Open Education

New Models for Policy Makers
In Promoting Public and Private Partnerships
For Cyber Education

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ABSTRACT

For societies to remain economically competitive, educational institutions, government and business must collaborate in an effort to broaden the range and reach of education. We must create an educational system that is available to all individuals over the course of their lifetimes. In this context, the role of policy makers in promoting public and private partnerships for Cyber Education is evolving rapidly. Increasingly, policy initiatives to address the digital divide will have to address not just the broad availability of technology and connectivity, but also the development of knowledge and skills to foster effective use and new educational models for a digital age. This paper looks at ways in which policy and technology can address the challenge of transforming the current education "industry" into one that better meets the needs of societies dependent on ever more highly skilled, flexible citizens and workers.

INTRODUCTION

Education is of critical importance to business and government. It provides us with educated employees, educated consumers of products and services as well as an educated citizenry. More than ever before, an educated workforce is the competitive differentiator for businesses and nations. However, this workforce is only as strong as the quality and accessibility of education. The potential value added to society by education is immense. Furthermore, it has the opportunity to grow because knowledge and learning represent one of the few sources of sustainable advantage in a fast-moving, highly competitive world. Education will need to become accessible to those who need it and more consideration must be given to learning productivity where outcomes are the focus. The 'Ability Driven Education' roadmap in Singapore's 'Thinking Schools Learning Nation' framework is a good example of a policy initiative that holds much promise in this regard. (Teo, September 2000).

IMPORTANCE OF EDUCATION

Although natural resources and capital will continue to be necessary, wealth and power will increasingly be predicated on knowledge, creativity and global communications. For business, increased education and skills translates into increased productivity, creativity and competitiveness. Company productivity increases with the educational level of its workforce. One study showed that a 10 percent increase in the education level of a firm's

workforce increased productivity by 8.6 percent. In contrast, a 10 percent increase in capital equipment increased productivity by only 3.4 percent (Goldberg, 1996).

In a World Bank report published in February 2000, entitled "Education in Crisis: The Impact and Lessons of the East Asian Financial Shock, 1997-99" Jonathan Ablett, and Ivar-AndreSlengeso note:

> Among the most widely cited studies assessing the economic returns on investment in education is the World Bank's *East Asian Miracle* (World Bank, 1993). Not rich in natural resources, the fast developers in this region have invested heavily in education.
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> The countries that achieved universal basic education first, Korea being the prime example, were also the first ones to experience economic "take-offs." Within-country analyses of eight East Asian economies – Hong Kong, Indonesia, Japan, Korea, Malaysia, Taiwan, Singapore and Thailand – found that the single largest contributor to economic growth was primary education.
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> Primary school enrollment explained between 58 percent (Japan) and 87 percent (Thailand) of predicted growth. In other parts of the world,

education – while important – was not found to play such a major role in promoting economic growth.

In other parts of the world as well, there is a growing recognition of the importance of education to remain competitive, especially in a knowledge driven and technology enabled global economy. The European Commission adopted a plan earlier this year to invest US$13.3 billion in e-learning over a three-year period that spreads across all levels of education. The plan is "aimed at broadening digital literacy in Europe and at reducing the continent's shortage of trained information-technology workers" (Birchard, April 16, 2001). Similar in at least one respect to the e-learning investments and proliferation of digital learning initiatives in APEC member economies, the European Commission is looking to cyber education as one of the ways to address the issues of a growing shortage of technology skills - which today impacts nearly every age group, education level, and regional economy on a global scale. Education and the new models of e-learning has become pivotal to tackling these kinds of economic challenges and spurring growth.

Moreover, for the individual and society, education is about much more than just productivity in the workplace and a return on investment for government. An educated citizenry, one that can understand issues and participate in the political process is a requirement for a vibrant and dynamic society. In addition, quality of life is often linked to education. Whether the measure is exercising voting rights, health, appreciation of the arts

or a positive attitude toward the future, education improves the overall quality of life for individuals and their communities.

CONTINUOUS LEARNING

Irrespective of how good education is at any level, getting educated once will no longer be enough. Although education systems are currently segmented into pre-school/school/higher education, public/private/proprietary, there are increasing calls for a seamless, lifelong education system.

