Eight paradoxes in the implementation process of e-learning in higher education[1]

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ABSTRACT. *The new information and communication technologies affect currently most spheres of life, including higher education environments. Their effects are most likely to grow in the future. However, many predictions in the last few years as to the sweeping impact of the new technologies on restructuring the learning/teaching practices at universities and their high-profit prospects have not been materialized; and several large ventures of e-learning undertaken by the corporate world, new for-profit organizations and some leading universities failed to yield the expected results. This article examines eight inherent paradoxes in the implementation of the new technologies in various higher education settings worldwide. The paradoxes relate to the differential infrastructure and readiness of different types of higher education institutions to utilize the technologies' potential; the extent to which the 'old' distance education technologies and the new technologies replace teaching/ learning practices in classrooms; the role of real problems, barriers and obstacles in applying new technologies; the impact of the new technologies on different student clienteles; information acquisition vs knowledge construction in higher education; cost considerations; the human capacity to adapt to new learning styles in the face of rapid development of the technologies; and the organizational cultures of the academic and corporate worlds. Understanding these inherent paradoxes is essential for policy-makers at institutional and national levels of higher education systems in the process of planning a macro-level comprehensive strategy for the efficient and effective applications of the new information and communication technologies.*

RÉSUMÉ. *Aujourd'hui, les nouvelles technologies de l'information et de la communication (TIC) touchent la plupart des domaines de la vie, y compris l'enseignement supérieur. Leurs effets vont très probablement continuer à croître. Cependant, nombre de prédictions ne se sont pas matérialisées quant à l'impact considérable qu'elles devaient avoir sur la restructuration des pratiques des enseignants et des étudiants à l'université, et sur les perspectives de marchés fructueux, et plusieurs tentatives commerciales d'envergure concernant le e-learning, des sociétés nouvellement créées et des universités majeures n'ont*

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pas obtenu les résultats escomptés. Cet article étudie huit paradoxes inhérents à la mise en application des TIC dans différents contextes d'enseignement supérieur dans le monde. Les paradoxes concernent les empressements variables des institutions à faire usage du potentiel des TIC ; la réalité du remplacement des « anciennes » technologies éducatives par les nouvelles dans les pratiques pédagogiques ; le poids des problèmes authentiquement rencontrés dans l'application des TIC ; l'impact des TIC sur différentes clientèles d'étudiants ; l'opposition « accès à l'information/construction du savoir » dans l'enseignement supérieur ; les coûts ; la capacité humaine à s'adapter à de nouvelles formes d'apprentissage liées aux développements rapides des TIC ; et les cultures organisationnelles du monde universitaire et de l'entreprise. La compréhension de ces paradoxes est cruciale pour les décideurs aux niveaux institutionnels et nationaux dans la planification de stratégies générales impliquant les TIC.

KEYWORDS: *higher education; information and communication technologies; e-learning; distance education; distance teaching universities; cost efficiency.*

MOTS-CLÉS : *enseignement supérieur, technologies de l'information et de la communication, enseignement à distance, universités à distance, rentabilité.*

Introduction

Over the past decade, the new information and communication technologies have had a huge impact on the world economy, corporate management, globalization trends and education at all levels, including higher education. In the last few years, dozens of conferences examined a broad spectrum of uses enabled by the new technologies, hundreds of scholarly articles and books were published on various aspects of e-learning and multiple ventures have been undertaken by many actors in the academic and corporate worlds aiming at implementing a variety of uses and applications of the new technologies' potential. The information and communication technologies are complex in nature and serve a rich array of functions. Often discourse on new technologies suffers from 'The Tower of Babel Syndrome' — a confusing language and misleading conclusions, emanating from the fact that people refer to totally different functions and roles while using the same generic terms (Guri- Rosenblit, 2001a). It is not just the meanings attached to specific terms that are unclear. The language used in the relevant literature to depict the nature of study environments shaped by the new technologies is blurred and confusing. New study environments are defined by a long list of terms such as: web-based learning, computer-mediated instruction, virtual classrooms, on-line education, e-learning, e-education, computer-driven interactive communication, open and distance learning, I-Campus, borderless education, cyberspace learning environments, distributed learning, flexible learning, blended learning, mobile-learning, etc. (Bates, 1995, 1999; Collis, 1995; Harasim *et al*., 1995; Tifflin and Rajasingham, 1995; Daniel, 1996; Khan, 1997; Somekh and Davis, 1997; Fetterman, 1998; Littleton and Light, 1999; Selinger and Pearson, 1999; Trow, 1999; American Federation of Teachers, 2000, 2001; Collis and Moonen, 2001; Guri-Rosenblit, 2001a; Matkin, 2002; Ryan, 2002). These multiple terms reflect the lack of a standardized language in the

discourse on information and communication technologies' uses in educational environments. They also portray different foci in relating to the various functions of the technologies, which cover a vast range of activities.

In addition to the confusing language in the discourse on new electronic technologies, there seems to be also a wide gap between the rhetoric in the literature describing the sweeping effects of the digital technologies on educational environments, particularly on higher education settings, and their actual implementation. A few years ago, many analysts, such as Morgan Keegan (2000), projected a multi-billion dollar e-education and e-training market globally. Virtual networks of colleges and universities have become a marker of a new economy. Several years on, the euphoria surrounding high-technology industries has subsided. The potential of e-education as a profit-making activity has become questionable (Matkin, 2002; Ryan, 2002; Hulsmann, 2004). Costly experience has caused many higher education institutions to question the increasing costs of their commitments to digitization and wired campus programs.

Some inherent paradoxes in the process of implementing the advanced technologies in higher education settings explain part of the misconceptions and failures of many e-learning ventures. This paper examines eight such paradoxes that relate to:

(1) the differential infrastructure and readiness of different types of higher education institutions to utilize the technologies' potential;

(2) the extent to which the 'old' distance education technologies and the new technologies replace teaching/learning practices in classrooms;

(3) the role of real problems, barriers and obstacles in applying new technologies;

(4) the impact of the new technologies on different student clienteles;

(5) information acquisition vs knowledge construction in higher education;

(6) cost considerations;

(7) the human capacity to adapt to new learning styles in face of the rapid development of the technologies; and

(8) the organizational cultures of academic and corporate worlds.

