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**'Bridging the gap': Approaching ICTs for
education in developing countries**

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Abstract

This discussion highlights the complex issues relating to the implementation of information communication technologies (ICTs) for education from early resistance to current achievements. Issues pertaining to the developing world are discussed. The author is of the opinion that there are sufficient success stories to serve as both resources and motivation for this context. A radical approach will however, put valuable resources and morale at risk. An incremental approach in an enabling environment may contribute more to enhancing education through the use of ICTs in the long run.

INTRODUCTION

Little more than a decade ago we became used to the idea that we can have access to millions of computers all over the world. People from universities, schools, laboratories, newspapers etc, started sharing information and engaging in constructive debates via the internet at www. Today we are living in a world of wikis, blogs, winks, emoticons and nudges. Not only do these features structure our online communication and easy access to information, but they are personalising the way we communicate. New messenger software now makes it possible for people to share resources, to integrate different technologies and to personalise their communication environments.

Microsoft's Windows Messenger (2006) already provided us with a number of

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direct communication facilities for half a decade. It enables video conversations, PC-to-PC calling and some graphic elements like winks, emoticons, and your own personal display image to enhance your messages. Microsoft unveils a world of personalised communication and shared resources through its latest version of MSN Messenger (Microsoft nd) and they state: 'With your own space, you can share your thoughts, photos, and music lists. Sign up now.' This service is totally free to computer users around the globe. They continue to invite users to the following features: create a blog (an online journal), share photos, go mobile (use your mobile device to post photos and blog entries to your space) and personalise your space (select a colour, layout, and theme that fits your personality). Users cannot only talk to one another live and share images, but can also play games, share music and listen to online radio. These messages and discussion facilities are also integrated with email and popular and useful resource categories. Yahoo Messenger (Yahoo nd) also offers these facilities and adds drag-and-drop photos, interactive themed backgrounds, search within the message window and sharing the results, synchronisation of contact information and exchanging text messages with multiple people in one message window.

The above information communication facilities are just two examples of what is available to facilitate communication between people. In general, online interactive synchronous and asynchronous communication are starting to revolutionise people's lives, including their learning and work environments. While these developments are happening in the online world, other technology and media developments have brought the global village into the homes of billions of people. Baghdad is in everybody's lounge (live television), and we press a button to vote on the justification for the 'war on terror'. There is a need to access information in order to become informed citizens and to gain the competitive edge. In a techno-utopia, we can visualise people from the Cape Flats, in the Kalahari, at the foot of the Ngong Hills in Kenya and in the mountains of Morocco walking with mobile devices accessing health information, furthering their education, seeing what is going on in the rest of the world and communicating with relatives and friends... But how realistic is such a picture from our perspective? Can ICTs be the panacea for all ills? Or should we succumb to the alternative of simply immersing ourselves in a depressive innovation paralysis and ignore it all?

These developments (integration of technologies and media) predict the radical transformation of the way people learn, work and play. Developing countries, and specifically Africa, still have to address tremendous needs at all levels of education. In this regard, it is almost impossible to ignore the pull-effect of ICTs in today's world – and indeed, Ratsatsi (2002, 45) sees ICTs as the driving force in all economies of the world as technology skills are crucial to all employers. Haddad (2002, 5) supports this view and recognises the value of information communication technologies (ICTs) in the lives of people as learners, workers and citizens.

Will we ever 'get there'? We may have to adopt a more functional and pragmatic approach in dealing with the myths about our capacity and to share innovation

miracles. As much as we agree with these benefits and the contribution of educational technologies there are still problems preventing access to and utilisation of ICTs. In order to understand the challenges and to present some solutions, it will be necessary to explore some key areas, including the early stages of new ICTs, and make suggestions around at least the following headlines:

- technology and society
- the digital divide
- technology and education
- the corporate 'connection'
- access in the developing world
- evidence of innovation from developing contexts
- approaches to implementation
- ensuring an enabling environment.

