

Technology in education - A study into the effects of information technology in education

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Abstract

With the continued advances in information technology and associated communication comes the interconnectivity of all businesses and all industries. Either by default or association, the traditional education system will also be affected. The information age has encouraged the ubiquity of a seemingly endless supply of information that is there just waiting to be absorbed by students that have the ability and the inclination to interrogate the vast range of information systems available. There is an inherent problem with this in the management of the information, but that is outside the domain of this paper.

Many research articles suggest that all facets of education will change, virtual education, on-line teaching, global universities, demise of traditional teaching methods are just some of the terms used to describe this euphoria. New models of teaching and learning are emerging, driven by accessible new media. The role of the Teacher and Trainer is becoming one of a facilitator of learning discovery.

This paper will consider if the ever-increasing presence of technology and information will help or hinder the education process in the 21st Century. In addition it will explore the possible impact on the predominant components of the system, which create the pedagogic environment we know today - the students and the lecturers.

Introduction

Virtual reality has the potential to change the way individuals learn (Pantelidus and Auld, 1995). If current research articles are to be believed, this is an understatement since the technological revolution is fast changing, not only the way society learns but also the way the world communicates, conducts business, and even carries out day to day activities. With 62 million users of the Internet in the USA alone, statistics like this make it the fastest growing technological revolution in history (Hosie and Mazzarol, 1999).

The possibilities for improving educational practices using the Internet seem to be boundless (Joo, 1999). Higher education institutions are seeking innovative ways to provide flexible courses through new media (Barnard, 1997). The possible era of a truly inter-connected global schoolhouse (Knight, 1996) is no longer considered extreme in the age of technology mediated learning and the transmission of information at the touch of a button.

However, many such as, Hutchison, (1998), fears that institutions are rushing into this technological dimension too quickly. He warns that there is a need to think carefully about the implications of technology on society.

'All aspects must be deliberated to ensure that we get the idea of virtual universities right in order to envelope the rapid expansion of the university sector and the ever growing dependence and recognition of formal qualifications.'

Morrison (1999) shares this fear and debates whether something essential to higher education is being sacrificed when college and university courses take place online rather than on-campus. Examples that have been frequently researched are the effect on emotional attributes of students as a result of a lack of in face-to-face integration. Whilst the change predicted is so transformational, damage may be inevitable, but according to these writers, the impact of IT on education must not be detrimental to the education process.

This paper considers the impact of IT and how it is changing the traditional classroom. It explores the differences in the traditional classroom structure and the virtual university. To date, the success of the virtual university can only be based on research on distance learning where students work individually and tutorial support is limited. With the epoch of collaborative learning, virtual universities however, promise to be more interactive. Classroom teaching and distance learning are converging on a new educational approach (Westera, 1999). However, the consequences of a more intense IT experience may be more a hindrance to the education process with possible detrimental impacts to the quality of learning students receive through lack of interaction.

The first section analyses and summarises the impact of IT on the main areas of the education institutions, management, students and finally impact on society.

The Change in University Organisational Structure

The information technology environment is dynamic and fast changing which suggests changes in current university organisation structures which maybe more transformational than incremental. Schuler (1997) believes that it is the end of an era for university campuses as they are currently known identifying a change in the traditional paradigm of learning. Much attention seems to have been devoted to suggestions that change in the education systems is long over due. Hardin and Ziebarth (1995) believe that traditional education is evolutionary rather than revolutionary and Thomas (1986) supports this and adds that up until now, educational institutions have been "moving in the same steps with which it and society are familiar and comfortable, while the rhythm changes". He further states that education relies on familiar paradigms for focussing processes, problems and solutions. Likewise, Westera (1999) agrees that education in the past has favoured the status quo.

Universities may have to adopt a more business-like approach to education and meet the demand of the students (Cornell, 1999). An example of this is in a New York University. It has established its own distance education venture hoping to bring in thousands of Internet based learners and in addition, thousands of dollars in profit. Hosie and Mazzarol (1999) state that IT is a potential source of competitive advantage particularly in the education industry.