It is estimated that today's workers will move through three to five careers. The predicted number of careers for those now graduating from college is closer to thirteen. In addition, skills and education requirements within careers are constantly changing to address new opportunities as well as new demands created by the introduction of new technology. One study found that over half of the employees with a bachelor's degree have been encouraged by their employers to get more job-related education or training (Dillman et al., 1995). With these kinds of employment shifts, we are in an era of "upskilling" where an individual needs to continuously enhance his or her skills and competencies to remain fully employed.

It is hard to quantify the need for workforce training, but assuming that a person will need to retrain at least five times in a working life, and that such retraining requires the

equivalent of three months full-time learning, then the capacity of the current education and training market—public and private—needs to be doubled (Open Learning Agency, 1992). The need is worldwide and additional capacity is not yet available anywhere.

In an era of rapid changes to the work environment, lifelong learning brings challenges beyond current capacity. There are new kinds of students. Many of them are older, representing an age group with which higher education is relatively unfamiliar. The way people acquire knowledge changes as they get older. People aged between 18-20 are most likely to have taken a course for college credit in the last three years, while those over the age of 40 are most likely to have taken a short course, seminar or workshop (Dillman et al., 1995).

The requirements of this new learning market are very different from those of the young adults the system has traditionally served. Individuals will initiate much of their adult learning as part of their working and leisure lives. Most of the learning will be informal, not leading to any formal qualification. It will become more self-directed and on-demand delivery of education will be fundamental to accommodating the convenience of learning at anytime, in any place, and at any pace. Learning will often be in a piecemeal manner; broken into small parts of learning, some as small as a few minutes a day, some several hours in length. Some learning will lead to certification. It will be driven as much by short-term needs as by any conscious plan of study. Thus, it will not be determined by some master instructor, but by the task at hand (Weimer, 1992).

The impact of ensuring access to high quality education is broad. We must significantly improve access to affordable and high quality learning for traditionally underrepresented and undereducated groups. We can ill-afford to lose the talents of people who are geographically isolated, economically disadvantaged or workers and students with different learning styles. The need for increasingly educated populations in all APEC member economies is immense. We cannot allow some learners to remain disenfranchised when solutions are available.

OBSTACLES TO INCLUSIVE EDUCATION

There are a number of potential barriers for people seeking education. Some deal with access, others with effectiveness.

Place: Location can be a barrier to participating in education. Frequently, educational options are more limited for those living in remote rural areas. For some people, simply having to leave home or work to go to another location for education presents a major barrier. With information technology, learning opportunities can be brought to the student.

Time: Traditional education offers classes on a fixed schedule. If the student is not available at the times a class is offered, the course simply cannot be taken. Time can be a barrier to inclusive education in other ways, as well. Today, most education is offered in

50-minute increments such as lectures. This educational model holds time constant and does not allow learning to vary. Limiting educational achievement by restricting time is a major barrier to providing effective learning opportunities.

Information technology can remove many of education's time restraints. Classes can be available 24 hours a day. Flexibility—in terms of individual student pacing and duration—becomes practical. Interactivity moves beyond the traditional constraints of the classroom and class times.

Learning style: It would be easy to assume that the dominance of lecture indicates that almost all students have the same learning style and that lecture is their preferred method. In reality, it is more indicative of us having grown accustomed to teaching through telling. While this approach worked for many in the past, it is less effective for the majority of today's students.

In one study, 60 percent of students were found to prefer a direct, concrete learning experience. They also needed to know why they were learning something. These students preferred the tangible, the practical and the immediate, with a low tolerance for ambiguity. The other 40 percent were "big picture" types who focus on imaginative possibilities rather than on concrete realities. They preferred to move from theory to practice and liked open-ended instruction. With technology, more flexibility and adaptability can be designed into

learning environments—from preschool to adult education—so that multiple learning styles are accommodated.

Information technology allows us to offer students alternative learning styles that can improve retention. Instructional environments can be created that range from reading to assuming the role of the instructor. Research indicates that students retain 10 percent of what they read, 50 percent of what they see and hear, 70 percent of what they discuss with others, and 95 percent of what they teach (Cook and Cook, 1998).

