration of electronic media will need to reflect on the one hand the vision of the individual teacher/tutor and that of his or her department. On the other hand, when it is articulated in the planning process, it will need to win the confidence of academic and support staff seeking to deploy technologies in diverse situations. The bottom-up perspective is concerned with the potential for deploying technology to achieve and sustain *real* change, confronting such intractable issues as the tedium of the 'information-only' lecture, meaningful discourse with students in large class groups (on or off campus, synchronous or asynchronous), provision of improved tutorial support for coursework that is intellectually stimulating and the provision of support for innovations such as collaborative working/peer tutoring. The top-down perspective prioritises issues such as costs, sustainability, scalability and transferability of innovations and the need to create an institution-wide awareness of diversity of 'good practice' in course presentation. A pragmatic response should include consideration of:

- academic management, accreditation and quality procedures that facilitate diversity and innovation
- flexibility in allocation of academic 'teaching' workload to create space for individuals or teams to undertake exploratory or innovative pedagogical actions
- mechanism for allocating funding for pilot projects
- staff development requirements in area of electronic media
- support for and recognition of individual contributions to research on teaching/learning in particular disciplines (to parallel value placed on research within the discipline itself)

Evaluation & Debate

A key objective in approaching strategy for electronic media is to create and sustain debate within the institution and to foster an interdisciplinary approach, informed by practice as it is emerging elsewhere and an openness to the evaluation of initiatives being undertaken within the institution itself. Internally funded projects may be more effective in creating a climate for debate; projects funded by external agencies are often restricted in their exposure to the immediate faculty involved. Actions to foster evaluation and debate may include:

- an action research focus, based on evaluation and dissemination of experience with pilots or other initiatives - this can help to stimulate cross-faculty co-operation, sharing of expertise and resources
- a moderated internal electronic discussion forum (intranet, listserv) with links to similar fora in other institutions or in the international context
- annotation and dissemination of key reports, evaluations and other relevant published material on electronic media in education

Development and Operating Costs

Should electronic media provide a *complement* to conventional course delivery methods or should a methodology for programme delivery be considered that is feasible *only* in the context of an adequate infrastructure for the deployment of such media? This is a crucial decision with implications for start-up and ongoing operating costs. A high initial cost is typically associated with the development and management of well-designed, high quality electronic media (whether published in CD-ROM format or made available over networks); this together with ongoing communications for tutorial and other support must be justified when compared with alternatives. An acceptable level of access and service must be attained, appropriate to the pedagogical requirements of the situation. In this context it is worth noting, for example, a recent cautionary report from the business sector that indicates the overall cost of providing a desktop PC, software, servicing and support over its lifetime is approximately eight times the initial purchase price.

Conclusion

Multimedia and the Internet are already making a difference. In primary schooling, where curricula are unambiguously child-centred, electronic media provide scope for significant innovation. Leverage is achieved when *learning* itself becomes the goal and when students (and teachers) appropriate the concept of a community of learners. In such an environment, tasks are challenging and meaningful and are integrated with subject area. Assessment reflects tasks and challenges of coursework. There is provision for meaningful support, particularly for the development of students' metacognitive skills. If such a climate also prevails in institutions dealing with students in their early or mature adulthood, then it will be possible to deploy technology in imaginative ways and to renew and invigorate curricula. The alternative and line of least resistance is the replacement strategy, integrating electronic media into existing curricula with limited (but not to be discounted) scope for realisation of large scale innovation. The starting point is participation in meaningful debate and strategy formulation at institutional, regional, national and international level.

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