This is unlikely to have a profound affect on the standards of education in the short term however, there is an element of danger that hints at the possibility of education institutions becoming organisations focusing on profit based output rather than an output concerning levels of education and achievement.

There appears to be much emphasis on the use of IT in education. Hardin and Ziebarth (1995) and Schuler (1997) claim that universities cannot ignore computers and the vast selection of information available, and what is more, teachers cannot ignore them either. Because IT is removing all barriers, it should be incorporated into the running of the institutions. Universities were to be communities (Hutchison, 1998) but now the world is a much smaller place.

There appears to be a danger that in an effort to adapt to the technological changes, universities may offer information to the surrounding community. Hutchison goes on to say that although well meaning and useful, this is a wasted investment and demonstrates the insular culture of education institutions. The catchment area is not just the local community, it is the world.

The structure of universities needs to change to respond to the imperatives of technological development and changing consumer demand (Kershaw, 1996), and to encompass or embrace IT. Research however, indicates that there may be resistance in meeting these changes. Hopper (1999) insists that the structural core of the traditional university contain elements that inherently discourage technology integration. Kershaw shares this opinion and states that there is an existence of territoriality among departments within university, particularly those that use IT. The use of IT by some departments is restricted and ownership is confined to one owner and jealousy guards expertise. Kershaw further suggests that the way to implement a change in both structure and attitude is to remove the focus from technology. This suggests that the change agent should be from the academic side, not technological. In order to overcome resistance, Kershaw believes the vertical organisation representative of academia combined with the job description and narrow focus should be discarded.

Funding and Staff

Funding has always been a controversial issue within education and writers seem to suggest that the advent of information technology in the system may relieve the continuous financial pressure. The need for Higher Education opportunities is increasing at the same time costs associated with public universities are being reduced ((Barnard, 1997). The crisis of funding is as evident as ever in the traditional university, as a result, Hutchison (1998) considers traditional universities are not fulfilling historical functions of transmitters of knowledge. One of the areas poorly funded are the libraries, which in fact is ironic since many resources are dissipated in the same universities where lectures and courses are duplicated across different campuses. A solution to this problem may exist in the form of distance learning. "Distance education is a method of reining costs associated with expanding and maintaining an increasingly expensive campus infrastructure" (Barnard, 1997). This intimates that by having students learning in a location of their choice relieves the responsibilities for universities to provide suitable infrastructure. This could be criticised since this method, although may be effective, does not put the student first and the argument reverts to the educational institutions focusing on profit based output.

Further consideration and research suggests that lecturers and employees of education institutions, cannot escape a change, particularly if campuses will no longer be confined to a geographical area. Universities may no longer require established lecturers and administrative staff on the payroll. Research suggests that the information age brings the epoch of tele-working where employees work when required. Applegate et al (1994) describes cluster organisations where people work together for the length of time it takes to complete a task, for instance to produce materials for a module. As a result, universities will have the benefits of small scale and large scale simultaneously. This invites criticism from two points. Firstly, Westera (1999) is keen to impress that it remains the education institutions responsibility to monitor and warrant the quality of learning. To this end, staff may still be needed on a permanent basis, which introduces the second point. Hopper (1999) explains that a typical university may still need personnel and resources for instructional technology to support the classroom teaching in addition to a department of instructional technology to provide assistance to staff.

Wilson (1996) agrees but suggests that universities will employ staff on a support basis rather than a lecturing one, facilitating the process rather than simply delivering content

There is no consensus among researchers regarding what the impact of technology on university structures will be. Much of what has being researched is based on the futuristic virtual university and has yet to be evaluated. However, the key points appear to be the problem of ownership of technology within departments. It appears that students not learning at the forefront of these departments will have a lessened education, which causes some concern. It seems an inherent cultural problem is identified here. Education institutions cannot pool the resources for technology and there is also evidence of duplication of resources in institutions with different campuses.