Parental and community involvement for schools: Parents are finding it increasingly difficult to participate in their child's education due to work schedules and other demands on their time. Parental involvement is widely recognized as having a powerful effect on student learning in schools. When parents or other adult mentors are aware of student assignments, pay attention to the work submitted and review results with children and teachers, student performance improves markedly. Technology can make this participation more convenient and more effective.

Just-in-time learning: An individual's effectiveness often depends on what they can do or learn quickly. If learning is not available when needed, the opportunity may pass. Moreover, the time-saving services which consumers have become accustomed to, including fast food restaurants, ATM banking machines, and the proliferation of online services available at their fingertips, are also increasingly expected of education. For

learning to be useful and convenient, content and courses must be available in a variety of formats that allow students to access the material on-demand and from a variety of locations, which is better known as Cyber Education. In addition, the acquisition of information or skills as they are needed results in improved learning comprehension. Technology can help ensure that learning opportunities are available when they are needed.

Higher Education/Schools relationships: A strong schools system relies on the quality of its teachers, which depends in part on teacher professional development and retraining. Teachers need additional training to educate students for society's changing needs in a digital age. Although the potential challenge may be at the school level, the solution may come from higher education. There are many ways that higher education can positively and dramatically impact the current education reform efforts underway in almost all APEC member economies.

- Improve the academic knowledge of teachers;
- Develop teacher's integrative skills to help students develop analytical, problem solving and communication skills;
- Teach administrators/teachers improved methods of structuring and extending the reach of the classroom and the school day; in part by more effective use of the Internet to provide better access to learning assistance and resources for underachieving students;
- Encourage parental involvement, particularly via the Internet.
- Improve all tools used in schools, especially technology; and

- Improve education for administrators so they can manage highly complex organizations (Oblinger and Verville, 1998).

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Systemic reform and redesign: The Education "industry" is being called upon to transform itself. Its current structures limit its ability to be effective in a world where customers, competition and rapid change demand flexibility, quick responses and new assumptions. Incremental changes will not suffice; systemic reform and redesign will be required to:

- Help people develop the beliefs and behaviors to meet the emerging environment;
- Identify and implement the appropriate technologies to support a new system; and
- Establish measurable performance objectives and continually assess progress in achieving strategic goals (Hafner and Oblinger, 1998).

NEW APPROACHES

As societies wrestle with how to improve education, new approaches are emerging. Our existing place-based model is neither scalable enough nor flexible enough to meet society's diverse needs. Many of the new approaches utilize the network for Cyber Education - to distribute instruction and broad access to learning resources, while supporting interaction and collaboration among those who need it, anytime and anywhere. These innovations may help us identify ways in which we can make education more open, effective and responsive to society's needs.

Singapore's Outram Secondary School - Parent/community involvement: As part of Singapore's Model Schools Project, a collaboration between Outram Secondary School, Singapore's Ministry of Education and IBM was formed to implement a cyber learning environment with a solution called IBM Learning Village. The initial phase focused on the communications and collaboration aspects of IBM Learning Village, and involved all members of the school community. As the project has progressed, teachers are now making more use of the assessment tools available in this web-based solution. This collaboration at Outram is one example of a more open education model that policy makers can cite in promoting public and private partnerships for Cyber Education.

In addition to bridging the gap between home, school and community, IBM Learning Village is sometimes used to help teachers work more closely together for professional development. As it is Web-based learning tool, it can be accessed from any location with an Internet connection. It includes the following capabilities, which are all integral to an open education model:

- Teachers and families can communicate anytime, at their convenience, to support student achievement.
- Parents can view homework assignments, completed work and teacher evaluations. In addition, parents can compare their child's progress against defined standards. All this is available during and after school hours, confidentially.

- Online private conversations can be held between teachers and parents, teachers and students, as well as between teachers and teachers.
- Approved mentors and tutors can participate in online discussions with students and teachers.
- Projects can be accessed from home providing an extended school day with more opportunity for parental guidance and involvement.
- Teachers can use a variety of tools that help them achieve greater efficiency and effectiveness in their classrooms such as the instructional planner, which helps them develop unit and lesson plans collaboratively with other teachers online. They also can ensure their lessons meet required performance standards and use instructional materials stored in a database or available on the Internet.
- Family and community members can contribute their expertise and support to local schools or access a wide range of school information, from lunch menus to event calendars.