Understanding these inherent paradoxes is essential for policy-makers at institutional and national levels of higher education systems in the process of planning a macro-level comprehensive strategy for the efficient and effective applications of the new digital technologies. The article concludes by projecting some leading future trends of e-learning implementation in higher education systems.

Paradox #1. *Those higher education institutions that are well equipped to use the information and communication technologies efficiently — either need them less or are reluctant to use them on a wide basis in their teaching/learning processes.*

Those higher education institutions that can greatly benefit from the new technologies' potential — are ill-equipped to use their broad-spectrum possibilities.

Higher education systems worldwide are vastly diverse and are composed of different-type institutions. There are elite research universities, mass-oriented universities, professional institutes, liberal arts colleges, community colleges, mega distance teaching universities, for-profit training institutions, etc. The academic goals, potential clienteles and organizational infrastructure of each are diverse, and these profound differences shape the ways in which the new technologies are mobilized in each context to achieve different end-products (Guri-Rosenblit, 1999a).

Elite research universities around the world are relative newcomers in the distance education field, but paradoxically they are better equipped to utilize many of the information and communication technologies' abilities and qualities as compared to many long-standing distance teaching institutes. (Guri-Rosenblit, 1999b) Nevertheless, most research elite universities feel reluctant to use the new technologies to supplant the face-to-face interaction in a residential university setting. The new technologies are applied mainly to enhance the teaching/learning processes in the classroom rather than substitute the face-to-face interaction. Rarely do research universities offer full on-line courses or programs. On the other hand, distance teaching universities, as well as some mega universities, that teach scores of thousands of students can benefit greatly from the digital technologies' potential. Yet, most of them lack the appropriate infrastructure and human capital to use the new technologies efficiently (Bernath and Hulsmann, 2004; Guri-Rosenblit, forthcoming).

Why are research universities well equipped to use the new technologies efficiently, and why do they feel reluctant to use them?

Elite research universities have a favorable ratio of faculty–students and rich financial resources. Therefore, they can use the new interactive technologies most effectively for the benefit of their student clientele and academic faculty. Stanford University, for instance, has a ratio of 1:8.2 of faculty to students (Stanford University, 2002) and UCBerkeley of 1:14 (Douglass, 2001), as compared to 1:100 and even more in mass-oriented universities (Daniel, 1996). The new technologies have highlighted the enormous importance of human interaction in teaching/learning processes. No expert teacher can interact with hundreds, and even dozens, of students. Most successful on-line programs, like in the University of Phoenix Online and in UMUC (University of Maryland University College), create very small virtual classes composed of nine to 15 students (Twigg, 2001; Ryan, 2002). Obviously, many distance teaching universities, employing a very small faculty, cannot afford creating small virtual classrooms in which the expert professors will communicate with hundreds of students (Bates, 2001; Guri-Rosenblit, 2001b, 2004; Hulsmann, 2004). Continuous interaction between students and faculty and among students is a

most attractive idea and is enabled by the new technologies. At the same time, it is most difficult, if not impossible, to put forward in highly populated universities with a small number of academic faculty.

Elite research universities have richer resources to lean on. They are also much more attractive to the corporate world compared to mass-oriented and distance teaching universities in developed countries, and even more so in developing countries. Corporate and business enterprises are interested in cooperating with universities to enhance research into the new information technologies, and to design tailor-made professional programs and upgrade training programs for their working force (Adelman, 2000; Xebec McGraw and Training Magazine, 2001; Ryan, 2002). When such giant corporations, as Microsoft and Hewlett, are willing to explore and examine in depth some of the advanced technological applications, they naturally approach universities such as Stanford, MIT, Harvard and Cambridge. Rarely do they refer to massoriented and distance teaching universities, which by their very nature have less prestigious research capabilities and facilities, and lack the reputation of leading research universities.

In spite of the fact that research universities can design efficient on-line courses for distant students, they are less interested in doing so. First, they are not interested in widening access to large numbers of students and in broadening their boundaries through the distance teaching technologies. By their very nature they are inclined to stay selective for the few and well-to-do students. Second, they have no real need and no will to supplant the overall classroom teaching by electronic devices. MIT is currently a leading institution in advanced technological applications (Robinson and Guernsey, 1999; Olsen, 2002). Its president, Charles Vest, stated clearly in his 2000/1 annual report that:

'The residential university will remain an essential element of our society, providing the most intense, advanced, and effective education. Machines cannot replace the magic that occurs when bright, creative young people live and learn together in the company of highly dedicated faculty' (Vest, 2001). No wonder then that most applications of information and communication technologies in well-established campus universities are used to enhance classroom interaction or to substitute part of the teaching/learning activities, not to replace them.

Why are the information and communication technologies so attractive to distance education institutions, and what kind of difficulties do they encounter in the implementation process?

Information and communication technologies have the potential to overcome three major problems of distance teaching institutions:

(1) to 'rescue' the isolated students from their loneliness by providing interaction with teachers, professors and tutors, as well as with other peer-students;

(2) to provide easy access to library and other information resources, which was nearly impossible in the past; and

(3) to update the self-study materials on an ongoing basis (Guri-Rosenblit, forthcoming).

However, the basic infrastructure of most of the large distance teaching universities itself hinders the possibility of substituting their current teaching/ learning infrastructure by the new technologies, despite the latter's huge appeal and attraction.

One of the main areas in which distance teaching universities choose to excel is the development of high-quality study materials. The well-articulated materials replaced the ordinary textbooks and the low-level correspondence courses. They have been used extensively not only by the distance teaching universities' students but also by many students at conventional universities.