TECHNOLOGY AND SOCIETY

The information society is changing many aspects of people's lives – such as the ways they live, work, relate to each other and even teach and learn. These changes are also affecting the developing world. Today's society is supported by an economy with different needs – one's running shoes were conceptualised in the USA, designed in Japan, manufactured as components in China and Indonesia, assembled in Mexico and marketed from the United Kingdom for a particular location. This globalisation of the factory and marketplace has filled the individual worker or citizen with uncertainty and fear; once one is to be laid off one needs to upgrade knowledge and skills to be competitive for the next production run (Gutstein 1999, 22). Halfway through the establishment of the Internet and other new communication technologies, Wilson et al. (1998, 09) talk about a techno-utopia. These techno-utopianists (Gayol and Schied 1997) are full of outright optimism about technology in society and education. They support the myth of the technological revolution – and who could reasonably argue that our lives have not become a lot easier since we have been able to quickly warm up something in the microwave, use a cellphone to call a friend when the car breaks down on the highway at night, or access much-needed up-to-date information via the Internet. This aspect of technology leads to positive consequences for society and the globe, and we must embrace it with open arms. We should therefore, see online learning, for example, as a great opportunity to engage in education we would otherwise not have been able to receive. Advocates of techno-utopia (Sullivan 1983, 22) view society's technological development as driven by the notion of *progress*. Any technological advance is seen as progress. We need only look at some technological instruments, for example the computer (and the advent of online learning), to tell us that we have made some cultural advance – this is a form of instrumental rationality that puts a technological innovation in the positive light of progress.

However, ICTs are not always viewed as beneficial to society. Computer mediated communication, as one example, is analysed in depth by earlier oppositionalists (Gayol and Schied 1997) and numerous negative effects highlighted – so is its function via the Internet of being, ironically, a non-communications development flooding people with rubbish and detrimental visual material. Noble (1997, 1998a and 1998b) was gravely concerned with the effects of online teaching on traditional universities and their task – there were no solutions envisaged and a disastrous future out of control is predicted for higher education. They assess technology on a cross-disciplinary basis, assuming that society, history and technology constantly influence each other. The oppositionalist camp includes the radical structuralists, who focus on structures, modes of domination and deprivation and contradictions within an objective social world (Boshier 1996). Some of their advocates narrow their focal point down to internal contradictions within society, while others zoom in on power relationships. For all radical structuralists, all societies are characterised by inherent conflicts within which lies the basis for change. It could be argued that it makes commercial sense to promote technological progress with a techno-utopia as the ideal. However, this could lead to imbalances in terms of capacity to deal with and realise such progress. The digital divide is one such potential product of technological progress that is explored by radical structuralists.

THE DIGITAL DIVIDE

Today, almost two decades after the introduction of the Internet, millions of people are online, and distance education, distributed learning and face-to-face education are attempting to show themselves through technological innovation. The 'global information' society threatens to create a new divide between the 'information rich' and 'information poor' people of the world as poorer and marginalised people in developing countries are excluded from the benefits of new communication technologies (Practical Action 2006). While poorer nations grapple with the problems of investing in these technologies, recent experiments show that convergence of new and traditional communication media is still relevant to poorer communities who lack basic infrastructure such as roads, water, electricity and telephones (Practical Action 2006). These realities beg the question of which basic needs come first and where ICTs should be positioned given its ability to assist with development.

Baartman (2003, 52) highlights the 'digital gap' between developed countries in the North and developing countries in the South. Wolff and MacKinnon (2002, 7), from the Inter-American Development Bank, report that over half of the households in the USA own computers compared to less than 1% in Africa. They also state that while there are about 77 million computers in the USA with valid Internet connections, these numbers are only in their tens in some developing countries. As the number of connected computers increases in developed countries, there is no similar growth in developing countries, which increases the divide between the haves and the have-nots.

Wolff and MacKinnon (2002, 7) and Haddad (2002, 5) also identify an ‘information underclass’. Where there is significant growth in access to computers and the Internet in some developing countries, it is not equally spread, and it is mostly the unemployed, disabled, rural people, single parents and inner city residents who do not benefit from such growth. ICTs have thus not succeeded by themselves to correct the divide between technology-rich and technology-poor countries.