However, not all parents, teachers, community members and students will have access to the Internet in their homes, at their workplaces and schools. Particularly in developing countries, policy makers need to promote public and private partnerships in cyber education, to incorporate newer technologies and approaches that will continue to improve access, affordability and effectiveness.

IBM Learning Village is presently being used in 12 countries and 9 languages globally. It is being further developed and enhanced in alliance with the Dublin-based Riverdeep Group, to offer both new functionality and the added availability of Riverdeep's full range of Web-based, interactive learning courseware. This will make for an even more comprehensive solution offering for schools going forward.

Mexico's Monterrey Tech - The Best Experts Available to Students Throughout Mexico and Latin America: The Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM), the Monterrey Institute of Technology and Higher Education or Monterrey Tech, was founded in 1943 by a group of Mexican business men. It is a private institution without religious or political affiliation. ITESM has 30 campuses, a student enrollment of over 86,000 and a faculty of about 6,877. First established in Monterrey, it has a presence throughout Mexico and has begun to serve other countries including Columbia, Costa Rica, Chile, Ecuador, El Salvador, Honduras, Panama, Peru and Venezuela. It also has field and liaison offices in China, Singapore, Paris, Brussels, Washington, Boston, and Vancouver.

Since 1989, it has operated a virtual university that today includes 1,430 receiving sites in educational institutions and corporate workplaces throughout Mexico and Latin America. It is the largest geographically dispersed educational system in the world. It provides ITESM's dispersed faculty with the means of increasing its skill in both subject matter and educational methods. High school, bachelors, masters and doctorate degree programs are offered in such fields as computer science, engineering, business administration, law,

medicine, communications, and educational innovation and technology. Additionally, it is determined to contribute to the economic strength of Mexico by improving the skills of its engineers and others in the work force.

ITESM's virtual university outreach has been developed to leverage the best faculty from the system and other universities to all of Mexico and then to Latin America. It has expanded its mission to ensure the delivery of this expertise to new settings and to serve more students. Increasingly, ITESM's virtual university has moved toward collaborative-style asynchronous learning. Taking advantage of Mexico's newer telecommunication infrastructure enhancements, it is adopting multimedia Internet communications to continue to expand its reach, along with wireless access capabilities to enable greater mobility and convenience of use in some locations.

In a recent Cybercast on "Improving the Quality of Education and Life: Monterrey Tech's Use of Technology for Social, Cultural and Economic Results," Eduardo Salcedo, Director for Educational Technology at ITESM, discussed how ITESM is presently changing from a traditional teaching approach to being aligned with the Institute's newer mission and objectives:

- To educate students to be individuals who are committed to the social, economic and political development for their communities,
- To be internationally competitive in their professional fields and;
- To carry out research and extension relevant to Mexico's sustainable development.

To access this Cybercast: www.ieg.com/cyber/education/edu061200_first.html

For more information on Monterrey Tech: www.sistema.itesm.mx/english/sistem.htm.

Korea National Open University - Making It Easier for Working Students: Korea National Open University (KNOU) has a long history of incorporating newer technologies to provide broad access and better educational programs for its students throughout the country. Ninety five percent of these students work full or part time, and are often seeking new skills for their professional advancement. With over 27 years experience in open learning, KNOU has become a premier example and model of Cyber Education globally. It serves Korea's ever increasing numbers of lifelong learners, both through its own broad range of programs and also more recently, through its participation in a virtual university consortium with several other educational institutions in Korea.

With more than 200,000 full and part time students, and 13 regional and 31 local study center campuses nationwide, KNOU is constantly looking for ways to develop and distribute advanced educational material using current information technologies on offer. For example, a vast collection of Korean educational content is being organized and managed in a digital library that makes the material more easily available to students through network access. KNOU also broadcasts lectures over television and radio to reach students in a variety of settings, and in 1996, established its own cable television channel (Channel 47), which allowed KNOU to realize significant cost savings. These, and other

interactive video-conferencing and web-based media solutions provide KNOU's working students with a much more flexible and convenient range of learning options and alternatives.