The production of such courses is tremendously expensive (Bates, 1995, 2001; Daniel, 1996; Guri-Rosenblit, 1999c; Peters, 2001; Hulsmann, 2004). However, distance teaching universities succeeded in achieving economies of scale by trading off the high expense of developing self-study courses against a drastic reduction in the size of the permanent faculty and by employing many parttime lecturers from other universities to develop the materials and provide tutoring. Academic faculty are much less involved in the actual teaching process, and many junior academic staff are responsible for the actual tutoring of the students. The simple formula applied by many distance teaching universities has been to invest large amounts of money in producing highquality study materials for the use of large numbers of students, and to employ a small academic faculty (Peters, 1994, 2001). The underlying assumption of this formula is that as the number of students increases, so the cost per student decreases.

The new technologies challenge this very basic formula as well as the whole organizational infrastructure of the distance teaching universities. The shift to the new technologies demands a major overhaul of their whole operation, and a further huge investment in setting up a totally new infrastructure for developing and delivering their courses (Bates, 1999, 2001; Guri-Rosenblit, 1999c, 2001b, 2004; Bernath and Hulsmann, 2004). Most of the distance teaching universities, which are based on relatively small numbers of academic staff, cannot afford to hire many more academics in order to facilitate student– staff interaction in most of their large courses, which are often studied by thousands of students.

The egalitarian philosophy of most distance teaching universities requires them to provide equality of opportunities to all of their students. It constitutes an additional problem in the adaptation process of the advanced technologies. By catering to large numbers of students, many of whom lack the ability or opportunity to reach Internet facilities and information resources, distance teaching universities are hindered from substituting part of their courses, or part of any given course, by on-line materials, and by a built-in reference mechanism in the pre-prepared

textbooks. This accounts for the duplication phenomenon. Many distance education institutes currently develop both printed and on-line versions of courses, and enable their students to choose their preferred mode of study. Such a policy adds substantial additional costs to the already very expensive process of developing self-study materials.

Thus, despite the apparent attractiveness of information and communication technologies to distance teaching universities, as well as to many mass-oriented universities in developed and in developing countries, most of these institutions lack the appropriate infrastructure and necessary conditions, as well as the human capital to utilize the full potential of the new technologies. It is scarcely surprising that most of the large distance teaching universities have incorporated the new technologies so far to a very limited extent (Bates, 2001; Curran, 2001; Ryan, 2002). The UK Open University, for instance, continues to value print and video-based distance learning. In 2001, more than 150 courses of the UK Open University utilized various aspects of the interactive technologies, and only a handful of courses were delivered entirely on-line (Ryan, 2002).

Paradox #2. *The 'old' distance education technologies were simple, and they replaced totally the learning/teaching processes in conventional classrooms.*

The new information and communication technologies are complex and offer a rich spectrum of uses, but they are mostly used for add-on functions. They do not replace most of the learning/teaching practices either in campus or in distance teaching universities.

The media through which distance education or distance communication have operated throughout centuries were quite simple. In ancient times, paper or papyri carried by messengers were used to transfer instructional and didactic correspondence from monarchs and rulers, as well as from religious leaders like the Apostle Paul, to communities throughout the world. The invention of print, the advent of postal services and the development of professional publishing houses have stimulated the use of the written text for correspondence education purposes (Daniel, 1996; Guri-Rosenblit, 1999c). Radio was added as a distance education medium in the first half of the 20th century. Television has been incorporated by a few distance teaching universities, notably the UK Open University, since the 1960s (Bates, 1995; Guri- Rosenblit, 1999c). These media have clearcut and transparent characteristics. They have replaced almost totally the teaching/learning encounters in classrooms, lecture halls, seminar settings and other face-to-face activities (except for some tutorial meetings, lab attendance or summer schools).

New digital technologies are much more complex than the old distance teaching media. They open up possibilities to design new study environment, which were not feasible before — for both on- and off-campus students. Their capabilities go far beyond the ability to transfer content of textbooks and lectures to students at a distance. Paradoxically, they are used, in the main, for enhancing classroom teaching or for substituting small portions of the functions performed in class (Guri-Rosenblit,

2001b, 2004; van der Molen, 2001; Vest, 2001; Bradburn, 2002; CHEPS, 2002; Harley et al., 2002; Matkin, 2002; Olsen, 2002; Ryan, 2002; Scott *et al*., 2002).

The range of uses for advanced technologies and their application are enormous. They are applied in a variety of domains for information retrieval, course design, simulations and multi-media presentations, communication with instructors in and after classroom sessions, communications among students, practicing exercises and tests, reading notice boards, classroom administration, etc. Furthermore, new technologies have a huge impact on other important activities of universities, such as library management, registration and loan administration, enhancement of research communities, academic publishing, mobility and cooperation between institutions.

In early 2000, the National Academies of the USA launched a study on the implications of the information technologies for the future of the nation's research universities (National Research Council, 2002). The panel members of this study concluded that the impact of the information technologies on the research university will be profound, rapid and discontinuous. New technologies will not only influence the intellectual activities of the university (learning, teaching and research), but will also change how the university is organized, financed and governed. Nevertheless, the Academies emphasized that the campus, as a geographically concentrated community of scholars and a center of culture, will continue to play a central role. Most of the technological applications will take place in the framework of the campus-based university. They will add on new functions or substitute part of the activities in classrooms, but all in all, they will not replace face-to-face encounters.

The need of humans to socialize is most essential. It explains why most students prefer to study in classrooms and lecture halls, even when provided the opportunity to get video-taped lectures, exercises and intimate tutoring through electronic media. The need to socialize explains why most of the predictions of Alvin Toffler failed when he projected in his famous book, The Third Wave, the restructuring of the human society and economy into an 'electronic cottage' (Toffler, 1980). He predicted the return to the cottage industry on a new, higher, electronic basis, and a new emphasis of the home as a center of society. In reality, only a handful of people choose to work at home. Most prefer to work outside their home, even to commute many hours per day for that purpose. In other words, most people do not consider space and time as limits to overcome. Only those with real problems attending regular classrooms and campuses choose distance teaching modes. Most others prefer the hybrid types of courses that combine the attractive features of the new technologies with conventional learning/teaching methods.

