Education and Training Policy

ICT and Learning

SUPPORTING OUT-OF-SCHOOL YOUTH AND ADULTS

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Foreword

Across both the industrialised and the developing worlds, many educators have high hopes for new information and communication technology, or ICT. In recent years, adult learning, out-of-school youth and ICT have each been important issues in the work of the OECD Directorate for Education. Adult learning has been the focus of two major international surveys – the International Adult Literacy Survey and the Adult Learning and Life Skills Survey – as well as the topic of a major thematic review in which 17 OECD countries participated. It was also the topic of a set of case studies carried out by the Centre for Educational Research and Innovation (CERI) as part of its "What Works?" series. Out-of-school youth were a key focus of a review conducted in the late 1990s that examined the transition from school to work. ICT has figured prominently as a topic in the PISA surveys and in the International Survey of Upper Secondary Schools. It has been the subject of a number of important CERI studies, including a review conducted by the Education and Training Policy Division.

The meeting that was the origin of this volume pulled together these themes. The publication is produced jointly with the National Center on Adult Literacy (NCAL) at the University of Pennsylvania, which has been the OECD's partner in five roundtable meetings and the publications that ensued. Over more than two decades and with the support of the US Department of Education, NCAL has been a locus of work on many facets of adult learning and literacy, increasingly in the area of ICT and educational innovation.

This publication, based on the papers given at the joint OECD/NCAL international roundtable that took place in Philadelphia in November 2003, asks whether and to what extent ICT can be a useful tool for raising the educational outcomes of out-of-school youth and adults. Low-achieving and low-qualified adults are a growing concern in countries around the world as economies globalise – the roundtable gathered researchers and policy makers from some 20 countries, rich and poor. The book reinforces a number of lessons that have emerged from studies on youth, adult learning

and ICT. First, raising motivation is a key factor in encouraging disenchanted and under-confident learners, whether out-of-school youth or adults, to re-engage in structured learning. Second, ICT is not a panacea. It is not an alternative to good teachers, an interesting and relevant curriculum, or accessible, learner-friendly settings. ICT can, however, be a useful complement to each of these. The publication reveals a number of interesting examples of innovative programmes using ICT that can increase access to learning by the disadvantaged. ICT can improve the pathways to learning as well, by tailoring curricula to the needs and preferred learning styles of the disadvantaged. And, it can make learning more interesting by providing immediate feedback. A third message is that, just as adult learning itself has been the under-funded and underappreciated Cinderella of the formal learning spectrum, the application of ICT within adult learning has tended to lag behind much of the rest of the education system. The reader will encounter some cautionary remarks on the recent past, and discover some significant opportunities for the future.

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Director for Education
OECD

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Chapter 1

Introduction

Daniel A. Wagner and Richard Sweet

In attempting to raise levels of educational achievement and attainment**,** countries will obtain the greatest increase in overall national performance if they raise the performance of the lowest achievers and of those with the lowest level of qualifications. These are the groups whose improvement will make the greatest difference to the national average. Policies that specifically target low achievers and those with few formal qualifications have a special relevance to two groups outside the education system: youth who have dropped out of school without having completed a secondary education qualification, and low-skilled adults. The pressures for public policy to focus on these groups come from many sources. Equity, both within and between nations, is a powerful motive. But there are also strong economic pressures to raise the educational performance of low-skilled adults and out-of-school youth. In OECD countries with ageing populations, the prospect of a shrinking labour force leads policy makers to seek ways to increase the supply of labour**,** and to improve overall educational performance through raising the skills of the existing workforce. These pressures intensify as countries seek to compete in the global economy on the basis of the quality of their human capital.

In many circles, information and communication technology (ICT) has been seen as an important part of strategies to deliver basic education to the low-skilled, the poorly qualified and the hard to reach. These high hopes for ICT within OECD countries find a parallel in developing nations, and they have risen as the cost of ICT has fallen and the educational possibilities afforded by the Internet have widened. They can be seen within the United Nations World Summit on the Information Society, and within the United Nations Millennium Development Goals. Concerns about the relationship between ICT, low-skilled adults and poorly qualified youth have been sharpened by the growing awareness that, in information-rich societies, digital literacy is becoming a key generic skill. The fear is that the digital divide and the literacy divide may overlap so strongly as to be identical.

Evidence from OECD surveys shows that countries facing these challenges actually face quite different circumstances, which call for very

different policy approaches and programme responses. For example, the International Adult Literacy Survey (IALS) can tell us something about the literacy skills of 20- to 25-year-olds who have not completed upper secondary school. The OECD's Programme for International Student Assessment (PISA) gives us some data on the extent to which schools are computer-intensive, as well as data on the number of computers in the homes of 15-year-old students. Putting these two sets of data together shows that countries such as Denmark, Finland and Sweden have relatively high levels of basic literacy among out-of-school youth and that, at the same time, a relatively high proportion of homes in these countries have computers. The number of computers in Canadian homes is also very high, but low-qualified Canadian youth have far weaker basic literacy skills. In Hungary it is a compound problem: relatively few computers in the home coincides with low literacy skills among poorly qualified youth. PISA data also show that there are wide differences between countries in the availability of computers in the homes of good *versus* poor readers. In the United States, poor readers have only half as many computers in the home as good readers. In the United Kingdom, there is very little difference.

Personal participation in this technology-knowledge-economic development cycle must begin with basic education and literacy. The connection between literacy and technology (in both industrialised and developing countries) is the focus of this book. In particular, ICT is viewed as a set of potential delivery and instructional tools that can be used to help people acquire skills needed for their society's knowledge economy. In this approach, out-of-school youth and adults are a crucial target population in a world increasingly concerned about literacy, employability and lifelong learning.

This publication is the result of a joint OECD/National Center on Adult Literacy (NCAL) roundtable held at the University of Pennsylvania in November 2003. The meeting, one of a series in which the OECD and NCAL have collaborated over the years, brought together some 70 participants from both OECD countries and developing nations to seek a clearer understanding of key policy questions, and to explore possible solutions.

The meeting examined a number of key policy questions. Are the expenses associated with providing the hardware, software and delivery infrastructure for joining the global knowledge society through ICT on a par with those required to provide this training by some other means? Or if not less expensive, are ICT-based methods more effective than traditional means, and sufficiently so to justify the added costs? From a policy perspective, the costs and uses of ICT are, therefore, considered in a broader educational, social and economic context. The rationale for ICT investment

is not seen merely in terms of a more efficient or effective means to deliver education. It also results in an environment, one that sustains an educated citizenry by providing a range of productive tools and information through which literate people can use their skills to promote their own personal improvement and the social and economic development of the country. A significant benefit is that this new ICT infrastructure would be used not only for supporting skills learning but also to improve, for example, community service and welfare, and the development of global commerce. The result would be a "high road" spiral of continuous development and use of new knowledge to benefit the economy, society and its citizens. A further significant issue explored in the meeting was motivation: can ICT be used to improve the motivation to learn, whatever its objective value in raising literacy and skill levels? And how does the motivation to use ICT relate to literacy skills? Are the low-qualified and low achievers more, or less, motivated to use ICT than the highly qualified and high achievers?

The meeting occurred two years after the dot-com (high-tech) bubble had burst, and a similar period after the publication of some influential critical reviews of the impact of ICT upon the quality of teaching and learning, such as *Oversold and underused:Computers in the classroom* by Larry Cuban (2001). Both lent a greater tone of sobriety to the meeting. Robert Kozma, in his roundtable presentation, termed this "techno-realism". Thus, ICT and schooling were not viewed as the major combined panacea for radical global change; nor was the solution a stronger emphasis on the importance of access to ICT for its own sake. Rather, the strong emphasis was placed on access to learning opportunities as the vital key to giving youth and adults access to ICT, for both returns to individuals and returns to enterprises and society.