Additionally, KNOU is looking at the potential to serve Koreans, and students wanting to learn more about Korea, but who are residing in other countries. In this regard, KNOU has already established institutional relationships with other universities in nine countries, and is cooperating with them in the areas of faculty exchange, training and research. On its own web site, the following can be found about the future of this open learning environment at KNOU:

> The future KNOU will be a field of national education which leads the unified Korea of the 21st century. Distance education will contribute to resolving the differences between South and North Korea, and will be efficiently used to carry out national education. It will also establish a worldwide education network by offering various educational opportunities to overseas Koreans. This effort of KNOU will be a cornerstone for Korea's future education to spearhead the progress of the world in the future.

For more information on KNOU: www.knou.ac.kr/

Northern Territory University in Australia - Web-based self-services: The Northern Territory University (NTU) became Australia's first university to introduce online enrollments in January of 1998. It has since received a prestigious national award for the quality of its implementation. Instead of waiting in long lines on campus, or even longer for a paper-based application process through the mail, students today are able to apply for admission and handle their enrollments directly through the Internet by filling out an online form. This form interfaces directly with the NTU administration system to process the enrollment. "This model is perfectly suited for an isolated campus like NTU. Lotus Domino's integrated Web, workflow, and messaging technology has let us overcome our geographic remoteness", says Kevin Davis, Pro Vice Chancellor for NTU. "The new Domino-based system speeds up our administration and offers students a fast and easy way of enrolling. Using the Internet, all students have access to their enrollment details, university accounts and course information." NTU has five campuses in Australia's Northern Territory, as well as a campus in Malaysia and in Hong Kong. It was the first Asia Pacific campus to receive IBM's e-mark distinction for the security of their web site as well.

For more information on NTU: www.ntu.edu.au/

Florida High School - Flexible learning: The mission of the Florida High School is to take full advantage of instructional technology to provide students with educational opportunities to gain the knowledge and skills necessary to succeed in the 21st century.

The school's motto supports its belief that education in the future will be delivered "any time, any place, any path and at any pace." Starting in August 1997, the school offers a complete high school curriculum online with 47 different core and elective courses, including Advanced Placement and honors level. Apart from courses, the Florida High School also provides student services that will assist students to successfully transition to post-secondary educational institutions and the workplace.

The design of course content for the Florida High School is based on creating a rich, collaborative and active environment where students can learn at an individual pace, share experiences with peers and mentors, and successfully mature into lifelong learners. Instruction in an online environment allows for rearrangement of time, space, materials, ideas and people to maximize student achievement. The Florida High School staff seeks to empower kids, nurture literacy, instill responsible citizenship and produce efficient workers. Overall, the cyberspace classroom provides for dynamic, interactive, project-based, collaborative courses that can produce an individualized learning environment to meet the needs of all students.

For more information on Florida High School: http://fhs.net

The University of Hong Kong - Universal Access: As part of its Information Technology campaign to create a "digital campus" and better prepare students for the future, Hong

Kong University (HKU) and IBM China/Hong Kong Limited have formed a strategic partnership to foster ubiquitous computing and assured access to an increasingly digital and student-centered learning environment. The partnership also includes a research collaboration initiative, through the establishment of an e-business Technology Institute (ETI). ETI is headed by Prof. CJ Tan, lead researcher from IBM's Watson Lab who was behind the development of IBM's Deep Blue supercomputer, which became well known for defeating world chess champion Gary Kasparov in 1997.

Key to the strategic partnership is the notebook program, which was the first implementation of IBM's ThinkPad University program in Asia. Through this program, students and staff at HKU have access to computing power, networking tools and resources from anywhere, on or off campus. HKU students are also able to access the Internet, as well as the university's own network, via thousands of network access points located throughout the campus or from their homes. The Centre for the Advancement of University Teaching at HKU is conducting annual surveys to rigorously study the trends and changes in IT skills and attitudes among those participating in this assured access / mobile computing initiative, now in its third year at the university.

For more information on HKU: www.hku.hk/

Athabasca University - Canada's Open University: Athabasca University is committed to removing barriers that traditionally have restricted access to university studies. The

university's 1996 strategic plan called for the expansion of individualized, electronic, learner-driven cyber education models to accelerate the transition from print-based to electronic curricula.