Without a more joint approach, it becomes questionable how will they solve the problem of deterioration of libraries. A library is a shared facility and requires shared resources. On the whole, findings seem to indicate that in order for the current education institutions to adjust to meet the demand of the Information Age, the process of business re-engineering needs to take place.

Impact on Management

Research seems to indicate that the management of education institutions will undergo a change as well, (HEFCE, FEFC, NISS, JISC). Writers suggest that management will be forced to adapt their management styles to meet the change information technology will bring. However, despite the information technology necessitating a change in management techniques, management must maintain a vision of what is needed to allow students to be effective learners (Kershaw, 1996). There is a strong impetus on the management of all contemporary industries and organisations to ensure maximum return is received from employees before they leave. Campbell (1996) notes that employees develop no loyalty for their employers and quite willingly take advantage of other offers. Angell (1995) agrees and states that loyalty in the information age is on the "basis of unashamed rational self interest". This may not be the ideal attitude to adopt. Education has always and will always be based on the interest of the students and therefore management must motivate lecturers to provide a service for students they may never actually share a room with. Also, these lecturers need to be motivated enough to enable the university to receive maximum return from them. Angell goes on to point out that this in itself may prove challenging since for those operating in a virtual world, but is uncertain why would a worker be motivated to take part in an organisation that they do not physically or perhaps even socially belong to.

With the notion that teachers must be motivated to use the IT available, encouraged by many, many centrally funded initiatives (NGfL, Learning Age, Peoples Network, NOF, Ufl, etc). It follows that the impact of IT and the Internet depends on the motivation of the teachers involved (Joo, 1999), not to mention the students themselves. Hardin and Ziebarth (1995) add to this by suggesting that an increase in the collaboration among students, parents, administrators, and lecturers could benefit the education process of future generations. Ultimately, Berge (1999) states that it is the responsibility of the institution and the instructor, regardless of the media used to provide a learning environment in which the learner has the opportunity for appropriate interactions.

It is interesting to note that the mindset remains as in traditional education, in that it is still the institutions responsibility whether virtual or traditional, to provide appropriate learning environments. However, for staff that have no loyalties to the institution, there appears a danger of little continuity in teaching practices which would surely impact on the mission of providing a suitable learning environment.

The Changing Role of Lecturers

With a combination of increases in student numbers, decline of the tutorial system and standardisation of the curriculum, Hutchison (1988) believes already presents lecturers with an abundance of change to adjust to. Joo (1999) believes that teachers could be removed from classrooms. There might be two possible reasons for this. Firstly, Joo believes that lecturers are no longer a major source of information to students since the materials they once used are now freely available to anyone and therefore devalued. Joo adds that attendance in classes is already reduced since students simply meet with tutors when problems arise and when a synchronous solution is required. Secondly, Hutchison (1998) in support of this view considers face-to-face lecturing little more than a filter for the learning process. He is of the opinion that lecturers who simply transfer information verbatim do not add value. Students can study and learn the curriculum with recommended textbooks.

As a result of this suggested reduction in attendance to classes distinct advantages have been identified. Firstly, Knight (1996) supposes that teachers are freed from chalk face learning and can spend virtual time with those students that need help and one-to-one tuition. Secondly, Dertouzos (1997) agrees that the freelance scholar who can teach relying on virtual technologies without timetabled attendance in given classes, could be useful in teaching illiterate adults who may experience discomfort and embarrassment in a face-to-face environment. On the other hand, Wilson (1996) believes that this one lecturer talking to fewer students must still retain the capability to interact individually with each student.