In the roundtable, there seemed to be broad acceptance that policy questions needed to be asked not only in terms of whether or not ICT was of value, but also in terms of the circumstances under which different uses of ICT might produce different types of benefits for different types of people. Closely allied to this was a theme concerning the importance of ICT having an integrated role in learning: combined policies were needed to put multiple pieces on the table, such as teacher development, software, and organisational change – not just hardware solutions.

Roundtable attention also gave serious consideration to the organisational and institutional forms through which to use ICT in youth and adult learning, including formal classrooms (school, post-secondary, tertiary), community settings, workplaces and the home as venues for ICT-delivered or ICT-mediated learning. Questions were raised about whether the institutional forms needed to meet the needs of adult learners were the same as those needed for out-of-school youth; about the nature of formal

school *versus* that of community settings; and about whether policy reform might lead to organisational changes needed for the most effective returns from investments in ICT.

An important set of issues arose about costs and benefits, as well as the broader area of monitoring and evaluation. There seemed to be general agreement that the case study (and anecdotal) evidence, as well as, to a lesser extent, the research evidence was generally positive about the potential value of ICT in youth and adult learning. However, there was also evidence of poor investments in ICT, and many questions were raised about the opportunity costs of ICT investments compared to those of other methods to provide access to and deliver learning. Related to this were questions about the appropriate scale of technology used in youth and adult learning, and the pitfalls of using technology that was too complex. Overall, there was concern that too little has been invested to date in the monitoring and evaluation of ICT efforts with out-of-school youth and adults. New efforts are under way to try to rectify this situation by developing a set of measures that can be used widely.

Another major issue raised in the roundtable was that of supply and demand in ICT for education. While everyone recognises the demand for ICTs in general, with respect to the content that runs on ICTs, supply seems to outstrip demand. That is, the content providers (from Microsoft to smaller educational software firms) tend to supply what they believe the market desires. Within education, at least, it would seem that demand for effective educational software could be enhanced so that such software could cater more directly to out-of-school youth and adults. A simple example of this phenomenon is the need for educational software in a multiplicity of languages so that linguistic minorities – often the most disadvantaged – can have equal access to ICT solutions.

In sum, there is little doubt that much more can and will be done to utilise ICT to foster improvements in the quality of learning that takes place outside formal educational institutions for out-of-school youth and adults. The question we are left with is how soon the field will be able to achieve and substantiate results.

Chapter 2

ICT in adult education: Defining the territory

Neil Selwyn

Introduction

Throughout the 1990s and into the present decade, information and communication technology (ICT) has increased in educational prominence. From the virtual classroom to the cyber-campus, ICT-assisted teaching and learning are now a significant part of the educational landscape in developed countries. There is also growing interest in ICT being used to extend educational opportunities in developing countries. While many governments paid specific attention to integrating ICT into compulsory schooling during the 1990s, more recently the focus has shifted to *post*-compulsory education, including adult education[1]. In essence, ICT is argued to make post-compulsory teaching and learning more effective and more equitable by offering a diverse range of learning opportunities to a diverse range of learners on a convenient and cost-effective basis.

This shift reflects the growing economic and social importance of adult education. Traditionally seen as a Cinderella educational sector, adult education is now recognised to be a powerhouse of the knowledge society. The ability to continue to learn throughout life is recognised as a prerequisite to the development and sustainability of knowledge economies, as countries, corporations and communities increasingly require workers and citizens to have flexible, just-in-time skills, competencies and knowledge. This need for diverse and accessible learning opportunities has drawn policy makers towards the use of ICT as an educational delivery mechanism *par excellence* for the 21st century:

> [We] stress the need to adapt European education and training systems both to the demands of the knowledge society and to the need for an improved level and quality of employment … In particular, Member States should strengthen their effort towards the use of information and communication technology for learning. (Council of the European Union, 2002, para. 9)

Adapting and expanding the scope of post-compulsory education beyond its traditional, institutionalised forms is a pressing requirement, especially in light of ongoing concerns to encourage lifelong learning beyond the continuous pursuit of formal education. Although participation in traditional forms of adult education remained conspicuously low during the latter half of the 20th century, there now is increasing demand for learning from younger, more-educated generations, as well as from employers who require higher-skilled and information-literate workforces. Understanding how ICT is able – and not able – to play a part in the expansion of adult education therefore forms the focus of the chapter.

The disparate nature of ICT-based education

Any debate about the educational role of new technologies must first clarify exactly what is meant by ICT. The term ICT updates the conventional term information technology (or IT) by highlighting the rapid convergence of technologies such as computers, telecommunications and broadcasting technologies. It also stresses the communication and networking capacity of modern-day information technologies. The chapter therefore uses ICT in a broad sense: the term here refers to a range of technologies that includes computers; digital broadcasting; telecommunication technologies, such as mobile phones affording access to e-mail and other forms of computer-mediated communication; and electronic information resources such as the worldwide web and CD-ROMs.

When discussing ICT-based learning (now often referred to as e-learning) the discussion follows the recent definition provided by the United Kingdom government: any "learning with the help of information and communications technology tools. These tools may include the Internet, intranets, wireless networking, PC (personal computer) based technologies, handheld computers, interactive TV and also e-technology to support traditional delivery, for example using electronic whiteboards and video conferencing" (Department for Education and Skills, 2002, p. 2). Thus it is important to recognise that ICT-based learning spans a continuum from distance learning, which is remotely provided and accessed via the Internet or digital television broadcasts, to the occasional use of technology in a "face-to-face" classroom setting. There is, therefore, a range of uses of ICT as a learning tool: from an information delivery mechanism to a means of creating knowledge and providing tailored assessment and learner feedback. Curtain (2002, p. 5) argues that these diverse forms "make it impossible to offer a conclusive answer in most cases" to broad questions of the effectiveness of ICT-based adult education. Obviously, these different forms of ICT-based learning have different strengths and weaknesses and, where applicable, this is distinguished in the text. In addition, there are important

generic issues that cut across ICT and e-learning in its many forms; these are also highlighted.

The disparate nature of adult education

A need for clarity of definition is not confined to the technological side of our debate. Despite its current political popularity, adult education remains a rather complex and disjointed educational sector. Beneath the umbrella term adult education there lies a range of different forms of teaching and learning, recently re-branded under the term "lifelong learning" to emphasise the fact that a breadth of learning can take place across an individual's life course. Put simply, adults can learn for a variety of reasons, in a variety of ways and in a variety of settings. For example, learning may be undertaken for personal or professional reasons (although the reasons often blur as time passes). Learning can be formal (institutionally sponsored and structured), non-formal (non-credentialed but still institutionally based and structured) or informal (occurring by chance or during everyday activities). Adult education in its broadest sense can therefore take place in the workplace, college, home and community, at different times and for different purposes.

Despite this wide scope, we know that significant groups continue to be excluded from participation in all forms of adult education (see Beinart and Smith, 1998; NCES, 2002a; OECD, 2003). Those currently disenfranchised from formal and non-formal adult education are more frequently female, not employed, older, socio-economically disadvantaged and less qualified, with lower literacy skills or with negative attitudes to institutional learning. Recent work has also emphasised the role of regional factors in determining patterns of participation. And we know that those employed in high-skilled, white-collar occupations are more likely to receive work-based training, as are those in larger and multinational firms (OECD, 2003). There are recent suggestions that participation in informal adult learning is similarly delineated. Those who do not participate at all in *any* form of education once having left compulsory schooling can make up over one-third of adult populations in developed countries (NIACE, 2003; OVAE, 2000). These inequalities are entrenched, and perpetuated by the fact that those who participate and benefit most from adult learning tend to be those who have higher educational attainment levels (OECD, 2003).

ICT as a technical fix for adult education

Attempts to encourage full and effective participation in adult education – under the various banners of creating learning ages, clever countries or learning societies – now form a central part of current educational and

economic policy making in most developed countries. As already hinted, ICT has been viewed by many governments as having profound and far-reaching implications for the achievement of these aims. In the United States, as in nations across Europe and South-East Asia, the role of technology in post-compulsory education is currently of key political concern (see Eurydice, 2002; Selwyn *et al.,* 2001).