The Executive Master of Business Administration (MBA) program, for example, has developed a Lotus Notes learning system which incorporates courseware (key concepts, required readings, case studies, pop-up links, glossaries, etc.), individual and group interaction with a virtual faculty of nearly 60 academics across Canada, simulations, self-tests, survey tools, Internet links and a help hotline. Most important of all, students can interact with and challenge each other with ideas, knowledge and information to create a learning community. As a result of its effective use of this learning platform and a support system designed to meet learners' needs, Athabasca University has been able to offer a program, of high quality and broad reach, at a reasonable cost. Presently, Athabasca's executive management program has 1,100 students, representing 25 percent of Canada's Executive MBA education market.

At the undergraduate level, a key concern for students is flexibility, and having programs offered continuously, with students able to start courses on any business day. The electronic delivery systems complement print and mixed media courseware and are designed to enhance communication between students and academic staff, including in some cases online testing. The electronic delivery system also compliments all student services such as the library, registration, financial aid, information center and help desks.

On its Internet home page, Athabasca University declares: "We are dedicated to the removal of barriers that traditionally restrict access to and success in university studies, and to increasing equality of educational opportunity for all adult Canadians." Since 1997, Athabasca University has experienced approximately 50 percent growth overall, with 45,000 course registrations annually for the whole university.

For more information on Athabasca: http://www.athabascau.ca/

Of particular interest, under 'News Items' on the home page, is the summary of a study that was undertaken recently comparing online education to the traditional classroom educational experience.

Regional and Global Consortia - A Growing Phenomenon: According to Asiaweek's annual cover story on Asia's Best Universities in 2000, a regional alliance of five universities belonging to the 17-member ASEAN University Network, designated Manila's private DeLaSalle university as lead school in an online master's degree program in ASEAN studies. Elsewhere, the Global University Alliance, a group of nine founding universities from the U.S., Europe, Australia, New Zealand, and Taiwan, has recently started offering post-graduate programs over the Internet, with aggressive plans to expand this kind of Cyber outreach in future. (Bacani, 2000)

Also globally, some of the members of one prominent university alliance called Universitas 21, which includes several leading universities from APEC member economies, are working on plans for a global online university. While not all universities in the Universitas 21 consortium are involved in this particular venture, Universitas 21 has an agreement in principle with Thomson Learning to operate the project, should it proceed.

Taking a different approach, eleven prestigious British and American universities have recently partnered for the specific purpose of starting a worldwide distance learning alliance, with the intent that the alliance will grow to include other colleges and universities from a range of countries. In this model, "the courses and programs will be marketed under the names of the individual universities, or groups of universities", and not the alliance as a whole (Carr, June 8, 2001).

Finally, within several APEC member economies, there are numerous examples of country-specific university consortiums deploying a variety of organizational, academic and business models for online education. The virtual university consortium in Korea, referred to earlier in the paper, is a good example of this phenomenon. Similarly, in the U.S., "at least 35 states now have a virtual university or other statewide organization to deliver or promote distance education" (Young, June 13, 2001). In China, there are currently 38 online universities accredited to grant degrees. The Chinese Ministry of Education plans to further promote online learning by having five million students receive education from 50 to 100 online colleges and universities by 2005. This plan is part of a national drive to have

15 % of the eligible population in China receiving higher education by that time period (Walfish, May 21, 2001).

The initiatives and examples of cyber education cited above represent positive steps toward providing open education to citizens throughout their lives. Unfortunately, these programs are the exception rather than the rule and they do not address all the issues required to create a lifelong education system.

CONCLUSIONS

Corporations, governments and international organizations are calling for education to play a more prominent role, from basic literacy to lifelong professional education. The rationale is the same worldwide; economic prosperity is linked to an educated workforce that can compete in a global economy where information technology sets the pace of change.

No integrated system of lifelong learning exists today. Although there are many new approaches to education, there is still a need to create a cohesive, seamless system that meets the needs of society. Business, government and education policy makers all share responsibility for creating a more open education system.

The current and future workforce will require a combination of general education and specific training. With technology enabling individuals to learn any place and at any time,

it is more and more likely that workers will accumulate credits from a variety of institutions over three or four decades in the workforce. Individuals would benefit from a lifelong record of learning and accomplishments that would enhance career mobility.