According to Haddad (2002, 5) ICT access is related positively to economic development – the higher the income, the greater the access. For Wolff and MacKinnon (2002, 8) the digital divide will not decrease, unless there is also a drastic effort to reduce poverty. Computer equipment and connections are also far more expensive in developing countries than in developed countries. On the other hand, Proenza (2002, 58) is convinced that poverty can be reduced and inequality addressed with the help of technology. He is of the opinion that there is a hidden benefit in the implementation of ICTs in developing countries – service delivery can be spread much wider and can be made cheaper: ‘What ICTs offer is an unprecedented set of tools, an opportunity for a win-win situation that makes the provision of services and opening of opportunities for the poor to improve their well being less costly to achieve.’

TECHNOLOGY AND EDUCATION

Recent assessments on higher education in many developing countries tell a very depressing story of teaching taking place without adequate resources and libraries without the necessary books and journals (Perraton 2000, 6). New communication technologies allow access to information sources, and allows for collaboration and discussion towards knowledge construction. In this day and age, there can be no doubt that ICTs can contribute substantially to the teaching and learning process. Haddad (2003, 5–6) lists a number of these benefits, which may be familiar to all educators and developers of training:

- Materials can be presented in multiple media for multi-channel learning. This provides different paths of learning for different students.
- Video, sound and multimedia can assist with engagement with, and enjoyment of the learning experience.
- Students from African culture and traditions often have to cope with foreign concepts before these are adapted for local relevance. Multimedia can bring abstract concepts to life.
- Enquiry and exploration can be enhanced as the classroom is opened up to a wealth of resources elsewhere on communication networks.
- Communication technologies enable group work across borders and other boundaries.

Online communication technologies (such as the Internet, discussion facilities, chat

rooms, and email) make it possible for learners to study independently of the constraints of time, place and slow mail systems, and just in time for current work requirements. In fact, any location with a computer can be a study facility. What is even more beneficial is that the new qualities required of the skilled worker (or graduate), which Bates (2000, 11) lists as: good communication skills, independent learning competency, social skills, teamwork skills, the ability to adapt to changing circumstances, thinking skills and knowledge navigation, can be greatly enhanced by the use of these technologies, which provide communication, collaboration and interaction opportunities – the tutor, fellow students, and experts are just a click away (Harasim et al. 1995; Oblinger and Verville 1998; Tapscott 1998). Farrel (2002, 13) also mentions the growth of virtual education as an important factor in the drive for connectivity. Virtual or online education tends to erode the historic distinctions that have existed within education systems as it opens up opportunities for study, resources and research, and the borders between different types of qualifications.

A critical stance however, accepts the benefits but considers it necessary to react to technology with political awareness and guard against people in developing countries being stripped of their cultural identity in the process. Postman (1992, 183) warned that our local history, originality and humanity should not be blindly subjected to the 'sovereignty of a technological thought-world'. An effort should be made to include local sources and content in course materials. El and Amerlia (1998, 694) and Anstendig et al. (1998, 78) stress that learners need to acquire a new literacy that is about being able to communicate in a post-typographic world. Being literate now involves integrating reading and writing, navigating through information sources, discriminating between important and unimportant information, responding to email and/or engaging in electronic chat sessions. Although we have seen powerful changes through ICTs in teaching and learning, many people's lives remain untouched by technology (Elliott 2004). This scenario demands an assessment of where technology reaches, attention to infrastructure and also training to facilitate adaptation and implementation.

THE CORPORATE 'CONNECTION'

As the need for connectivity increases, the role of business as the supplier of technology becomes another factor to be explored. In the beginning of the 1990s Apple (1991, 77) offered the following cautionary advice: 'Wise choices about the appropriate place of the new technology in education . . . are not only educational decisions. They are fundamentally choices about the kind of society we shall have, about the social and ethical responsiveness of our institutions to the majority of our future citizens, and to the teachers who now work in our schools.'