In the United States, for example, the "From the Digital Divide to Digital Opportunity" proposal was introduced under the Clinton-Gore administration to address issues of social exclusion from ICT learning. These proposals centred around USD 2 billion of tax incentives over ten years to encourage business and industry to donate computer hardware, training and sponsorship to schools, libraries and other community technology sites. Continued financing was also committed to Community Technology Centers and Neighborhood Learning Centers in low-income urban and rural communities, offering computer access and training to adults and schoolchildren. Both of these schemes were complemented by the 21st Century Community Learning Center programme aiming to support the creation of school-based community IT centres; the Star Schools programme which funds projects that deliver distance education courses and services; and the Learning Anytime, Anywhere Partnership grant programme for asynchronous distance education projects. There were also measures to expand home access to computers and the Internet for low-income families and accelerate the construction of high-speed networks in otherwise underserved communities. Although some of these funding streams have been cut under the Bush administration, finances were still being committed at the time of writing to promote tele-education and to fund the rural ICT infrastructure.

The United Kingdom government has pursued a similar set of policy initiatives aimed at a technological re-engineering of adult education under the aegis of the University for Industry (UfI) and UK Online initiatives. UfI most prominently takes the form of a telephone-based helpline and website for directing individuals to approved, government-endorsed learning opportunities. It also provides its own technology-mediated learning opportunities via a network of over 7 000 UK Online and learndirect centres in communities throughout the United Kingdom. The initiatives aim not only to widen participation and achieve a "mass-market penetration of learning" (Limb, 2003), but also to reduce the current inequalities in participation among those groups traditionally underrepresented in adult education. The People's Network has established public Internet connections in England's 4 300 libraries alongside a host of other initiatives aiming to widen access to ICT and ICT-based learning.

Similar initiatives have been introduced across Europe, South America, South-East Asia and Australasia. From the German "IT in Education: Communication Rather Than Isolation" programme to the Indian "IT for All by 2008" initiative, governments in most developed countries (and many developing ones) have firmly stated their faith in the use of ICT to establish inclusive learning societies. These initiatives, coupled with the ever-growing rates of domestic and work-based access to forms of ICT such as computers and the Internet, are now prompting politicians and educationalists to make wide-ranging claims: the combination of adult education and new technology is at last overcoming existing social inequalities and leading to a surge of lifelong learning. For some, therefore, the ability to learn with and through ICT has solved the adult education conundrum in one fell swoop:

> E-learning is a relatively new tool with the potential to *radically improve participation* and achievement rates in education … Through e-learning we have the opportunity to provide *universal access* to high quality, relevant training and education. (Department for Education and Skills, 2002, p. 4 - emphasis added)

This reliance on ICT as a technical panacea for the woes of adult education has an understandable attraction for politicians and educationalists. Yet an emphasis solely on technological infrastructure and the ICT-assisted provision of learning is unlikely to fully overcome the social, economic, cultural and political factors that also shape adult education. The limitations of ICT are now beginning to be recognised as e-learning policies and initiatives continue to be implemented across the world and, in particular, become embedded in the adult education systems of many developed countries. In order to develop a better understanding of the key issues underlying the future effective application of ICT to different forms of adult education, the remainder of the chapter contrasts the perceived benefits of ICT-based adult education with emerging limitations. From this basis it is possible to highlight a series of different areas for further discussion and action.

The perceived advantages of ICT in adult education

The arguments about the ability of ICT to produce educational change are well rehearsed. In fact they are so well rehearsed that we often tend simply to assume that ICT is a good thing for education. But as Fitzpatrick (2003) and many others argue, new technologies should always be approached with a sense of cautious realism. In adopting a more critical and questioning attitude towards ICT in adult education, it first makes sense to reconsider precisely why ICT is assumed to be beneficial for adult education, and the evidence behind such assumptions.

Widening the provision of adult education

ICT is popularly seen as being capable of widening access to adult education – in particular, supporting and facilitating a diverse range of sources of educational provision from which learners can choose. In this way, ICT is viewed as complementing and extending the wide range of traditional post-compulsory educational providers: firms; commercial organisations and other private providers; further education institutions; adult education centres; and community education groups. By overcoming practical issues of economy and scale (such as buildings, staffing and other physical resourcing limitations), virtual or ICT-based educational provision, it is argued, allows this diversity of providers a level playing field, particularly benefiting smaller and more specialist organisations to distribute learning opportunities. ICT is also argued to lead to greater collaboration between private and public providers: it fosters remote partnerships between different agents and gives rise to wholly new educational providers. In this way, neo-liberal commentators have welcomed ICT as enabling a more competitive – and therefore more effective – marketplace for adult education to develop.

Indeed, the last ten years have seen the emergence of a large number of profit and not-for-profit organisations offering different types of ICT-based adult education, a reflection of the breadth of adult education. This provision is varied and often innovative. On the one hand, large-scale national learning organisations have been developed using ICT as their primary means of provision, such as the United Kingdom's University for Industry, the Korean Cyber University and the Spanish National Distance University. Private providers of e-learning such as the multi-billion dollar Skillsoft, Digitalthink and Pathlore corporations are also now substantial training providers, as are innovative public/private sector hybrid organisations such as the United Kingdom National Health Service's corporate university, reputed to be the largest e-learning project of its type in the world. Although estimates vary, the marketplace for work-related e-learning in the United Kingdom alone is estimated to be worth between GBP 2 billon and GBP 3 billion by 2005 (Paton, 2003). Community-based ICT provision is also flourishing. For example, the Community Technology Centre movement established in the United States to serve low-income populations in urban areas now boasts over 300 member programmes (Servon and Nelson, 2001). A variety of flexible learning networks have also been developed in Australia and Europe to bring together various educational organisations via central online hubs. In all these instances ICT can be said to be supporting new frameworks of educational provision as well as extending the reach of existing provision. If nothing else, ICT is certainly a prominent feature of contemporary adult education provision.

Widening participation in adult education

This increased choice and diversity is also seen as widening participation in adult education and training and, ultimately, leading to the inclusion of social groups that do not traditionally engage. It is suggested that distributing adult education opportunities via ICT (either fully or as part of "face-to-face" provision) helps overcome the barriers that deter people from taking part in existing forms of learning. It might do this by making learning provision more flexible; bringing costs down; making learning more accessible and affordable; offering reliable and accessible information; and allowing people to learn at their own pace (*e.g.* SEDL, 1995; Benton Foundation, 1996; Glennan and Melmed, 1996). In particular, ICT-based learning is seen as offering potential learners the fundamental advantage of convenience in terms of time, cost, and family and work commitments (Pérez Cereijo *et al.*, 2002; Learning and Skills Council, 2002). Barriers to learning, whether they are to do with lifestyle, arise from a lack of available opportunities, or are the result of low personal knowledge and motivation, are now seen as resolvable. The use of technology can offer learning on an "any-place, any-pace" basis.

Tentative evidence for these benefits is offered by ICT-based educational providers in developed countries. In the United Kingdom for example, the UfI initiative is claiming that since 1998 they have supported 1.8 million educational enrolments, nearly two-thirds of whom had not participated in formal learning for at least three years. Similarly, the Star Schools Programme in the United States is heralded as one of the largest and most successful public and private educational partnerships, having delivered technology and instructional programmes to more than 10 million learners since 1988. Private sector providers now also provide training programmes for millions of learners in the workplace. For example, WebCT claims to have licensed over 10 million learners on their software systems. Skillsoft – the world's largest e-learning company – cites over 2 000 client companies and over 4.5 million registered online learners on a global basis. As well as involving large numbers of learners, such e-learning is argued to provide work-based training to those in small and medium-sized enterprises who do not usually receive as many training opportunities as workers in larger firms. Although equity outcomes are difficult to assess in many of these claims, it can certainly be concluded that increased numbers of people are taking part in learning via ICT.