In order to advertise their services, Hutchison (1998) visualises the concept of tele-tutoring, by using online facilities. Hutchison imagines that lecturers will become 'instructional designers' and will spend increased time writing and designing courseware and web sites for dissemination though electronic means. In addition to that workload, Robertson (1998) thinks that tutors will also take on a role not dissimilar to a trainer or coach as

opposed to a taskmaster. In this way, the teachers dedication and ability is not wasted as it will still be deemed an important educational tool (Dertouzos,1997). Barnard (1997) explains that the tutors are then in a position to guide the students to specific material and libraries and therefore providing a level of guidance and direction. These arguments could be criticised for two points. Firstly, it could be perceived as manipulation of the information available and is contrary to the opinion that this method of teaching encourages a level of freedom in the students. Secondly, Westera (1999) insists that tutors will be forced into this role of coach rather than by choice since many of the students tele-tutoring will attract will be adult, highly autonomous professionals who expect a certain level of service. The result is the undermining of the traditional teacher. Berge (1997) conversely argues that this is the result of a collaborative learning environment and it is recognised that teachers have a wealth of knowledge, but students add value also. It will be implicit that there is a shared authority among teachers and students.

A Change in Teaching Techniques

The changes in the traditional teaching techniques as envisaged by many writers may be a harsh indication of the transformation education may undergo. Perhaps, the familiar, traditional, intimate classroom may be revolutionised into a distant communication, which takes place online that could ultimately be ineffective. Jones-Delcorde (1999) however, argues that for the foreseeable future, the computer is not threatening to replace the instructor. Nevertheless, despite this, he also believes that while IT stimulates creativity, it also stifles it by eliminating creative motivations. He considers the idea that computers may only be successful because they offer instant gratification. It therefore promotes the question that without instant gratification, could the learner be able to visualise on his or her own? Furthermore, would she or he wish to do so without the aid of a computer? This view very clearly highlights the disadvantages of the 'freelance scholar' (Schuler, 1997) and provide a strong argument to the case that IT will hinder the education process supporting the dispute that the personal touch so often offered by tutors could dissipate (Cornell, 1999).

The other side of the argument however, is that it is unavoidable that the role of the tutor will change (Westera, 1999). With so much information, students are less inclined to recognise the tutor's authority as an absolute expert and furthermore, lecturers are powerless to stop the flow of information to students (Cornell, 1999). Westera envisages the tutor/student relationship becoming more egalitarian. By empowering students to take responsibly for their own learning will become an effective learning technique. However, Jones-Delcorde (1999) suggests that learning could become more profound and meaningful if instructors simply supplement their current tool with innovative IT. He further states that there will be little change in the role of the lecturer since however virtual IT becomes, it will never replace the visual, mental and social stimulation of a good tutor. He believes learners remember more from a good tutor and hints at the degeneration of the learning process if learners respond only to instant gratification. This view is supported by Knight (1996) who suggests that teachers are not replaced by IT but take on the role of facilitating learning, and providing guidance.

It appears to be a view among writers, that rather than dismiss teachers because of their apparent ineffectiveness, a need has being identified to encourage true interactive learning with all involved. With increased access to reservoirs of information, many researchers appear to believe that it is inevitable that the role of the lecturer will change and possibly manifest itself in other functions which may impact upon the level of interaction institutions intend to provide. Perhaps the role of management is reaffirmed here and they must remind lecturers that they are there for the students benefits. This may however, be difficult since the increased workloads that will come with the facilitating of on-line tuition that is often overlooked but will surely have repercussions on the system and more importantly on the students.

Impact on Students

There appears to be a mixed response concerning the impact of the Information Age on students of the system. Jones-Delcorde (1999) believes that IT is nothing more than a tool for learning. Despite the interconnectivity, computers offer no social interaction. Dertouzos (1997) agrees that students need community and the opportunity to be motivated by role models and fellow students. However, it must also be acknowledged that the links with other across the globe offered by IT are both very exciting and positive (English and Yazdani, 1999).