In Israel, many academics participated in a nation-wide study that purported to enhance the use of information and communication technologies in Israeli universities through special funding and incentives provided by the Council for Higher Education. At Tel-Aviv University, more than 1,000 faculty members have utilized various forms of e-learning in their classes in the last 3 years. Only 1% of them used the electronic media to substitute for class encounters (Guri- Rosenblit,

2002). Many more studies serve to substantiate this trend (Somekh and Davis, 1997; Fetterman, 1998; Collis and Moonen, 2001; Curran, 2001; van der Molen, 2001; CHEPS, 2002; Collis and van der Wende, 2002; Harley *et al*., 2002; Scott *et al*., 2002).

Not only students in campus universities but also many students at distance teaching universities prefer face-to-face tutorials compared to on-line tutoring.

For instance, in the University of Phoenix, a subsidiary of the giant Apollo Group, the largest accredited private distance teaching university in the USA, which has operated since 1976, on-line programs constitute only about 10% of its student population (Ryan, 2002). The University of Phoenix appears to have no intention of downscaling its physical learning centers in favor of online provision. On the contrary, a 'bricks and clicks' model, offering both online and distributed face-to-face option is regarded as the best solution for the working adult market.

Even in the business world, many prefer hybrid courses. There is an apparent resistance by many students to the notion of exclusively on-line education. One demographic group targeted by many universities is the busy professional, unwilling to commit to weekly classes and highly mobile in work patterns. Specifically for this group, a hybrid model has emerged, combining on-line communication/resources with intensive residential periods on campus to engender group cohesion and social learning. A prominent example is the Global MBA from Duke University's Fuqua School of Business (Ryan, 2002). Evidence is accumulating that e-learning is rarely used as a stand-alone model in the corporate world. A European Study found that only 15% of companies using e-learning preferred a stand-alone approach. The majority opted for greater on-line interaction and use of e-learning to prepare for and reinforce face-to-face provision (Xebec McGraw and Training Magazine, 2001).

Paradox #3. *The 'old' distance teaching methods were used to overcome real problems, barriers and obstacles.*

The problems and questions that the digital technologies assist in solving in teaching/learning practices (mainly in campus universities) are blurred and not clearly defined.

The new electronic media were introduced into the academic world as a sudden thunderstorm without having time to define what were the purposes and functions that they could fulfill or replace. The lack of clear problems has turned out to be an acute problem in adapting new technologies in universities and colleges (Guri-Rosenblit, forthcoming).

Traditionally, distance education at the university level purported to overcome barriers and difficulties of students unable to attend a conventional campus. The obstacles that distance education has helped to overcome include: lack of formal entry qualifications; physical/health constraints; geographical barriers; working; family obligations; and being held in closed institutions, such as prisons and hospitals, etc. Target populations studying through distance education at the post-

secondary level were considered distinct and special, usually older than the age cohorts at classical universities, and mostly 'second-chance' students according to a variety of criteria. Such was the case of Professor Knight from St Andrews University, the oldest Scottish university, who decided that women are also entitled to study higher education. He offered between 1877 and 1931 an external higher education degree in arts designed specifically for women who were scattered over one hundred centers worldwide (Bell and Tight, 1993).

Interestingly, even nowadays when millions of people use the Internet and exploit its distance learning capacities, the profile of the students studying all or most of their higher education programs through distance education methods still resembles the profile of the traditional distant student. In a comprehensive survey, published by the US Department of Education in November 2002 on A Profile of Participation in Distance Education 1999–2000, students who chose to study distance education programs were 'those with family responsibilities and limited time. They were more likely to be enrolled in school part time and to be working full time while enrolled' (U.S. Department of Education, 2002, iii–iv).

This survey was conducted on all undergraduate and graduate students enrolled in USA post-secondary institutions during the 1999/2000 academic year.

Unlike the clear obstacles and barriers that traditional distance teaching technologies were designed to overcome, the new technologies have offered multiple uses with no clear relation to any existent or future problem in the teaching/learning processes in campus universities. The reactions of many academics asked to incorporate the new technologies into their classrooms have been of the type: 'If it ain't broken, why fix it?' or 'Technology is the answer — but what are the questions?' (Guri-Rosenblit, 2002).

A large study, conducted at UC Berkeley from September 2000 to June 2002, on the use of technology enhancement in some large undergraduate courses in chemistry (Harley *et al*., 2002) constitutes an interesting example of the impact of problem definition on institutional decision-making. While the study was being conducted, it was found that technology-enhanced classes in chemistry may save both faculty time and space. Instructors spent less time answering routine questions because students were able to find some of the necessary information on-line. And laboratory sessions could — in theory at least — be reduced from 4 to 3 h to better utilize lab space. Such a finding was most interesting for UC policy-makers, grappling with Tidal Wave II, namely an increase in the enrollment (43%) of about 63,000 full-time students that the University of California 10-campus system will face in the coming years. If, through the use of technology, it is possible to save from 10 to 20% of space and faculty time, technology becomes a strategic solution to absorb more students. It does not save money, however (*ibid.*).

Many studies on the implementation of the digital technologies stress that the time has come for both governments and institutions to become more focused and strategic in their policies regarding the use of technologies (Bates, 1999, 2001;

Trow, 1999; Guri-Rosenblit, 2001b, 2002, 2004; van der Molen, 2001; CHEPS, 2002; Collis and van der Wende, 2002; Harley *et al*., 2002; Matkin, 2002; National Research Council, 2002; van der Wende, 2002; Bernath and Hulsmann, 2004). A macro-level organizational effort is needed to consolidate the multiple findings on e-learning into a coherent body of knowledge, available to decision-makers in higher education settings.

Paradox #4. *The new technologies open up the possibilities of widening access to higher education for new student clienteles.*

Second-chance and unprepared students are less qualified to use information and communication technologies for their purposes (mainly at the undergraduate level and at distance teaching settings).

A major role of distance education for over a century has been to widen access to higher education. Since the 19th century, correspondence institutions, extensions and distance teaching universities have opened the gates of academia to diverse student clienteles for higher and continuing education. By doing so, the distance teaching institutions fulfilled an emancipatory purpose (Morrison, 1992), a mission to remove barriers. Time, space, prior level of education, social class, working and family obligations were defined as barriers to be overturned by special policies and mechanisms applied by distance education institutes. From the outset, many distance teaching universities designed flexible access policies, appealing particularly to parttime and second-chance students. Part-time higher education is an essential component of the lifelong, recurrent education concept.