Facilitating different forms of adult education

Throughout all these examples, a primary advantage of ICT-based adult education is seen to be the positioning of the learner at the centre of the

learning process, thus allowing individuals to pick and choose the learning appropriate to their particular needs and circumstances. Aside from issues of access, this "democratisation" of adult learning has been especially welcomed as stimulating different forms of adult learning, in particular, the types of self-directed, transformative learning that are argued to be "the ultimate goal of adult educators" (Pascual Leone, 1998).

For example, ICT is seen to support and encourage constructivist learning. Aside from an approach in which learners use ICT merely to acquire knowledge and skills, more interactive and self-directed use of ICT is seen as encouraging learners to actively construct new ideas, concepts and meaning when transforming their existing knowledge (Rosen, 1998). ICT fits in with constructivism's emphasis on learning that is mediated by participation in a social process of knowledge construction, and directly linked with the use of social artefacts or tools to provide the scaffolding for learning (Blanton *et al.,* 1998). As Lim (2002, p. 413) explains, "the emphasis is on the individual learning with a wide variety of tools and people that help them carry out their goal-orientated activities in a socio-cultural setting". This has led many educators to point to the use of ICT in supporting and mediating constructivist learning, given the personal control and diverse interactions that learners can achieve with "distributed knowledge" (Bostock, 1998). Thus, as Crook (1998, p. 380) asserts, ICT can provide ideal environments to support the constructivist perspective on learning, "complementing and extending what is [already] powerful in existing practice".

This emphasis on transformative learning also ties in with the potential of ICT to encourage informal adult learning; forms of ICT such as computers, the Internet and digital television are seen as key sites of self-directed informal learning. Within general patterns of adults' use of ICT at home and in the workplace, research is showing that any educative use, more often than not, appears to be informal rather than formally provided (Selwyn and Gorard, 2004). Informal learning is distinct from formal and non-formal types of education in that it is not typically classroom-based or highly structured; control of learning rests primarily in the hands of the learner (Marsick and Watkins, 1990). For example, the most common form of informal learning is work-based learning on the job (Hager, 2000), although informal learning also includes a range of learning stimulated by general interests outside the workplace that is "caught not taught" (Davies, 1998). The importance of informal learning in people's use of ICT cannot be underestimated; nor should it be seen as a surprise. Indeed, ongoing Canadian research suggests that informal learning represents the vast majority of learning that takes place across the workplace, community and home (Livingstone, 2000). As a result, one would expect ICT to be

appropriated by adults into pre-existing patterns of informal learning (Selwyn, 2004).

Improving the outcomes of adult education

Issues of provision, participation and diversity aside, the fourth and most contentious perceived benefit of ICT is that it leads to improvements in the outcomes of adult education. As with most research on education and technology, the evidence with regard to effectiveness is fragmented. There is, however, a growing body of localised case studies that purport to demonstrate the value added of the different forms. For example, studies across the United States, Europe and Australia have concentrated on evidence of improved academic performance and attainment. A series of studies has suggested that there are no significant differences in academic performance between adult learners using ICT (whether to partially or fully learn) and their "traditional" counterparts across a variety of different populations of learners and settings. These populations and settings range from postgraduate classrooms to adults with mild learning disabilities (see for example Schwartz and Duvall, 2000; Anderson and Nicol, 2000; Maki *et al.,* 2000; Tolmie and Boyle, 2000). Curtain's examination of six case-studies of online learning in Australia (2002, p. 6) found that students' satisfaction with forms of online learning involving high levels of interactivity was "on a par with the student satisfaction levels for classroom-based courses". Other studies have also suggested that more interactive forms of learning with ICT can lead to a more reflective, "deeper" learning and more empowered and democratic discussion among adult learners (Doubler *et al.*, 2003; Jeris, 2002) as well as proving to be an attractive and motivating medium of learning for adults with basic skills (Lewis and Delcourt, 1998).

Engagement in various forms of e-learning is also seen as leading to wider educational outcomes, such as increases in learners' self-esteem and propensity to engage in further learning. For example, James and Preece's (2002) evaluation of the experiences of 2 000 women attending a basic IT skills course reported increased confidence and subsequent engagement in further learning and employment by substantial proportions of learners. Similarly, the evaluation by Devins *et al.* (2002) of learning at a community centre found that a third of learners who were in employment reported applying skills learned at the centre in the workplace. Half of these centre users also went on to enrol in accredited courses of study. A larger survey of users of Community Technology Centres in the United States also reported effects such as developing new goals for further educational participation and a general change in outlook on education (Russell and Ginsberg, 1999). In all of these cases, although one cannot generalise further, it is safe to

conclude that there is a prominent body of research (backed up by practitioner experience) that suggests that ICT-based learning can be beneficial for learners.

Emerging limitations of ICT in adult education

These benefits not withstanding, it is important for educationalists and policy makers to avoid approaching ICT-based education and training as a panacea for educational problems. Crucially, they cannot assume that any benefits are universal. Indeed, for all the perceived benefits of ICT in terms of provision, participation and outcome, there are a host of caveats, drawbacks and unresolved problems that tend to be ignored or summarily dismissed by proponents of e-learning. In order to use ICT in effective ways, we need to develop a more sophisticated understanding of these problems. This part of the discussion concentrates on some of the limitations of ICT-based adult education which are emerging as initiatives begin to be embedded in education systems.

ICT and the narrowing of adult education provision

In spite of the increasing amount of education being provided via information and communications technology, there are concerns that ICT is leading to a narrowing of adult education provision to business and industry-friendly core skills and key competencies. For example, it is noticeable that much current virtual and classroom-based e-learning provision concentrates on work-related skills and, in particular, ICT skills themselves (NCES, 2002b). One of the criticisms of adult education at present centres on the confusing plethora of IT qualifications (E-Skills NTO, 2001; Devins *et al.,* 2002). While it is rational for commercial organisations to concentrate on the more profitable aspects of adult education and training, the notion of ICT promoting a broad spectrum of learning opportunities may not, therefore, be in evidence in many countries. If anything, current e-learning provision appears to be reinforcing the priorities placed by traditional post-compulsory educational provision on employability and work-related skills, at the expense of facilitating different forms of learning and competencies among a wider range of social groups.

If we examine the rhetorical foundations of many governments' current educational agendas it soon becomes clear that ICT-based adult learning (and indeed adult education as a whole) is seen primarily from the economic perspective of upskilling (or at least re-skilling) the workforce. As the director of ICT for the United Kingdom's University for Industry recently remarked, "We are there to make a difference to individuals to make them more employable" (Sutton, 2003). In this issue, any notion of using ICT to

widen participation to all social groups could more accurately be seen as increasing participation among economically active groups. This narrowness of provision and emphasis on profitability is compounded by the relative cost-ineffectiveness of using ICT for organisations. Indeed, as the OECD recently recognised, in e-learning the marginal cost of a student remains close to the average cost. Thus a powerful argument, "never addressed head-on by the advocates of computer based learning, is that in traditional teaching or training based on the idea that a group of people benefit from the knowledge of a teacher or instructor, it often costs very little to add an extra learner … [institutional] cost may disqualify e-learning as a panacea for adult learning" (OECD 2003, p. 190).