The empirical work of most researchers seems to suggest that the traditional university has been overtaken by events. Hutchison (1998) is of the view that there is nothing natural about traditional universities. There is nothing natural about being wrapped in cotton wool and nurtured into what society deems acceptable in a bureaucratic environment. Researchers have put forward many cases for education to move away from this sort of environment that would benefit the students. Firstly, Schurer (1997) writes that virtual universities would liberate students from this regimented conduct of traditional universities. Students would need to learn how to access resources as opposed to being spoon-fed information. Secondly, "in-time learning" allows the curriculum to become more fluent to suit the needs of the student. This encourages students to be more active learners, enhancing the intensity of the learning experience (Pantelidis and Auld, 1995). Hutchison (1998) makes the third point. He agrees that students will benefit from a shift from the traditional "print culture" to a more sensory culture which would help students to forge links with images they see and remember to information they need to learn. In addition, and as the fourth point, Joo (1999) believes that the Internet can make the content of lectures more vivid to students stimulating the memory and enhancing topic association. This could create an exceptionally positive attitude within students who previously experienced difficulty in and failure in their learning (Adam and Wild, 1997). An interesting point to acknowledge however, is that in the same way the Internet and other multi-media can relay positive and beneficial images, they can also reproduce strong stereotypes (Joo, 1999) which can often lead to misinterpretation and the obscurity of rational judgement.

The Impact of the Virtual Classroom

So there is a difference between the traditional classroom and the virtual equivalent. Here the impact of the latter is further considered. Knight (1996) believes that the Virtual Classroom would be a new experience and would have positive influences on those students who are used to being spoon-fed. Students would no longer be passive and would develop a competence of working on their own initiative and relying on their own resourcefulness to gain results. In criticism of the virtual classroom, Kershaw (1996) warns that students in this learning environment must be prepared to use the technologies available and become more involved in their own learning with an emphasis placed on interaction with lecturers and students. The level of on-line interaction received by students appears to be indicative of the success of the virtual university. Berge (1999) considers that integration is central to the expectations of both teachers and learners and is the primary goal of the education process. This suggests that learning only takes place after interaction has occurred. This is the same way that students need to consolidate their knowledge by talking to other students which in turn, increases self confidence and self awareness (English and Yazdani, 1999). While many researchers agree that interaction is good and vital, Berge goes on to add that a mismatch of interaction, synchronicity and technology can lead to information overload, loss of attention, boredom and frustration. Students require intra-personal reflection to help integrate new experiences with existing ones. Conversely, Westera (1999) implies that a mismatch could exist from interaction with other students which results in ineffective, incomplete and erroneous feedback, which is counterproductive to the learning process. Other possible repercussions from online learning as identified by Cornell (1999) are difficulties with service providers and a lack of experience in students. Bad time management would contribute to feelings of isolation and frustration, all of which suggest that the Information Age brings with it damaging affects to the students.

There are strong arguments for and against the asynchronous methods of teaching that virtual universities invite. There is the claim that synchronous communications can restrict students (Berge, 1999) while asynchronous communications does not demand students and teachers be present together which may offer convenience.

Westera (1999) however, believes that in asynchronous environments, speaking skills and assertiveness will become less important. On the other hand, Barnard (1999) observes that students who feel too intimidated to speak out in class open up more online and there is less opportunity for dominating individuals to govern conversations. Barnard (1999) also believes that instructor interaction is enhanced online. Cornell (1999) agrees and states that students recognise the benefits of being able to progress at their own pace. They enjoy the flexible constructivist approach to learning as well as the freedom from the physical constraints of the classroom.

Taking together these studies, there appears to be equal cases regarding how the impact technology in education will serve upon students. It appears debatable that the consequences suffered by students as a result of a loss of face-to-face interaction is equal to the sometimes ineffectual information gained from discussions with fellow students. Motivation it seems will have to come from within rather than from other students. Inter-personal skills learned in a traditional classroom, although could be transferred to a virtual environment, will lack feedback and could dissipate. From a learning point of view, certainly at first, there may be little short term repercussions since students will not feel cheated since they will still receive global interaction which will be exciting. However, as students evolve and future generations evolve, the loss of face-to-face interaction may begin to lessen the learning experience.