The new technologies, by their very nature, open up possibilities for widening access to higher education to new student clienteles. By doing so, they promote social equity (Gladieux and Swail, 1999). The potential new student constituencies include different groups. One consists of adults studying for recreational purposes, who are willing to pursue fields of study different from those in their professional careers. Another large new student clientele are professionals seeking to upgrade their professional knowledge and expertise on an ongoing basis. It remains a fact that the most successful e-learning ventures take place in professional training and professional upgrade programs (Adelman, 2000; Matkin, 2002; Ryan, 2002; Blumenstyk, 2003). Many students in the future are likely to study while they work. Being highly mobile, they will expect to continue studying while they move between different national jurisdictions, and e-learning will constitute an important tool for achieving this purpose in the growing entrepreneurial and globalized economies (Clark, 1998; Trow, 1999; Enders and Fulton, 2002).

A large group among traditional distant students were second-chancers, many of whom do not possess sufficient qualifications to enter conventional universities. They are usually less qualified to study on their own, and are unprepared to cope with academic study. The accumulated experience from large distance teaching universities indicates clearly that to deal effectively with second-chance, unprepared students, it is crucially important to back the teaching/learning processes with

efficient delivery and support systems (Tait and Mills, 2003). Many distance teaching universities provide their students with occasional campus-like grounds within regional and local study centers to meet and interact, summer or residential schools, personal tutors, professional counselors and intensive tutorials.

Unquestionably, digital technologies open up the possibilities of widening access to higher education, both in developing and developed countries. However, unprepared and less qualified students are less qualified to use the new technologies' capabilities without an intensive and steady support. Sir John Daniel, who served until 2001 as the Vice-Chancellor of the UK Open University, stressed, already in 1996, that the potential success of the innovative electronic technologies depends to a great extent on the ability to provide individual learners with adequate backup throughout their studies. Daniel asked: 'Can we through electronic mail, computer conferencing and the World Wide Web, provide the level of individual student support that we think necessary? We are experimenting with that, but despite all the arm waving, I think the jury is still out. If the jury comes back and declares us guilty of being able to provide effective, personal, tutorial support to students on a large scale, then all sorts of things become possible' (Daniel 1996, 38).

Since Daniel posed this question, the jury has raised its verdict — such support is possible when teaching on-line a very small numbers of students. Such a mode of teaching is highly costly. This explains why most successful e-learning programs take place at the graduate, post-graduate and professional training levels. Undergraduate students, and particularly weak students, need a lot of support and reinforcement both in regular and virtual classes. They cannot benefit from the wide plenty of programs currently available on the Internet without constant support and a caring and supportive environment (Tait and Mills, 2003; Hulsmann, 2004). In other words, the potential of the new technologies to widen access to large numbers of young and unprepared students, mainly in developing countries, is, in reality, most limited.

Paradox #5. *The Internet provides unlimited access to information and skill training.*

But information differs significantly from knowledge. Only expert teachers and professionals can guide novices to construct meaningful and relevant knowledge (particularly at the undergraduate level).

The new technologies provide unlimited access to information of all kinds for all types of students at all educational levels. E-learning offers attractive uses for all learners. Younger pupils enjoy its multi-media games and fun activities, acquiring very basic skills; older students use its endless information resources for preparing homework, assignments and examinations. Millions of people use e-mail, chat groups and other formats of telecommunication as students as well as in their social and work lives. People frequently complain that they feel lost in the overload of information they get, and sophisticated search engines have been designed to assist in finding relevant information as fast as possible.

In the sweeping enthusiasm for the endless possibilities of accessing remote databases and resources, somehow the essential distinction between information and knowledge has been blurred and confused. The traditional role of educational establishments at all levels has been to assist their students in constructing knowledge through guidance, tutoring and personal attention, and not merely imparting information. Children could have studied at home from encyclopedias and books instead of going to school, if the main purpose of education was to acquire information. There is a vast difference between a bag of flour and knowing how to make it into bread.

The role of schools, colleges and universities is to assist their students to develop their learning styles, to construct knowledge relevant for their lives, and to cope with values and norms in a changing world by providing them with adequate tools. Accessible information does not turn automatically into meaningful knowledge without the assistance of a teacher or an expert. Novices, particularly at the undergraduate level, have great need of ongoing support and guidance of expert teachers. The boundless information available on the Internet might enrich the learning/teaching processes in class. By no manner of means can it replace them. In some liberal arts colleges, which integrate various components of e-learning into their classes, the teaching personnel grew to include additional experts. For example, in a specialized course on 'Arts, Multimedia and the Internet' at Grinnel College, it was reported that a class of no more than 25 students are taught by a professor and a librarian who attends most class sessions and teaches about the location and assessment of sources on the Web. In addition, the class benefits from the presence of an instructional multi-media teaching specialist (Scott *et al*., 2002).

An excellent example of the inherent limitations of materials put on the Internet is provided by the Open Courseware project of MIT (Olsen, 2002). By putting syllabi and some other relevant materials of about 2000 courses online, MIT had no intention of teaching any students beyond its campus students. Its intention has been misunderstood by many. Through this unique project, it set out to provide an example of 'intellectual philanthropy'. The Open Courseware project gives interested students and faculty members all over the world a glimpse of MIT curricula. However, this does not mean MIT intends to enroll large numbers of students, and offer on-line courses by MIT professors for credit. Already, some professors at other universities indicated that the load of the MIT courses is too heavy for their students. Materials suitable for a quarter at MIT will have to be studied for a whole year by students of their institutions (*ibid.*). Adapting these materials will be conducted in each setting by expert teachers. Very few, if any, independent students will be able to benefit from the MIT materials and substitute them for registering at a teaching institute and very especially so at the undergraduate level.