The clash between ICT and existing educational organisation

There are concerns about how ICT-based education complements traditional provision of adult education. The notion of ICT leading to greater co-operation and collaboration between different education providers is not being realised in many countries; ICT-based learning is often seen as threatening rather than complementing existing education. The few studies that have looked at the implementation of e-learning from an institutional perspective point toward significant institutional clashes that can occur when e-learning is introduced into existing educational markets – especially where commercial and private interests are seen as impinging on the public good of education. This was evident in the author's own study (Selwyn and Gorard, 2002) of the implementation of virtual college initiatives in the Welsh adult learning sector. One result was that existing educational institutions perceived that new forms of ICT-based provision such as the United Kingdom government's UfI initiative deprived them of learners who otherwise would have enrolled in traditional courses (see also Cornford and Pollock, 2003). It would seem that such institutional clashes are likely when ICT-based initiatives are positioned around existing structures of education. As Alger (2001) points out, collaboration between educational institutions is not automatic; established providers are keen to retain their traditional reputations. There are also a host of legal issues, such as intellectual copyright over shared learning resources and sensibilities over branding and corporate affiliations. It is perhaps naive for ICT-based education providers to believe that they can complement existing forms of adult education without being seen as a competitive threat by the very institutions that they paradoxically rely on for partnership. Therefore one of the very real barriers faced by ICT-based education is the pre-existing micro-politics that characterises all education sectors.

ICT and inequalities in educational participation

Another of the fundamental limitations to ICT-based adult education is proving to be the relatively modest levels of take-up and, crucially, the social composition of those learners who are taking part. Levels of participation in all forms of ICT-based formal education remain relatively low (Sargant and Aldridge, 2002) and overall patterns vary between subject area and level of qualification (La Valle and Blake, 2001). Similarly, although there is evidence of adults using ICT to learn informally, this is very much a minor activity when compared to everyday uses of ICT such as word-processing and e-mail.

Empirical work also suggests that although ICT-based learning is taking place, it is having little impact on the overall patterns of (non)participation in education referred to earlier. Indeed, analyses of large-scale United Kingdom-wide datasets suggest that non-participation in education remains a significant and deep-rooted trend with or without ICT based initiatives (Gorard *et al.,* 2003; Selwyn, 2003a). This has been confirmed by recent qualitative studies. For example, the evaluation by Devins *et al.* (2002) of ICT-based learning centres found that they tend to attract largely traditional learners, many of whom already had access to IT at home or at work. (See also Breiter's 2003 evaluation of German public ICT sites.) The overall conclusion from these analyses is that whether or not an individual participates in learning appears to be a lifelong pattern, set in place at school-leaving age, and intrinsically related to long-term social, economic and educational factors. Crucially, access to ICT does not in itself seem to make people any more likely to participate in education and (re-)engage with learning. It can be concluded that at the moment ICT is increasing educational activity among those who were already learners rather than widening participation to those who had previously not taken part in formal or informal learning. This is referred to elsewhere (Selwyn and Gorard, 2002) as the "usual suspects" phenomenon. Mossberger *et al.*'s (2003, p. 77) study of United States citizens highlights the phenomenon; it found that "interest in online education was statistically more significant among the educated, the young, the affluent, and the employed".

ICT and the persistence of barriers to adult education

There is a danger of over-emphasising the ability of ICT to overcome barriers to education. To assume that it can is to ignore what we already know about (non)participation in education and training: that the chief obstacles to participation reported by adults are not necessarily the physical barriers of time and place – which ICT can address to some extent – but rather lack of interest and motivation (La Valle and Blake, 2001; DEST,

2001). Positively influencing individuals' decisions to learn is therefore not simply a case of making learning more convenient via ICT. If adults have not previously engaged in learning and education due to low levels of motivation or interest, there is little reason to assume that ICT will alter this. While ICT can overcome situational and institutional barriers, it can do little to alter the social complexities of people's lives and how education fits into these. As Kennedy-Wallace (2002, p. 49) reminds us, "whether learning online in the workplace, in college or at home, e-learning is still about learning and culture, not just technology and infrastructure".

Indeed, a major reason for the non-use of ICT for learning is simply the irrelevance of both ICT and education to people's lives. Much academic and political interest in education and technology has been based on an implicit assumption that using ICT and learning are both inherently worthwhile and desirable activities, throughout all sectors of society. Thus for many authors, the logic behind public policy in the information age is an imperative towards "giving people the information tools they need to participate in the decision-making structures which affect their daily lives. It means helping people use these resources to deal with their everyday problems" (Doctor, 1994, p. 9). Yet this rhetoric ignores the fact that for many people dealing with everyday problems does not involve using ICT or learning new skills. There is perhaps a need here to reconsider the relative advantage (Rogers and Shoemaker, 1971) and situational relevance (Wilson, 1973) of ICT-based education for the vast majority of adults who remain non-learners. The notion of digital choice is an important one. It recognises the fact that significant proportions of the adult population in Europe and North America are choosing not to engage with ICT and ICT-based education, not through barriers of access or cost, but due to a lack of interest, motivation, need or perceived usefulness (see World Internet Project, 2003; Selwyn, 2003b).

ICT-based education and enduring digital divides

There are concerns that the current emphasis on ICT may be introducing new forms of impediments to full participation in education. The most obvious of these concerns are the marked inequalities in people's access to and use of ICT, the so-called digital divide. Although the magnitude of the figures varies, the emerging trends are that even within technologically developed regions such as North America, Western Europe and South-East Asia, specific social groups are significantly less likely to have ready access to ICT (NTIA, 1995, 1999, 2000; Bonfadelli, 2002; Loges and Jung, 2001; UCLA, 2000; Jung *et al.,* 2001; Dickinson and Sciadas, 1999; Reddick, 2000, Lenhart *et al.* 2001, Quibria *et al.* 2002). The differences are apparent using a wide range of measures of social exclusion: age, income, socioeconomic status, ethnicity, geography and gender. The digital divide, it

would appear, is a marked feature of any information society, and there is strong evidence that these inequalities are strengthening over time rather than diminishing.

The problem in facing attempts to address these basic access issues is that subtle but significant digital divides remain once an individual has been given opportunities to access ICT. For example, people do not simply either have (or not have) access to ICT, in the same way that people do not simply have (or not have) access to transportation (Gunkel, 2003). It is important when discussing digital divides to distinguish between effective access and formal access to ICT (Wilson, 2000). Although in theory the formal provision of ICT in community sites means that all people who live locally have access to it, such access is meaningless unless people feel able to make use of such opportunities.

The conventional notion of access, whether technology is available or not, also obscures more subtle disparities in ICT access. For example, accessing online information and resources from a home-based computer or digital television set is not necessarily comparable to accessing the same materials via an open-access workstation in a public library or community ICT centre. Time, cost, the quality of the technology, the environment in which it is used, people's experience of using ICT and the availability of human and technological support are all crucial mediating factors in people's access to ICT. Thus it must be recognised that genuinely universal and equitable ICT infrastructures are not in place in most countries, nor are they likely to be. Inequality in individuals' ability to engage with ICT is a complex and self-perpetuating social problem which looks set to continue hindering any progress towards equitable e-learning societies.

The educational and pedagogical limitations of ICT

Finally, if different forms of technology-based educational provision are more conducive to certain types of learning than to others, the ability of ICT to effectively widen the skills base is challenged. For some, much current ICT-based learning is not the same as real-life learning. It appears to be more about knowledge dissemination than a genuinely transformative process. Serious questions have therefore been raised about the pedagogical fit of ICT, especially given the narrow paradigms favoured by many current e-learning providers that tend to rely on one-way transmission of information and communication. ICT-based adult learning is, or should be, critical and emancipatory, rather than solely about the transfer of information and specific skills. Yet it is the latter that dominates much current online provision. As Mayes (2000) argues, for reasons of cost alone the interactive pedagogical opportunities offered by information and communications technology are often overlooked by adult learning

providers, leaving ICT-based pedagogy rooted in more old-fashioned linear and restricted models:

> There are really two pedagogies associated with ICT. One is the delivery of information – this is predominantly the pedagogy of the lecture or book, and emphasises the "IT" – the other is based on the tutorial dialogue and involves conversations between tutors and students, and mainly emphasises the "C". Of course, successful teaching is underpinned by both – and the rapid interplay of the two is ideal – but in the context of lifelong learning policy the real problem is that "IT" is cost-effective and the "C" is not. Unfortunately, in terms of pedagogic effectiveness the second is better than the first. (Mayes 2000, p. 3)

Even the most enthusiastic proponents of ICT-based distance learning should be able to recognise its limitations for delivering all types of learning. As De Kerckhove (1997) concedes, at best ICT enhances rather than replaces real-life learning. Thus ICT should not necessarily be seen as providing better educational contexts, but different contexts for learning. For example, many educational processes are fundamentally altered once they are digitised and delivered online. This is the case in creative, ethical, moral and aesthetic learning (Trow, 1999).