Impact on Society

The middle class demand for the social and economic benefits of Higher Education (Hosie and Mazzarol, 1999), constitutes a massive social pressure on society and government, despite which, education has undergone little change. Thomas (1986) notes that for many years education has been conditioned to be desirable the way it is. Any hint of innovation in the traditional method of teaching, loses societies endorsement. This inhibits change since beliefs are not challenged.

"Education's way of bringing order to the social chaos of turbulent times appears to be to opt for the multi-media that is safe, tried and true". (Cornell, 1999).

Society must strive to modify tradition because without a change, the result may be an impediment to appropriate learning and a threat to growth (Hutchison, 1998).

It is on this basis that the impact of IT in education on society is considered, should society accept changes. Researchers believe that the virtual classroom fills a void in society and IT in education should be welcomed. For instance, English and Yazdani (1999) have identified that in our society the nature of employment and leisure has changed. There is currently less of the former. Virtual universities could fill this gap and students will benefit from fruitful and fulfilling communications and learning. Additionally, Hosie and Mazzarol (1999) support this and already highlight that the event of home, school and work place education on demand is likely to outstrip the current focus on entertainment. This could be considered as one impact that the Information Age provokes in society. Thomas (1986) considers that technology must be adapted to and lived with and society as a whole must subsist along side. It proceeds independently of any disapprobation. In short there is no means of escaping. Westera (1999) explains that it should be clear that the learning environment is no longer a fenced off and protected area that allows carefree activities, but it is part of the outside world. This opinion is unlikely to have a profound affect on learning but may be taking life long learning to the extreme. A debate could then emerge if is it really healthy for students to be able to study at any time of day, any day of the week for any length of time.

Writers suggest three main impacts that the information technology will have on education that will consequentially impress upon all societies. Firstly, Schurer (1997) questions the possible demise of human attributes. He believes that those brought up with telematics are intelligent but suffer a deteriorated emotional capacity such as socialising with people they never actually meet therefore omitting the whole social experience from their lifestyle. This in turn restricts development attitudes and cultures. As a result of asynchronous environment "emotions are poorly transferred via computer mediated communications and may easily be disregarded or misinterpreted", (Westera, 1999). Secondly, Joo (1999) believes the Internet is not an educational innovation since it does not take into account cultural precedence.

The Information Age seems to support the World Information Order reinforcing the flow of information from developed to developing countries regardless of culture. Therefore there is greater exposure of certain cultures encouraging marginal cultures to learn about it. Assuming that there is a language or culture that dominates the virtual environment, this questions the trustworthiness off the information available. Finally, there is the additional danger identified by Barnard (1997) that the current revolution is tele-communications threatens to create an expanding gap between the computer literate and the technologically deprived or technophobics.

The Virtual University encourages a change in the culture of learning. Hutchison (1998) identifies a perverse unnaturalness in believing that once a course of study is complete a student knows everything about that given topic. Distance learning and the vast web of information now available, allows everyone to be a student. The information age prepares students to be learners for life (Jones-Delcorde, 1999). Despite this, Shenk (1997) holds a more pessimistic view of the promises of the Information Age. He is of the belief that education is about enlightenment and not just access.

With a view to the management of social control, Joo (1999) suggests that governments may lose control over curriculum contents and pedagogical methods as schools gain more autonomy. This would clearly have an impact on authoritarian societies, unleashing a sense of freedom and anarchistic tendencies within educational institutions. Joo goes on to explain that submissive societies would not be praised for demonstration of individualism or creativity. The Information Age has little respect for culture. Likewise, the Information Age does not respect financial implications. Pantelidis and Auld (1995) suppose as more people send their children to private school, public education will become like public health. It will exist for everyone but used by those that have no options. As a result universities will become very costly. Perhaps however, technology will become an opportunity for financially disadvantaged students to continue learning with the advent of distance learning.