Noble (in Boshier 1996) attacked the power relationships that the corporate world is trying to impose on higher education institutions by waving dollars in front of their noses. He believes that online technology and its derivatives are simply controls that

spy on students and instructors in order to improve products and only serve the aims of the corporate villains. Noble took an outright critical stance on these ventures and technologies – according to him, they have no merit, in spite of their image as part of a techno-utopia (Gayol and Schied 1997), where everybody is learning successfully with the help of technology.

Gutstein (1999, 196) used the slow-growth economy of Canada to draw attention to the infiltration of business into higher education. New sources of revenue for businesses lie in cultivating areas of social and cultural life that have not previously been subjected to business transactions – this is described as colonising new areas of society. Education is a huge ‘business’ in many developed countries, and Gutstein believes that politicians have contributed to this phenomenon through corporate partnerships. Likewise, there is a view that the ‘cultivation of political quiescence’ also makes it easier to implement technological education in developing countries that have limited resources and expertise. Writing from the very early days of the ICT revolution, Iannacone (1984) confirms that elite groups managing education systems and institutions indeed tend to use a range of strategies to limit political saliency.

Having entered the 21st century, some of us may have forgotten the early struggles and territorial battles between stakeholders attempting to design and implement the next innovation in ICT, and there is a wealth of social investment in deserving communities and countries globally. The world’s most successful software company claims to have a 20-year history of community engagement. They have set up a variety of key community partnerships ‘built on the mutual commitment to find sustainable technology solutions that make real and lasting differences in people’s lives’ (Microsoft 2005). In 2004 Microsoft donated more than US\$47 million in cash and \$363 million in software to non-profit organisations throughout the world. Similarly, Hewlett-Packard (2006b) donated approximately \$61.6 million in cash and equipment worldwide, representing approximately 1.5% of their pre-tax profits. Of this, nearly \$26 million went to schools – from kindergartens through universities. Approximately 37% of total investment was given to organisations based outside the United States. The aforementioned are only two examples of assistance from the corporate world.

Many developing countries have skipped a number of earlier generations of ICTs and have made tremendous strides toward connectivity. These achievements are exemplary both from a development and a collaboration perspective. Many projects, supported by non-governmental organisations and multinationals, have contributed towards these projects in a transparent way. It would also be appropriate to say that as knowledge about ICTs is dispersed in developing countries, the risk of inappropriate decision-making and harmful partnerships is reduced.

EVIDENCE OF INNOVATION FROM DEVELOPING CONTEXTS

Some citizens of the developing world have surely entered a state of deep depression on observing the rapid development and use of ICTs in the developed world. Will we ever

get there? Maybe we should simply adopt a fatalist approach and 'sit it out'? According to Community Intelligence (2005) innovation is not only one of our human capacities; but the one that makes us human. It is further said that 'if it is so fundamental to the existence of our species that our very capability to evolve depends on it, then we can assume the capacity to innovate and make life better is present in each individual.' Moyo (2003, 497–498) is of the opinion that the full range of opportunities offered by ICT, for higher education specifically, remain underexploited. Taking the lack of confidence and this assessment of underexploitation into account, the author is convinced that there is sufficient capability and potential in Africa and the rest of the developing world to make ICTs work, and there is evidence to support this conclusion.

The United Nations Educational and Scientific Organisation (UNESCO) assists developing countries in strengthening their communication capacities by developing independent and pluralistic media, and improving media access to ICT in particular, through the International Programme for the Development of Communication (IPDC) (UNESCO 2006). They assist with development by supporting broad-based participation in media operations. UNESCO's strategy also takes into account the possibility of innovative application of ICT to reinforce media pluralism and to address the critical needs for building capacities among media professionals, including women in developing countries (UNESCO 2006). SchoolNetAfrica has done groundbreaking work in providing hardware and infrastructure in Africa by opening up a pipeline to distribute refurbished computers in Africa (SchoolNetAfrica 2004, 5).