These limitations extend to the perceived ability of ICT to facilitate constructivist learning. As Imel (2001, p. 1) and others such as Wessel (2000) and Wilson and Lowry (2000) argue, although constructivist learning may be desirable, it is not dependent on the use of ICT or even necessarily encouraged by it. As with all types of learning, the effectiveness of constructivist learning via ICT is very much dependent on the social contexts in which ICT is used, including the attitudes and approaches of learner and teacher. Studies examining the use of computers for constructivist learning in classrooms have found that they can just as easily result in ineffective learning. They can merely reproduce the existing beliefs and practices of teachers and learners rather than automatically leading to better forms of learning (Daley *et al.,* 2001; Dirkx and Taylor, 2001).

Learning with new technologies also poses many practical human problems. This has been highlighted by recent research examining the lack of human and social contact of many ICT-based learners. Learners through the Internet, for example, can often feel isolated when presented with the unstructured nature of the data and its sheer quantity. Learners in Hara and Kling's (2002) ethnographic study, for example, complained of the isolation and ambiguity of being left to study some elements of their courses via ICT as compared to their other offline educational experiences. Other studies have also reported that students feel lost and disconnected from the

institutional systems within which they are learning when studying via ICT (*e.g.* Saronji *et al.,* 2002). Similarly, as Connolly *et al.* (2001) report, although the need for self-learning when learning via ICT may be motivational for some adult learners, others find the experience, and in particular the lack of direction from tutors, more difficult. This could be the biggest barrier to widespread ICT-based learning – for, as Doring (1999) observes, "education is a fundamentally conversational business".

Implications

It is clear that, despite the wide potential for ICT to benefit adult education in its many guises, significant caveats remain. As the OECD acknowledges:

> ICT and distance education can be part of national policies to ensure wider access. However, they should not be seen as universal solutions, for a number of reasons. Many adults lack the skills needed to handle the necessary software and hardware; ICT can be difficult to access and expensive to purchase, and access via the Internet can be costly. Where distance education is built into access policies, a face-to-face component is still often important for adults. OECD (2003, p. 218).

These points, along with the others raised in the chapter, highlight the need for everyone involved in ICT and adult education – policymakers, practitioners, and the providers and consumers of e-learning – to reconsider received wisdoms and understandings about ICT-based education. It is perhaps understandable for governments and technologists to overestimate the gains that result from applying ICT to the delivery of public services and to downplay the conflict and complexities involved (Hudson, 2003). However, adopting naïve optimism will do little to achieve the effective integration of ICT into adult education. There is no longer a need for technologists and politicians to sell new technologies to a disbelieving educational community. What is needed is a realistic approach to technology and adult education that avoids the damaging but well-worn cycle of hype, hope and eventual disappointment as yet another educational technology fails to live up to initial expectations.

This will involve readjusting expectations away from universal effects of ICT and, above all, acknowledging that the technological aspects of adult education are intrinsically linked with its social aspects. As Fitzpatrick observes:

> New technologies do not emerge *ex nihilo*, but are always embedded within social contexts whose contours shape the ways in which technologies are constructed and utilised. (Fitzpatrick 2003, p. 133)

Participation in learning is often linked with wider exclusion from society. The failure to participate in learning is not merely due to a set of technical barriers that can be directly addressed. We need to recognise this before effective and sustainable approaches to facilitating and encouraging wider take-up of learning can be developed. Increased access to ICT has been found not to lead to greater empowerment in areas such as medicine and health, social security or political engagement (*e.g.* Henman and Adler, 2003; Nettleton and Burrows, 2003). To imagine education to be unique in this respect would be to ignore the wider impacts of ICT on society.

There is a need to develop policies and interventions that use both technological and non-technological means to address the social, economic and cultural factors underlying educational problems. This is not to deny the potential of new technologies or to argue for a scaling down of ambition. New technologies can, of course, be part of effective reforms and interventions in adult education. However, to expect ICT to provide ready-made solutions is to continue the misapplication of ICT that so characterised the past century of educational technologies (see Cuban, 1986). From this perspective there are a series of issues about technology and adult education that we need to understand, issues that are political, practical and academic. Such understanding will not be achieved overnight, but the chapter has, it is hoped, raised important questions in each domain.

In terms of technology and society, one fundamental political question is what the role of government and the state should be in regulating and stimulating adult e-learning provision. Reflecting their different cultural and political backgrounds, governments are currently adopting clearly different roles with regards to ICT-based adult education in different countries. For example, governments that are taking what can be broadly categorised as a neo-liberal approach view most forms of state intervention as an impediment to the operation of the market, which is seen as the most efficient means of economic organisation. Here the private interests of individuals and companies should be left to define the demand for goods and services, given that the state can never achieve a monopoly of information seen to be necessary for effective state planning. In this way Moore (1998) suggests that the state is merely as a facilitator to ensure that ICT markets flourish while the private sector determines the scope and nature of the provision. Developmental governments, on the other hand, can be seen as taking a proactive central role rather than leaving ICT-based educational provision solely in the hands of the private sector (Teo and Lim, 1998). Here the state is seen as the supreme catalyst for stimulating development, with ICT policy implementation firmly "driven by the state acting in accordance with a predetermined set of objectives" (Moore, 1998, p. 154).

Of course, while the role of the state in directing ICT-based adult education is a reflection of cultural and national norms, even in the most neo-liberal nation the state has a responsibility to move beyond merely acting as a market maker in charge of co-ordinating and accelerating the nascent markets for ICT-based education (Harris, 2000). Governments can take on a variety of other roles: broker of partnerships; protector of customers; and strategic investor on behalf of underserved customers (Bates, 2001). This argument is especially pertinent with regard to government involvement in influencing the fairness of e-learning. As we have seen throughout this discussion:

> There should be no illusions about the "magic of the marketplace" in providing quality and cost-effective e-learning services and programmes in post-compulsory education and training. Some populations and some occupations will be neglected in a "free market" driven environment. (Bates 2001, p. 29)

This need for some degree of government intervention is reiterated by Devins *et al.* (2002, p. 941) when they conclude that "the market mechanism is insufficient to overcome disparities and that active intervention measures are required to close the digital divide".

Thus, there is a definite need for the state to maintain some responsibility for developing policies to tackle the inevitable inequalities involved in ICT-based adult learning. While it is naïve to imagine the effective development of ICT-based adult education without the involvement of the IT industry and other private sector actors, a crucial question hanging over the longevity of any e-learning programme is the integral role of business and industry in their continuity and, in particular, the perennial clash between education as a private interest and as a public good. There is a danger that "the private sector therefore tends to see e-learning as just another sub-set of e-commerce" (Bates, 2001, p. 26). This problem is not necessarily a new one: how states can maintain the involvement and interest of commercial concerns while also maintaining the equity of adult education is a key policy issue.

This points to the importance of developing a balance between national and local policy making. Some countries have national adult-learning policies; in others adult learning is primarily a federal or regional responsibility. While the benefits of a nationally focused policy are clear, it is also clear that adult education policies are implemented in local contexts with different needs. For example, the discussion has identified the need for more co-ordinated and co-operative approaches to implementing ICT-based adult learning on the ground amid the existing micro-politics of local and national adult education systems. If policies should effectively build on the

existing education infrastructure, is this best achieved at a local or national level?