Arguments seem to assert to the fact that technology in education will have destructive impacts on the society. The main concern is the demise of emotional attributes as a result of lessened face-to-face contact (not interaction) will produce damaging repercussions including the promotion of isolation. It is interesting to consider that should society accept this decline in contact and integration and support the extent that life long learning offers, that future generations will evolve as isolated individuals with diminished social skills. There is also the concern over cultural issues. The Information Age does not respect the variances in cultures and students learning within these environments are put at a disadvantage - one that is ill-afforded when competing globally for sought after qualifications.

Conclusion

To conclude, there appears to be a mixed response from researchers in answering the question for this paper. Researchers have made it apparent that education institutions are due a change in the structure and the ethos. To date, education has been a static feature in a fast changing environment. This tallies with the British Council's discovery that UK HE is seen abroad as very traditional and unexciting, unlike the USA and Australia. However, there is the danger that since educational and professional qualifications are still in demand, the institution will become more profit based and maybe less concerned with educational standards. In addition there also appears to be an inherent culture with the ownership and territoriality of technology which will hinder education since students with access to technology will benefit where as those without will lose out. IT should be used across the whole spectrum of schooling and education and should therefore be pooled as such.

Research based on the impact of the information age upon the lecturers appears to intimate a deterioration in the system. With IT comes the removal of the term "a job for life". This brings less continuity to the education process since lecturers are constantly in quest of better opportunities.

Research additionally shows that lecturers are receiving less respect from students and have a diminished authority since students are finding more and more information on the Internet and dismiss knowledge and help from lecturers. This appears to be an indication that IT will have detrimental affects on education. Students follow the premise that lecturers have little knowledge, which in turn dissipates the personal touch and further diminishes teacher-student integration. Research has shown that interaction is an important experience that all students should encounter.

Students need interaction within their community for motivation and to reaffirm views and opinions. Interaction however, does take place on the Internet and it can be done electronically. What however, is missing from this contact is the synchronicity of being present in the same place as another. Integration is the important factor here. This can only be achieved by sharing an actual time and place. Without this, research suggests that speaking skills and assertiveness will become less important, and therefore presumably will deteriorate over time.

On a positive note, technology and IT in education will help to alleviate problems such as learning difficulties and overcome introvert personalities, however, it must be noted that it will not change them. For instance, shy individuals will always be shy especially if they circumvent day to day activities with the help of IT and never has to interact.

IT must be lived with. It is an enormous part of every industry and enterprise, both globally and domestically. The broader a spectrum it provides, in terms of learning material, the better. Research has indicated that education and the passage of information will replace entertainment and leisure. Perhaps this is the extreme however. Just as individuals need integration, it is also feasible that a break from learning is needed, a change from absorbing vast amounts of information, a way of feeling revitalised in order to continue the digestion of information.

Finally, IT will improve the pedagogical system if used as a tool and does not replace any component. The possible impact of a totally virtual educational environment could be detrimental to the students - the essence of the education system. Equally however, the education system should embrace the information age and adapt processes to accommodate the vast range of information available, in order to provide the lecturers and the students the best possible chance at providing and receiving an education. It is the development of technology based learning support structures, ie. alternatives to formal teaching and learning strategies but embedded in the pedagogy, that will assist the education and training sector as we enter the next millennium.