Paradox #6. *Distance education was largely justified for more than a century for its cost effectiveness and for providing economies of scale.*

Most evidence on the application of information and communication technologies in higher education indicates that they cost more — not less — than face-to-face classroom interaction.

One of the major benefits of distance education at university level in the last few decades has been its ability to broaden access to higher education by providing economies of scale. This is particularly true since the 1970s, when a new brand of large-scale distance teaching universities was established. The mega distance teaching universities followed the model of the UK Open University, founded in 1969. There are about 30 such universities in various parts of the world. All of these large-scale universities were a product of governmental planning set to fulfill national missions, mainly to absorb large numbers of students at a lower cost as compared to traditional campus universities (Daniel, 1996). This goal was achieved through an industrialist model of operation (Peters, 1994, 2001). The division of labor of academic teaching responsibility into two separate phases constitutes the essence of the industrial model of distance education. The first phase is devoted to the production of high-quality self-study materials. The second phase consists of the actual teaching of large numbers of students by lower rank academic faculty. As the number of students increases, the cost per student decreases. Some of the large distance teaching universities teach over 100.000 students.

Simple formula of the industrial model, upon which large distance teaching universities operate, accounts for part of the misconception about the economies of scale that electronic technologies were expected to provide. The blurring of meaning between 'distance education' and 'e-learning' led to expectations and predictions that dozens of thousands of students would be able to join higher and continuing education programs at lower costs, compared with classroom teaching in campus universities owing to the new interactive media (Guri-Rosenblit, forthcoming). When set, the underlying premises of e-learning differ significantly from the industrial model of distance education. Quite frequently, effective e-learning costs more, no less, than conventional face-to-face teaching (Bates, 2001; Guri-Rosenblit, 2001b, 2004; Matkin, 2002; Ryan 2002; Hulsmann, 2004).

In addition to the misunderstanding as to the essential difference between the industrial mode of distance education and e-learning, two additional factors account for the misconception about fast and easy profit-making from elearning. One relates to the substantial cuts of training costs that took place in the corporate world as a result of cutting out such elements as airline flights and hotel expenses, previously included in training. Such cost-cutting led many to assume that such monetary savings would also occur at universities employing e-learning. Obviously, it is more economical to bring training programs to the workplace rather than sponsor workers for days at remote conference sites and training sessions. Little wonder then that most of the profit-making claims came from the business and corporate world (Keegan, 2000; Newman *et al*., 2002). However, cuts in hotel and flight expenses are utterly irrelevant for students and faculty in academia. A further element of error is

related to underestimating the high expenses of setting up an appropriate infrastructure for e-learning, its ongoing maintenance and its wastage management.

Setting up an appropriate infrastructure for the effective utilization of digital technologies in any university or college requires large investments. Computer hardware is still quite expensive. Its rapid change plus the need for its frequent replacement increases the expense of using it. The initial costs of the basic infrastructure needed to operate e-learning is by no means trivial. Bates stressed in his report on National Strategies for E-learning in Post-secondary Education and Training that 'E-learning is heavily dependent on appropriate technological infrastructure already being in place for commerce or government reasons. Stable electricity and reliable and moderately priced Internet access is a necessary condition for e-learning' (Bates, 2001, 113). Until there is a basic and reliable infrastructure in place, e-learning is unlikely to be either a realistic or practical choice for learners.

Both the infrastructure and the maintenance of e-learning are costly. As we underlined earlier, it is of tremendous importance to establish support systems for both students and teachers who use the technologies. The induction of teaching faculty to the new technologies demands ongoing professional and technical support and the establishment of special centers for course development (Bates, 1999, 2001). Ongoing support is also needed for students, particularly weak students (Somekh and Davis, 1997; Guri-Rosenblit, 1999c, 2004; Littleton and Light, 1999; Collis and Moonen, 2001; Scott *et al*. 2002; Tait and Mills, 2003).

In addition to the heady expense of setting up appropriate infrastructures for e-learning and keeping up its maintenance, the wastage of the outdated hardware turns to be an unexpected additional cost. Getting rid of outdated computers poses financial, environmental and ethical challenges (Carlson, 2003a). In 2003, the University of Minnesota, for instance, spent more than $100,000 for the de-manufacturing of old computers — to pull out valuable steel, aluminum, copper and the chips that contain gold, and, in an appropriate way to get rid of the many poisons computers contain. During educational technology's boom, colleges bought computers by the truckload. Now, institutions have to be careful how they throw those aging computers away. In some USA states, such as California, New Jersey, Massachusetts, Oregon, Virginia and South Carolina, legislators have proposed or passed laws, banning the disposal of electronic waste and have legislated on how to treat large quantities of hazardous materials, which include computer monitors, televisions and other electronics. Electronic waste is regarded now as the next big environmental issue. Old computers compose 10% of the solid-waste stream in the USA, and computer-related waste is growing three times as fast as any other kind. The number of computers retired in 2002 was 40 million. The number of obsolete computers is believed to be nearly 300 million in 2004 (*ibid.*). Many universities and colleges have not yet decided how to deal with their electronic waste nor how to sponsor this activity. In sum, it is very far from easy to turn e-learning into a profit-making activity.

Paradox #7. *Developments of the new electronic technologies are very fast.*

The human capacity to adapt to new habits and new learning styles is very slow, and research in academia necessitates a perspective of time and reflection.

The development of the new electronic media is very fast. It poses difficulties for both researchers and students. Researchers find it difficult to conduct longitudinal studies on the digital technologies' effects and capabilities, and students, as well as their lecturers, find it difficult to adapt to new learning and teaching styles on an ongoing basis. Martin Trow stated the main problem of research on the new technologies: 'We need research in this area because while we can say with some confidence that the new forms of instruction will have large effects, for most part we do not know the nature of those effects, nor their costs, material or human' (Trow, 1999, 203). Most of the technologies' impacts on educational settings still lie ahead. One inherent limitation of the current and future research on new technologies is tied to their speed of development. Research in academia is characterized by the ability of the researchers to examine any investigated phenomenon from a perspective of time and through a relatively long reflective process of deliberation and trials. The speed of the electronic technologies' development inhibits this very basic characteristic of academic research. Researchers do not possess the luxury to examine the influences of the new technologies on human learning from a distant perspective and over time, since the entities they are investigating may become obsolete by the time they reach their conclusions. Thus, the tendency among academics to examine new phenomena rationally and carefully, is strongly reduced by the uncertainties of technological development in the near future.