There is also clearly a need to redevelop understanding of how ICT in its many forms can be used effectively across adult education. This is important to make sure that pressure is not loaded onto ICT-based adult education programmes to provide instant results and benefits. A degree of latitude should be introduced as the most effective applications of ICT to adult learning are discovered:

> …policies must allow – indeed encourage – experimentation by those who introduce use of [new] technologies into distance learning. If we must have national or regional policies, those policies might be of the form: "Give institutions and the people in them the freedom and resources to initiate from below, and to experiment in many different directions". And policymakers must accept that it is inherent in experiments that some may fail, in social and educational life as in the laboratory. (Trow, 1999, p. 207)

There is also a need for educationalists and practitioners to develop a deeper and more sophisticated understanding of ICT and adult education. One of the key considerations to bear in mind here is the appropriate use of ICT-based learning. It should be remembered that traditional classroom instruction will remain the dominant mode of adult education provision in the near future (OECD, 2003). Furthermore, newer technologies such as computers and the Internet do not supersede older technologies such as television and radio. For example, in the United States instructional television remains an effective means of promoting basic literacy (NIFL, 2000), and as Yates and Bradley (2002) remind us, technologies such as television, radio and film are still highly effective methods of basic adult education in developing countries and should not be overlooked. Trow argues that:

> Despite the introduction of new powerful information technologies into distance education, most continuing education will continue to be provided in its familiar forms of teacher and students together in classrooms and workshops. This is important if we are to keep the new developments in perspective. (Trow 1999, p. 201)

From that perspective, it is beginning to be recognised that adult learning is perhaps best suited to a combined approach of old and new technologies and face-to-face teaching and learning where "new technologies offer great potential for *adding value* to face-to face teaching" (Felix, 2002, emphasis added). Currently there is educational interest in the development of blended or hybrid educational situations where ICT-based learning is combined with human tutoring and where communication

between learners and teachers may be face-to-face or facilitated by technology (De Freitas, 2002; Franks, 2002; Wonacott, 2002; Anyanwu, 2003). In theory, blended teaching and learning combine the best aspects of traditional education with the best parts of technology to create a rich learning environment, with new courses being developed that reduce the amount of classroom time by offering a significant amount of the learning activities online:

> New approaches provide small "chunks" of learning, delivered using high-quality, well-designed materials, which make effective use of sound and pictures, as well as text. They are available to the learner at times and places - such as the home or workplace - convenient to them. Learners can be well supported by a mixture of staff with an appropriate spread of expertise, and by opportunities for learners to work with each other. These methods should be combined with other more traditional approaches in the right blend, to meet the needs of the individual learner. (Learning and Skills Council, 2002, p. 1)

Further questions about the application of ICT in adult education remain. How can ICT best be used to avoid a danger that e-learning reduces teaching to the delivery of information (Hamilton *et al.,* 2003), and instead facilitates transformative adult learning? How can adult learners best be socially supported when learning with ICT? How can ICT-based education compensate for enduring inequalities of access?

Finally, there are many areas to be addressed in terms of developing an academic understanding of ICT and adult education. As Trow argues, this is imperative if effective systems are to be developed and implemented:

> We need research in this area because whilst we can say with some confidence that the new forms of instruction will have large effects, for the most part we do not know the nature of those effects, nor their costs, material or human. (Trow 1999, p. 203).

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Note

1 This chapter adopts the definition of adult education provided by the US Department of Education National Centre for Education Statistics' national household education survey programme (NCES, 2002a). In these surveys, adults are defined as all civilian, non-institutionalised individuals age 16 or older who are not in elementary or secondary education. Adult education activities are seen to include adult basic education and English as a Second Language (ESL) courses, apprenticeship programmes, some programmes leading to a formal (typically college) credential, courses taken for work-related reasons, and courses taken for reasons other than work (non-work-related courses). The chapter also includes all other forms of non-formal and informal learning (which are defined below in this chapter) within this category. Since the continuous pursuit of formal education is typically not considered adult education, full-time participation in post-secondary credential programmes by those aged 16-24 is not counted as an adult education activity.

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Chapter 3

Adult learning and ICT: How to respond to the diversity of needs

Beatriz Pont and Richard Sweet

Introduction

Within education and labour market policies, adult learning[1] is becoming a priority for economic growth and social development in many OECD countries. The push for increased participation arose for a number of reasons, among them a recognition of the value of human capital for economic growth and social development, and the development of the knowledge economy society. Higher and changing skill requirements and a minimum of secondary education are prerequisites to obtaining employment in many countries. Yet the reality in many countries is that there continues to be a high proportion of adults who lack basic skills and who have low levels of education. Demographic trends also increase pressures to raise adult participation in learning. These include ageing populations and rising numbers of migrants and refugees, many of whom lack minimum levels of proficiency in national languages and have low educational qualifications. OECD member countries' education and labour ministers have recognised this greater need to focus on adult learning, most recently in the meeting of OECD Labour Ministers held in September 2004 (OECD, 2003b).

Within the heightened adult learning priority, information and communication technology (ICT) is seen in many countries as an important area of focus, for several reasons. One is that the capacity to harness ICT effectively, through for example developing citizens' ICT skills and ICT literacy, can be instrumental in achieving economic growth and competitiveness (OECD, 2003d). In many countries, national ICT policies recognise the need that not only youth but also adults have the capacity to acquire ICT skills. In addition, ICT has been viewed as a tool with significant potential to increase access to learning by making it less linked to fixed times and locations. That can help raise overall participation rates and make adult learning more flexible and responsive to learner needs. And finally, there is at least some evidence, largely derived from case studies (*e.g.* Pelgrum, 2003; Wagner and Kozma, 2005), that ICT has the potential to motivate low achievers and those with limited literacy skills and poor

qualifications. It could do this through giving these persons access to a wider range of learning resources, allowing greater individualisation of learning and control over the learning process, and making collaborative learning possible in flexible ways. Where those adults with low skills and low qualifications are a priority for adult learning policies, there is often hope that ICT will prove a powerful tool to raise the quality of their learning and provide them with the motivation to learn.

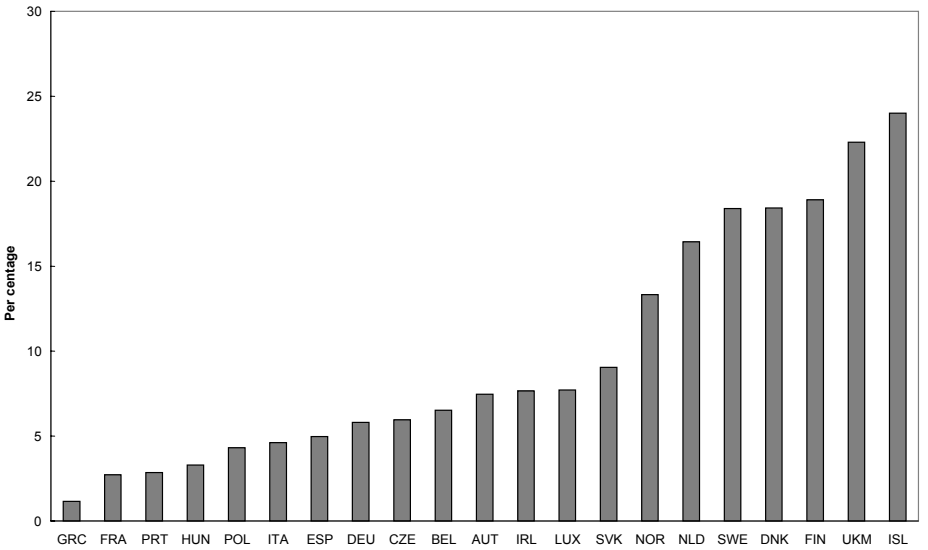
This chapter begins with an analysis of patterns of unequal participation in adult learning, and then examines some of the obstacles to learning. It follows with an analysis of differences in access to and use of ICT within adult learning. The chapter then reviews ways in which public policy in OECD countries has tried to use ICT to increase access to and participation in adult learning. It concludes with some policy suggestions.