There is certainly sufficient evidence to prove that developing countries, and specifically African countries, can independently and successfully conceptualise, develop and implement ICT-based projects. Such evidence is important to serve as examples and to develop home-grown skills to manage and develop ICTs for local needs. In North Africa, there is a Computer-Assisted Teacher Training Pilot Project (CATT-PILOTTE) in the Kingdom of Morocco. This project provides an opportunity for reflection on the use of educational technology to improve teacher training as part of national education reform – teacher training colleges were involved across Morocco. This project proved that reform can be implemented through technology, provided that educators are mobilised and involved in the process from the start (Coupe and Haichour 2002, 75–76). Another example is the Owerri Digital Village, which was founded in Owerri, Imo State, Nigeria, in September 2001 (Ugwuegbu and Steffen Gripe 2002, 27). The centre was established by the Youth for Technology Foundation (YTF), an international non-profit organisation. This initiative aims at implementing technology, by means of a grassroots approach, to improve the lives of rural people.

Connectivity to schools and other centres in rural areas of Africa is often established with the help of international partners. A very relevant example is the installation of a VSAT dish, ensuring wireless internet connectivity, at the Busoga College Mwiri, a rural secondary school east of Kampala, Uganda (Bloome 2002, 21). The World Links Program assisted with this project in order to pilot new concepts in technology

and pedagogy in education in developing countries. Isaacs (SchoolNetAfrica 2004) reports on the SchoolNet Africa project, which is promoting ICT use in 23 African countries, in partnership with a range of global, regional and local organisations. The Mindset Network, a new multimedia television network, has tackled South Africa's key educational and healthcare challenges since 2003 (Govender 2004, 157). The first channel of Mindset, Activate, has been piloted in 300 schools, and was to be rolled out into 1 000 schools and 800 000 homes by the end of 2003. This network was put in place in only one year with the help of a number of partners, including the Nelson Mandela Foundation. These initiatives prove that, through collaboration and support, access to ICTs can be greatly improved in the developing context. In the higher distance education sector, the African Virtual University (AVU) was launched as a World Bank project with the intention of assisting affiliated African universities to access science resources in particular (Moyo 2003, 500). The AVU uses a technical infrastructure that integrates satellite and web-based technologies to transmit video and data resources from anywhere in the world to multiple sites in Africa. Many Asian universities have also been very aggressive, and now offer courses with the help of technology. Western counterparts cannot meet the relevance, quality and cost.

The developing world is also producing technology hubs of the likes of Silicon Valley. Bangalore in India, is fast becoming a hub of ICT development and service provision. Hewlett-Packard Labs India was established in February 2002 in Bangalore to create a world-class lab with a focus on the needs of Emerging Markets such as India (HP 2006a). The mission of this lab is to generate ICT innovations targeted at the world's emerging economies by understanding relevant social, cultural, economic and technological drivers. Dell Computer (Computer Weekly 2002) has also set up a software development facility to develop and test software for enterprise-system products. Such is the development of Bangalore in the ICT related industry that the city is bursting at the seams (The Economist 2005): 'The city at the heart of India's booming information-technology industry is already choking on its own success; but the boom has barely begun.'

Many other multinational ICT companies are outsourcing to countries such as India, China, South Africa and many more, owing to more favourable production conditions. This tendency proves that developing countries can indeed stand tall in the fast developing ICT sector. These investments and developments will boost the capacity of developing countries to address the digital divide and the tremendous need for technology in education and the workplace.

APPROACHES TO IMPLEMENTATION

The team at Community Intelligence (2005) view innovation as equal to change. We have to be 'responsive to life in her full splendor of constant dance and fluctuation'. They go on to state that 'responsiveness to quickening change in technologies and

market conditions starts with the capacity to sense both the dangers of staying the way we have always been and how we do things, and the opportunities to innovate'. With this responsibility, there is no doubt that institutions have to position themselves timeously to accommodate the information technology revolution as an enabling factor in learning provision. But which approach would be most suitable for higher distance education, for example?