An excellent example of the inherent difficulty to project definite future impacts of the information and communication technologies upon higher education is provided by a wide-range study launched by the National Academies of the USA to investigate the impact of the new technologies on the future of the research universities (National Research Council, 2002). In the concluding section, the panel members of this study apologized for being unable to provide definite recommendations as how to proceed with implementing the technologies in research universities: 'Although part of its charge was to make policy recommendations, the panel ultimately decided not to do so in this first phase of activity. One factor in this decision was that information technology is evolving so rapidly that any perspective set of conclusions and recommendations could quickly become outdated. Also, the panel was unable to examine the numerous issues bearing on the topicy with the depth needed for recommending policy changes' (*ibid.*, 49).

Little wonder therefore that e-learning is adapted in higher education settings far slower than was expected a few years ago. The human capacity to adapt to new styles of learning and teaching is limited and slow, for both students and teachers. A large-scale comparative study on the applications of the new technologies in 174 higher education institutions in seven countries (The Netherlands, Germany, the UK, the USA, Australia, Norway and Finland) (Collis and van der Wende, 2002) was

presented at an international conference on 'The New Educational Benefits of Information and Communication (ICT) in Higher Education', in Rotterdam in September 2002. The final conclusions were: 'Change in relation to the use of ICT has been gradual and unsystematic. Many experiments and pilot projects have been launched leading to interesting innovations, which are, however, generally not well disseminated. ICT is used mainly to increase flexibility in on-campus delivery of education. Institutions turned out to be only moderately focused on new target groups, such as lifelong learners and international students' (CHEPS, 2002, 2).

Both students and academic faculty seem to like the traditional classroom encounters, even when given the opportunity not to attend a class, and to be provided on line with all materials and assignments required. In the UC Berkeley study, mentioned earlier, which sought to examine the impact of technology enhancement in large chemistry courses (Harley *et al*., 2002), only 16% of the students were willing to watch lecture webcasts entirely on-line rather than going to the lecture hall. In all, 84% indicated that they preferred to attend face-to-face encounters, even though they could have studied all the materials, conducted all of the experiments and watched the video-taped lectures at home. Thus, the myriad forecasts that predicted the replacing of the campus university with new technologies have, in reality, not been substantiated at all. Traditional styles of learning and teaching still reign in dominance and splendor in most higher education settings.

Paradox #8. *The costs of applying the new technologies, as well as their development, justify strong cooperation between the academic and the corporate worlds.*

The organizational cultures of these two worlds differ enormously, which results in many failures of such collaborative ventures.

The growing use of digital technologies in higher education led already to an intensification in collaboration between the academic and the corporate worlds, and this trend is likely to intensify in the future. There are clear tradeoffs that these two worlds can offer to each other. Universities have the research facilities and the human capital to both advance the development of the new technologies and to assist in their effective utilization in various societal domains. The corporate world has the necessary funds, and major intrinsic interests to invest in research on advanced technologies.

Many alliances were forged in the last few years between leading companies and universities. One such cooperation was created between Microsoft and MIT in October 1999 to investigate the range of possibilities of an I-Campus for distance learning and for new modes of academic publishing (Robinson and Guernsey, 1999). Harvard, Darmouth, John Hopkins and Brown Universities in the USA have invested in recent years in for-profit college companies (Blumenstyk, 2003). Harvard University, for example, is the biggest institutional investor in a $590 million fund run by Boston's Charlesbank Capital partners, which made its foray into the sector in April 2002 by investing in a school that trains automobile and motorcycle

technicians — not exactly the typical Harvard student. Side by side with some successful examples of working together, many joint ventures between leading universities and giant corporations failed to yield the initial expected results. Business models for on-line programs were predicated on booming employer demand, without establishing end-user demand (Ryan, 2002). And as Matkin admitted in 2002: 'The roof clearly has caved in on several efforts of prominent universities and colleges that entered the on-line game early with large investments and big plans. The headlines that 2 or 3 years ago announced with great fanfare the formation of large-scale and well-financed on-line learning partnerships have been followed in the past year with equally prominent headlines announcing 'restructuring', 'refocusing' and 'realignment' strategies in these joint ventures' (Matkin, 2002, 1).

Some failures have been dramatic with dire consequences to some universities. High-profile failures include NYUOnline, launched in 1999 as a for-profit arm, will close as a separate division of NYU, fold some of its operations back into the School of Continuing and Professional Education and sell its infrastructure. NYU invested $21.5 million into NYUOnline by July 2001 (Ryan, 2002). The much-respected Temple University abandoned Virtual Temple in July 2001 (Blumenstyk, 2001). Jones International University, with the backing of multi-millionaire Glenn Jones and the Apollo Group has not met its initial expectations. Only 200 degree students were enrolled by mid- 2001. Only 10 students in total graduated in 2001 (*ibid.*).

One of the most adventurous and highly funded projects involving top universities, including the University of Chicago and Columbia University — UNext.com — has eaten up in excess of $200 million with, so far, little or no prospect of return for investors (Matkin, 2002). Another Columbia-sponsored for-profit company called Fathom.Com, closed in 2003 (Carlson, 2003b). In 2 years of operation, the venture featured materials from a dozen prominent institutions and attracted widespread media attention. It was never profitable. It suffered much criticism from the Columbia faculty because of the losses it sustained after an investment of more than $25 million.

Deep differences between organizational cultures of the academic and the business world explain part of the problems in some joint ventures. The research interests of the business sector vs the academic world are different. Their expectations, perceptions and professional jargon reflect distinct working milieux. Decision-making in the business world differs significantly from universities. Corporations are ready to invest large sums of money both in research and in inviting tailor-made training programs, but they want the endproducts to be delivered on time and decisions made fast. These are not exactly the values and operational procedures that characterize the academic life. Decisions at any given academic department have to be approved by several committees, and much time is needed for reflection and deliberation.