References

- Angell, I O. (1995) I Have Seen The Future ... And It Works (For Some)! *Third Annual Clifford Barclay Enterprise Lecture*. 12 October 1995
- Applegate, L M; Cash, J I; Quinn Mills, D. (1994) Building The Information Age Organisation: Structure, Control And Information Technologies. *Informational Technology And Tomorrows Manager*, Vol 3, Pp.473-482.
- Barnard, J. (1997) The World Wide Web And Higher Education: Promise Of Virtual Universities And On-Line Libraries. *Educational Technologies*, Vol 37, Pp.30-35.
- Berge, Z L. (1999) Interaction In Post Secondary Web-Based Learning. *Educational Technology*, Vol 38, Pp.57-61.
- Campbell, A. (1996) *The Culture Of The Virtual Organisation: Creating Competitive Advantage*. University Of Warwick.
- Cornell, R. (1999) The Onrush Of Technology In Education: The Professor's New Dilemma. *Educational Technology*, May/June 1999, Pp.60-63.
- Dertouzos, M L. (1997) *What Will Be: How The New World Of Information Will Change Our Lives*. San Francisco: Harperedge. [Http://Www.Sims.Berkeley/~Sthomas/Education.Html](http://Www.Sims.Berkeley/~Sthomas/Education.Html) (Accessed 21 September 1999).
- English, S And Yazdani, M. (1999) Computer-Supported Co-Operative Learning In A Virtual University. *Journal Of Computer Assisted Learning*, Vol 15, Pp.2-13.
- Hardin, J; Ziebarth, J. (1995) *Digital Technology And Its Impact On Education - A White Paper (Draft)*. [Http://Www.Gsh.Organisation.Wce/Archives/Ammon/Htm](http://Www.Gsh.Organisation.Wce/Archives/Ammon/Htm) (Accessed 15 January 2000).
- Hopper, K. (1999) Mastering The Invisible Technologies In Education: Who Are The Real Technology Prodigies Among College Teachers?. *Educational Technology*, (1999), Pp.50-55.
- Education Services. *Journal Of Computer Assisted Learning*, Vol 15, Pp.118-128.
- Hutchison, C. (1998) The Virtual University And The Culture Of Learning. *Education Libraries Journal*, Vol 41(1), Pp.5-11.
- Jones-Delcorde, D H. (1999) The Information Age: The Instructor-Computer Dilemma. *Education Today*, Vol 45(2), Pp.32-33.
- Joo, J E. (1999) Cultural Issues Of The Internet In Classrooms. *British Journal Of Educational Technology*, Vol 30(3), Pp.245-250.
- Kershaw, A. (1996) People, Planning And Process: The Acceptance Of Technological Innovation In Post-Secondary Organisation. *Educational Technology*, (1996), Pp.44-48.

- Knight, J. (1996) The Virtual Classroom. *Business Education Today*, Mar/Apr, Pp.14, 35.
- Morrison, L J. (1999) *The Technology Source*. [Http://Horizon.Unc.Edu/Ts/Vision/1999-09.Asp](http://Horizon.Unc.Edu/Ts/Vision/1999-09.Asp) (Accessed 3 March 2000).
- Pantelidis, V S; Auld, L. (1995) Virtual Reality In The Schools. *Virtual Reality And Education Laboratory*, Vol 1(1), [Http://Www.Soe.Ecu.Edu/Vr/Vrits/1-1-Cont.Htm](http://Www.Soe.Ecu.Edu/Vr/Vrits/1-1-Cont.Htm) (Accessed 8 March 2000).
- Robertson, Ds. (1998) *The New Renaissance: Computers And The Next Level Of Civilisation*. New York: Oxford University Press. [Http://Www.Sims.Berkeley/~Sthomas/Education.Html](http://Www.Sims.Berkeley/~Sthomas/Education.Html)
- Schurer, G. (1997) *Liberation From The Slavery Of Time And Space*.
- Shenk, D. (1997) *Data Smog: Surviving The Information Glut*. New York: Harper.
- Thomas, G. (1996) Education And Technology In The Third Wave. *Oxford Review Of Education*, Vol 12(3), Pp.223-231.
- Westera, W. (1999) Parodies In Open, Networked Learning Environment: Toward A Paradigm, Shift. *Educational Technology*, January-February 1999, Pp. 17-23.
- Wilson, A (1996) The Virtual University? Myth Or Reality? *Capability 2*, May 24 1996, Pp.62-65.