The radical approach

According to Money Programme (2006), radical or discontinuous innovations result in fundamental changes in practice and markets. Such innovation results in 'gales of creative destruction' that wipe away the old, while creating new opportunities. On the contrary, Money Programme (2006) continues to reassure those under threat that radical innovations with this destructive potential are rather more rare than incremental innovations. Furthermore, radical innovation is difficult to apply to traditional institutions and concerns. Whilst incremental innovation in new product information appears to be dependent on traditional management structures and processes, radical innovation can demand an organisational response that reaches beyond the 'steady-state' approach to managing innovation (McLaughlin, Bessant and Smart 2005, 3). When we introduce a radical side to innovation, we depart from a slow mode to an almost disruptive approach to change. The aim is to break the almost stagnant approach of 'sustaining as much as possible without disturbance' to changing as much as possible, and thereby breaking through old patterns, conventions and traditions in order to move forward. Radical innovation implies non-linearity and discontinuity, and services under threat need urgently to develop strategies to cope (Money Programme 2006) with this. Radical innovation is high-risk and high-return, and therefore, does not respond well to the management practices that apply to incremental innovation activities (McLaughlin, Bessant and Smart 2005, 3). This approach is a 'do-or-die' one – is it worth the risk?

Learning zone (2006) reports that the UKeU (e-university in the UK) failed in 2004 (a loss of \$114 million), and another e-learning project, the Allearn project, an e-learning venture by Oxford, Yale and Stanford Universities has called it a day after five years. In both cases, the project has underestimated the cost of e-learning and overestimated the interest it would generate. There was a lack of pedagogical and cultural consideration, and an overemphasis on technology and the learner's needs were not fully understood. Many institutions are still hesitant about the use of e-learning owing to failures, either real or perceived, within other institutions/consortia; and also owing to lack of knowledge and understanding of the possibilities. Development Gateway (2006), in a special report, states that seven of the world's largest distance education universities, where student and faculty alike all use some form of computer-assisted learning, are located in developing countries. For these communities, educational resources available via the Internet can offer cutting-edge applications of cyberspace.

They warn of ‘roadblocks’ from inadequate national communications infrastructures to teachers reluctant to adapt to e-learning. Don MacIntyre of the Fielding Institute makes a very powerful relevant statement (Paloff and Pratt 1999, 163): ‘In talking about distance learning, I keep stressing that our focus is on the learning process, not the technology. Many institutions are jumping on the technology bandwagon so as to become a part of the information super-highway.’

Failures of e-learning operations have overshadowed the prospects of widened and flexible access to tertiary education, pedagogic innovation and decreased cost, that e-learning once embodied. But universities are gradually bringing e-learning into the mainstream of their educational programmes (OECD 2005, 1). It becomes part of classroom-based courses or distance delivery. This background supports a slower but more careful approach – simply jumping onto the information super-highway cannot be recommended.

The gradual approach

The systems and practices of educational institutions do not change overnight. Bates (1991, 12), writing from the first stages of the new Internet-based ICT revolution, was of the opinion that it would be easier to create new institutions of higher education based on online technologies than to convert old industrial model institutions doing mostly conservative correspondence teaching. Daniel (1996, 25) concurs with this and goes on to say that when new knowledge media are targeted, new institutional types have to be established as part of a comprehensive re-engineering of the provision of learning. With these warnings and some significant failures, there seems to be a need for a more gradual approach to the adoption of technology to enhance education. The slow or incremental innovation process is one of low risk and slower returns. It will consider the status quo, prioritisation of resources, change culture and people as a linear and calculated process that achieves small goals over a longer period of time. Educational institutions may have strong traditions and cultures that are difficult to change – this may influence the pace of change and more radical approaches may not be successful.