While creating the educational mosaic that will support a lifelong learning system, accessible to all citizens, it is important to continue to develop the infrastructure that will bring high quality education to more people. Without a robust and reliable network infrastructure, learning on demand, distributed learning or open education, cannot become widespread. Support for the network, within and among countries, should encourage the development of the physical infrastructure as well as the emerging applications that the network will enable. Attention must also be paid to policies that could help or hinder the network's viability including such issues as security, privacy and intellectual property.

For years we have seen education-specific networks at the country levels in Asia-Pacific. For example, at the primary and secondary school levels we have seen private Internet and Application Service Providers such as myinternet, and its subsidiary Schoolsnet, in Australia. Alternatively, government funding supports EdNA Online of Australia and the Taiwan Academic Network (TANet) in Chinese Taipei. In higher education, national network infrastructures for education and research have been developing for even longer, as far back as BITNET in countries like Australia, Japan and Korea, HARNET in Hong Kong, and the China Education and Research Network/CERNET.

Beyond the network infrastructure, in order for cyber education to become a major force in education, a significant body of distributed learning courses and curricula must be developed. These instructional units will be created by different individuals at various institutions. To conserve the collective effort of developers, common standards are needed to facilitate the interoperability of content modules, courses and curricula. Standards will also support the ability to catalog, search and share content across educational institutions and initiatives globally.

EDUCAUSE's Instructional Management System/IMS project is an example of broad-based standards development. Australia and Singapore decided in 1998 to participate in the IMS initiative, and were the first in Asia-Pacific to do so. Japan's Distance Learning Association and several other Japanese organizations, including the Advanced Learning Infrastructure Consortium (ALIC), have been actively tracking and assessing prominent standards initiatives in the distributed e-learning arena around the world, with a particular focus presently on the ISO/IEC JTC1 SC36 initiative in terms of standardization.

Some other examples of global standard initiatives include AICC, ADL, IEEE, and European-led initiatives such as ARIADNE, PROMETEUS, and CEN/ISSS.

While commonly accepted standards may continue to be a challenge, distributed e-learning has already proven a viable way of providing education and training. IBM for example, moved 36% of its employee training to an online environment in 2000, resulting in a cost savings of US$350 million through the use of distributed e-learning. More importantly,

200,000 IBM employees around the world have received education and training online in a more convenient and "as needed" manner. In today's complex environment, we will all need both education and training, from a variety of education providers, throughout our lives and at many points in our work and careers. We should make use of the most flexible delivery channels available. Today, that flexibility is optimized through the Internet with Cyber Education.

New models of corporate citizenship and philanthropy can also contribute to the innovation that is required to transform education. IBM's Reinventing Education initiative is one such model. The program presently serves more than 10 million students in the U.S., Australia, Brazil, Ireland, Italy, Mexico, Singapore, the United Kingdom and Vietnam. Through this program, IBM is working closely with teachers and administrators to harness the power of the Internet in ways that will better enable and empower educators to overcome long-standing barriers to greater student achievement and address the challenges of the digital divide. This kind of approach is more than a matter of writing checks and donating equipment. It involves listening, sharing and acting together to address specific needs. It is about collaborating to craft real solutions and achieving results that can be replicated elsewhere. An independent evaluation of IBM's Reinventing Education Program by the Education Development Center, Inc. released in June this year, indicates that these investments in educational technology are indeed yielding gains in student performance, teaching quality, and school management. The three-year study can be accessed from IBM's Reinventing Education web site at: www.ibm.com/ibm/ibmgives

Education is the responsibility for all stakeholders in society. The new role of policy makers in promoting public and private partnerships for cyber education is to begin working toward the development of a cohesive, lifelong, open education system. Policy initiatives to address the digital divide will have to address not just the broad availability of technology and connectivity, but also the development of knowledge and skills to foster effective use and new educational models for a digital age. It will require the involvement of individuals, educational institutions, business and government.

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- IBM white papers, case studies and education related e-magazines, 'Multiversity' and 'IBM at School,' in addition to project highlights from IBM's Reinventing Education worldwide initiative and webcast discussions with academic leaders, are all available through IBM's global web site for education: www.ibm.com/solutions/education

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