In addition, many corporate trainers claimed that they were frequently disappointed with the quality of the programs they got from universities. Some of the generic on-line courses they purchased were simply boring and could not engage learners sufficiently to maintain interest (Ryan, 2002). Too often, text was shoveled on screen, animated with a few trite graphics and tested with memory-recall quizzes. It is also obvious that the more customer-tailored programs are customer tailored, the more their development costs increase, and eventually cancel out the savings promised by mass-market distributed learning.

Other business leaders claimed that the structure of the university courses does not fit their rhythm and needs. The ponderous nature of some for-credit university courses seems unattractive to many in the business environment, as NYUOnline found, shortly before expiring. It reduced its 13-week semesterlength courses based on university rhythms, to 6-week modules, in a desperate attempt to cater for short attention spans and fast-finish mentalities. Industry and the corporate world prefer just-in-time training rather than concerted programs of study (Ryan, 2002). Such disappointment led many large corporations to establish their own universities to train their personnel in close coordination with their particular professional demands.

Certainly, collaboration between universities and the corporate world will continue to evolve. However, in each collaborative venture, it is of tremendous importance to define the major goals of each party, the exact anticipated endproducts and the terms of publishing the final products, results or conclusions, and, last but not least to take the immense differences in their organizational cultures fully into consideration.

Concluding remarks

This article examined eight inherent paradoxes in implementing the new information and communication technologies for learning/teaching purposes in various higher education settings. These paradoxes explain partially the wide gap between the rhetoric in the literature, which describes the sweeping effects of these technologies on educational environments, and their actual implementation. Even so, the use of e-learning in higher education will grow in the future. It will be based on more realistic expectations and lessons drawn from both successes and failures in this field in the past few years.

The impact of the new technologies on higher education will affect all domains of academic activity — research, teaching and learning, organization, finance and government. The provision of distance education through them will constitute a partial function of the e-learning applications. The campus as a center of culture, knowledge generation and the locus of students–faculty interaction will continue to thrive and flourish. The new technologies are not likely to endanger the existence of the campus universities, but rather enrich, support and enhance many of their activities.

One important lesson to be learned from past experiences is that if universities are to gain maximum benefit from their digital resources, institutions might be advised to play to their strengths rather than try to create resources in every discipline and offer every service. It is important also to exchange resources and to change the 'not invented here, must invent for self' approach. Well-planned collaboration between higher education institutions might benefit all participants.

Between countries, there are distinct differences in the application of elearning. The most notable being between developed and developing countries. Paradoxically, the latter can benefit greatly from the new technologies, but most still lack the appropriate resources to adopt e-learning. Bates, who was asked by the International Institute for Educational Planning of UNESCO to recommend national strategies for implementing e-learning in post-secondary education in various parts of the world, concluded that: 'Those countries that are not yet ready for the knowledge-based economy are probably not yet ready for e-learning' (Bates, 2001, 111). He suggested that countries with large numbers of students unable to access the later years of secondary or higher education should adopt the industrial model of the distance teaching universities, which provides the best route for mass education, rather than design e-learning frameworks. In other words, utilizing the new technologies has to be based on a careful examination of their costs and the necessary infrastructure for their successful implementation.

There is a clear technological divide between developing and developed countries. Most developing countries do not possess the resources and skilled workforce necessary to make e-learning feasible and available on a wide scale. However, large distance teaching universities in the developed world will also utilize the new technologies for add-on functions to their core curricula, which will continue to be based mainly on printed self-study materials and mass media.

E-learning will promote the growth of both academic trade and academic philanthropy. More universities and new for-profit companies will export academic and professional programs as a commodity to a variety of student populations. There are already some noticeable differences between national policies in this domain. Australia, the UK and Canada are more oriented to the international market as compared to the USA (Ryan, 2002; van der Wende, 2002). Many of their universities try to export their higher education as a commodity to third-world countries. The American universities are more directed inwards, generally preferring campus-based integration of e-learning, with a few examples of purchases and partnerships in physical campuses overseas. Concurrently with a growing activity of using e-learning for profit and commercial purposes, academic philanthropy through using the new technologies will grow as well. The Open Courseware project of MIT constitutes such an example. Already, some other universities, such as Carnegie Mellon, Princeton and Stanford have followed suit (Olsen, 2002).

E-learning will greatly contribute to a growing flexibility in academic study patterns (Collis and Moonen, 2001). Flexible learning offers students many

opportunities to adjust their needs and learning styles to a variety of learning settings and media combinations. Hybrid courses combining various components of face-to-face encounters with on-line provision will emerge as a growing pattern in many academic institutions. It is likely that more graduate and pos-tgraduate students will study on-line, whereas the majority of undergraduates will prefer the more conventional classroom meetings. Forprofit institutions are likely to dominate the market of professional training.

Using new technologies will add new roles to the academic faculty. Teaching responsibility will be distributed among several actors. Academics are expected to become more facilitators and mediators between knowledge bases and students, rather than the main vehicle for transmitting bodies of knowledge. The development of on-line courses and the adaptation of traditional learning materials to delivery through the Internet are complex processes, which require teamwork and the participation of many actors. Academics will have to become reconciled to collaborating with other colleagues and professionals in designing materials and in the teaching process (Guri-Rosenblit, 2004). The new technologies will require the academic faculty to assume new responsibilities and to develop a range of new skills. Faculty members will be expected to lead teleconferencing via the computer, be able to lead chat groups, and design computer software. At the same time, teachers will have greater flexibility to choose the teaching styles better suited for their personal strengths and individual preferences.

Likewise, e-learning will enhance globalization trends. The Bologna Process in Europe, as well as many reforms in other parts of the world, encourages higher education institutions to engage in inter-institutional schemes and initiate collaborative ventures. Students, academic staff and curricula are transferred and exchanged between institutions, and governments append their signatures to collaborative projects. E-learning constitutes an important tool for strengthening partnerships between academic institutions within any particular country and across national borders.

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