For Moyo (2003, 497–498), the concept of virtual education remains largely rhetorical. This is supported by Kirkup and Kirkwood (2005, 185) when they state that ICT has not produced the radical change in learning and teaching that was promised despite its widespread adoption. The pressure to implement technologies is high but institutions are slow to develop policies regarding proper support for delivery via new ICTs (Schnorr 1999, 115). Daniel (1996, 40) saw problematic teaching and support as a strong characteristic of mega-universities. The production and delivery cultures of mega-universities are unique, and they may experience problems when they implement new technologies to improve teaching and learning. According to Kirkup and Kirkwood (2005, 186), these adoption patterns (which vary significantly from institution to institution) are better understood if higher education is seen as being made up of many

institutional activity systems. ICT is only one of the tools forming part of the whole, and teaching is only one of many activities. The adoption and implementation of ICT may therefore, even vary within a single institution – no uniform assessment can be justified in all cases.

On a more positive note, for Kirkwood and Price (2005, 259), digitisation has indeed been a driver in the transformation of higher education. Modern communication technologies have made it necessary to reconsider 'distance' in relation to higher education. Many residential universities are now supplementing classes with resources via the WWW or are communicating remotely with learners. ICT has indeed also changed the face of distance education (DE) in many instances with its communication capability (Kirkup and Kirkwood 2005, 185). It has opened up the 'one-way flow of packaged knowledge' which was inherent in second generation DE. Third generation would be known for its interactive and communicative approach with the help of ICTs.

A slow and more incremental approach to innovation with ICTs may be more suitable for higher education. A carefully planned longer-term strategy may have more force than radical short-term steps without change in culture and systems as such institutions do not operate in the same unstable and unpredictable environments as competitive commercial enterprises (Carlisle and McMillan 2005, 2).

ENSURING AN ENABLING ENVIRONMENT

Any approach by educational institutions would be futile if there were no attempt at an enabling environment nationally. Governments of developing countries still have to play a key role in this regard until it is taken over by competitive commercial initiatives.

Government and statutory interventions

The African Information Society Initiative (AISII) is of the opinion that although African countries are 'equally placed to take advantage of ICTs to facilitate their socio-economic development process, they cannot hope to move their industrially weak, subsistence agriculture towards an information and knowledge economy, unless they develop and implement comprehensive integrated ICT-led socio-economic policies, strategies and plans (ECA 2003). Haddad (2002, 6), on the other hand, cautions that laws and regulations could hinder just as much as facilitate plans for ICT implementation. To be effective, the development of laws and regulations should tie in with a national e-strategy, according to Wolff and MacKinnon (2002, 8). Government and its affiliated bodies must show leadership in guiding the steady implementation of connectivity. In his annual report on Internet access in South Africa Goldstuck (2005, 8) expresses the opinion that broadband (for example) is not the solution to bridging the gap between the haves and the have-nots. To achieve this, objective, massive intervention by government is needed. In this regard he says, 'Technology by itself won't change the lives of the

disadvantaged. For that you need a commitment from Government, and that commitment must run from top to bottom. Technology without leadership will remain the domain of the privileged.' The Economic Commission for Africa (ECA) assists with policies and plans for e-strategies (ECA 2003). They work on at least four levels: national, sectoral, village and regional.

Improving connectivity and access

For Goldstuck (2005, 136) the five basic needs of the Internet are as follows (and in this specific order): access; quality; utility; community, and strategy. He compares this information society need to the most basic of physical needs by Maslow (such as air, water, food, etc). Haddad (2002, 6) is of the opinion that connectivity goes beyond political boundaries, and that it cannot be constrained by laws or regulations. Wolff and MacKinnon (2002, 8) stress efforts to set up regional networks as well as worldwide initiatives to assist countries that need access the most. In this regard, Botswana is striving to deal with equity of access on a national basis, and Ratsatsi (2002, 46) stresses the importance of policies and frameworks to establish equity of access on the national, rural, school and classroom level.

Funding and affordability

Haddad (2002, 6) sees costs as a huge constraint as ICT projects are expensive to start up. Implementation of any such projects will have to be creative and public/private partnerships will have to be investigated in order to use available funds wisely (Wolff and MacKinnon 2002, 8). Bates (2000, 153) lists six possible strategies to ensure sufficient funding at higher education institutions: external grants; student technology fees, government grants, re-allocation of internal funds; centralising/decentralising funds, and partnerships and consortia. All these suggestions are aimed at making the process of implementing ICTs more affordable through the careful use of available funds and collaboration with similar institutions. Strategic considerations such as these are very relevant to the developing world, where there may be a lack of funding for education in general and therefore, even less for the implementation of ICTs specifically.

Infrastructure and resources

Wolff and MacKinnon (2002, 8) recommend the development of local content by making software applications available to as many parties as possible. Such a drive can be greatly enhanced through the use of open source software (OSS). OSS refers to software that is developed, tested, or improved through public collaboration and distributed with the intention that it must be shared with others, to ensure further collaboration (CSIR nd). It has the potential to impact fundamentally on areas ranging from education and health

to e-government and various spheres of business. Neither South Africa nor any other African country will be able to afford the investments in imported technology required for full participation in the global information society of the future, if conventional approaches are followed. Bridges.org (2005) and the Collaboration for International ICT Policy for East and Southern Africa (CIPESA) have assisted with an OSS policy for Africa and low-cost computing. Their work serves as a toolkit for policy-makers and practitioners 'spanning the digital divide'. As regards physical infrastructure and hardware, Haddad (2002, 6) recommends that dependence on electric power and telephone lines be reviewed. He suggests that effort be invested in obtaining and using other sources of energy (such as solar) and alternative technologies (wireless, radio satellite), which do not require a wired network to ensure connectivity.

Training and development

ICT projects often do not succeed in developing countries due to the fact that they are transplanted into sectors of societies where there is not enough local expertise (Haddad 2002, 6). It is recommended that acceptance and use be secured through the removal of cultural and political constraints. Local education systems can play a significant role in this regard. Wolff and MacKinnon (2002, 8) suggest the training of all teachers as part of a human resources development strategy. Such training and awareness initiatives can both establish sufficient expertise and change attitudes towards acceptance and use in communities. Baartman (2003, 52–53) further recommends the use of ICTs for national priorities such as HIV/Aids, malaria and other communicable diseases.

CONCLUSION

Where there is slow adoption and poor utilisation some observers from the developed world may conclude that there is simply no drive or commitment. It is possible that they do not know about the myriad of initiatives and the success stories that can indeed serve as a very important resource to 'make it happen' – but do these success stories motivate us, the citizens of the developing world, to engage in implementing ICTs? Taking a closer look at achievements from China through to Brazil whilst visiting the smallest of initiatives in rural South Africa (better farming with cell phone technology) may inspire us to get going. But it is not a simple step to take.

A note of caution must be sounded, though, along with the fanfare of bells and whistles announcing all the latest ICTs luring us to adopt them and promising to turn our educational challenges into miracles. Approaching the better utilisation of ICTs for delivery is indeed a complex matter in the developing world. While it is important to investigate the possible contribution to be made by technology to furthering the cause of improved education, the latter must not find itself in the service of technology. The dumping of complicated technologies in poor rural villages will by itself give rise

to a national wave of educational innovations with ICTs. Such radical 'commercial' approaches will in the long run, do more harm than good to the morale and drive of local people.

Haddad (2002, 6) offers a hard-hitting but yet encouraging view on ICTs in developing countries: 'ICTs-for-All is a desirable but elusive target. The needs are expanding, the demands are escalating, the technologies are evolving, and the resources are diminishing. Will we ever get there? Probably not, if we take the visions and missions of the radical 'technologists' as a measure. But we can certainly develop relevant and affordable infrastructure and competencies, and ensure expanded use through sustained pursuit; hard work; exploration; creativity; collaboration, and commitment.' There is sufficient evidence that radical approaches have contributed to the most phenomenal of failures in education in the developed world – these mistakes cannot be afforded in the developing world. A gradual and focused approach, supported by national strategies, will assist with connectivity and gradual implementation of ICTs in education. Such an approach should have the important objective of enabling pedagogies and competencies that can empower the peoples of the developing world to be more independent and to compete in the global village.

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