Unequal participation in adult learning

While substantial public and private support for adult learning does exist, there are significant obstacles and inequities in participation throughout OECD countries. These inequities are greater in some countries than in others. They vary according to individual characteristics such as age, educational attainment, labour force participation, type of occupation, and type of firm in which the person is employed. Adults' participation in learning also reflects factors such as motivation, returns to learning, and distance from learning opportunities. It is important at the outset to understand these differences in access, in order to have a clear view of how ICT might be used to respond to the diversity of needs: to develop adults' ICT skills; to increase access to learning and to help reduce inequities in participation; and to better respond to the different adult learning needs.

Rates of participation in adult learning vary widely from country to country. To illustrate this, Figure 3.1 shows data taken from the 2002 European Union Labour Force Survey. It shows that Southern European countries have quite low participation rates: the proportion of 25- to 64-year-olds who participated in learning in a four-week period in 2002 in countries such as Greece, Portugal, Italy and Spain is 5% or less. Similarly, low rates can be observed in France, Hungary and Poland. Rates of participation in Nordic countries and in the United Kingdom are substantially higher: as high as 24% in Iceland and close to or over 20% in the United Kingdom, Finland, Denmark and Sweden.

Figure 3.1. Percentage of 25- to 64-year-olds who participated in learning during the previous four weeks, 2002



Source: European Union Labour Force Survey, 2002.

Many factors could explain these widely differing participation levels. Overall, adult learning depends on the levels of employer and public support, on the educational attainment of the population, on the costs and the benefits (or rates of return) obtained from learning, on incentives, on culture, on working schedules, on family size, and on the information and advice that is available about learning opportunities.

Participation in adult learning also varies across different population groups within countries. Work at the OECD has shown that there are differences in participation by age, by educational attainment levels, by labour force status, by occupation and by nationality. Overall, people with higher educational attainment levels, people under the age of 40, people living in urban areas, and employed adults participate more than other groups (OECD, 1999; 2003a; 2003b). Among these factors, prior level of education is one of the most significant; those adults with the highest levels of prior educational attainment participate the most in education and training. These patterns suggest that initial educational attainment and adult learning are complementary. Those who are more educated receive more

training, and have jobs that require them to use higher skills. As a result they have greater chances of receiving more training associated with their work.

Table 3.1. Participation in learning by type of course

25- to 64-year-olds who took part in learning in the previous four weeks, 2000 (%)

	1 Continuing vocational training	2 Training measure	(1+2) Training related to employment	3 Initial education	4 General interest	(1+2+3+4) Total
Italy	14..0	75.5	89.5	1.8	8.7	100.0
Norway	82.1	0.0	82.2	7.5	10.3	100.0
Hungary	72.3	3.5	75.8	16.5	7.7	100.0
France	73.4	0.0	73.4	26.6	0.0	100.0
Finland	68.0	3.6	71.6	22.1	6.3	100.0
Luxembourg	62.8	2.6	65.5	11.5	23.0	100.0
Iceland	65.0	0.3	65.4	21.1	13.5	100.0
Germany	51.9	11.9	63.8	22.4	13.8	100.0
Ireland	58.2	5.4	63.6	20.1	16.3	100.0
Denmark	52.2	9.1	61.2	32.8	5.9	100.0
Netherlands	53.3	2.7	56.0	6.5	37.5	100.0
Sweden	49.9	5.9	55.8	23.5	20.7	100.0
Poland	51.8	2.1	53.9	40.0	6.1	100.0
Austria	44.1	6.6	50.7	22.5	26.9	100.0
Belgium	4.8	42.3	47.1	13.5	39.4	100.0
Portugal	31.3	10.2	41.5	24.4	34.1	100.0
Czech Republic	25.3	13.7	39.0	9.3	51.7	100.0
Slovakia	32.2	2.0	34.3	9.5	56.2	100.0
Greece	28.0	1.6	29.6	68.6	1.7	100.0
Spain	17.9	2.2	20.1	35.9	44.1	100.0
Average	**46.9**	**10.1**	**57.0**	**21.8**	**21.2**	**100.0**

Note: Countries are ranked by the sum of those taking part in continuing vocational training and training measures. Category 2 refers to training undertaken as part of active labour market policy programmes.

Source: European Union Labour Force Survey, 2002.

Generally, adult participation in formal education and training is strongly mediated by the labour market. People tend to follow training for career- or job-related reasons, for the most part focusing on professional or career upgrading. Table 3.1 shows the importance that work and employment play in influencing adults' participation in formal learning. Across 20 European countries in 2002, continuing vocational training accounted for nearly half (46.9%) of all types of formal learning in which 25- to 64-year-olds participated in a given four-week period. Training

measures account for another 10%. In only six of the 20 countries (Belgium, Portugal, the Czech Republic, Slovakia, Greece and Spain) did work-related learning account directly for less than half of all participation. In fact, there is a strong link between the overall levels of participation in adult learning and the amount of training that is provided by the enterprise.

The firm or enterprise, then, is a key catalyst for learning opportunities. Because much formal adult education and training is career- or job-related, firms become the providers or supporters of training for their employees. The evidence suggests that workers in white-collar high-skilled occupations, workers in service sector and some manufacturing occupations, and higher-paid workers receive the most training, as do those who work in larger firms or those which are introducing new workplace practices.

On the other hand, it is mostly people with low skills, people earning low wages, people not in the labour market, or people over the age of 40 who either do not get as many learning opportunities, or do not take advantage of the existing opportunities (OECD, 2003a; 2003b). The type of learning in which adults participate is related to their labour force status. Those in continuing vocational training courses are largely employed. A greater proportion of the adults taking initial education are outside the labour force, while both unemployed and employed people may be under specific training measures[2]. Adults taking general interest courses (which may include languages or other courses for leisure) may be in or outside the labour market.

Table 3.2. Type of learning engaged

(25- 64-year-olds who took part in learning in the previous four weeks, 2000 (%)

	Classroom	Work environment	Combination	Distance	Self-learning	Conferences
Austria	20	6	19	24	21	11
Luxembourg	32	36	3	1	5	23
United Kingdom	42	43	2	9	3	1
Hungary	48	6	5	18	7	15
Sweden	48	23	11	18	0	0
Finland	53	13	12	2	2	18
Germany	59	8	14	2	2	15
Norway	65	24	9	3	0	0
Belgium	67	23	6	2	3	0
Spain	70	6	20	3	0	0
Spain	73	2	2	7	13	4
Denmark	80	0	3	1	0	16
Portugal	81	4	9	0	0	6
Italy	82	13	4	1	0	0
Greece	89	2	4	0	2	2

Notes:

1. Countries are ranked by the percentage of adults taking classroom instruction. Data refers to 2000 because it was the last year when distance learning was coded as a different category. In 2001, it was regrouped with conferences and self-learning under a new category, "other types of instruction".

2. Percentages sum across rows.

Source: European Union Labour Force Survey, 2000.

The type of learning that adults engage in can help to shed light upon possible current and future uses of ICT for the delivery of adult learning. For example, the degree to which countries depend upon distance education methods for the delivery of adult learning can suggest the extent to which they have already embarked upon the use of ICT in adult learning. The European Union Labour Force Survey allows us to distinguish whether people learn in a classroom, follow instruction in a work environment, combine both methods, or use distance learning, among other methods. Table 3.2 shows that in Denmark, Portugal, Italy and Greece there seems to be a heavy reliance on traditional classroom learning within adult education and training. However in Austria, Luxembourg and the United Kingdom a much wider range of learning methods is used, suggesting greater flexibility

within national systems for delivering adult learning. As of 2000, distance education was used the most extensively in Austria, Hungary and Sweden to provide adult learning, but even in these countries it accounts for under a quarter of all participation. In most European countries it is hardly used at all, though this situation now may be changing with the increased use of ICT in these countries.

Some obstacles to learning and to ICT use by adults

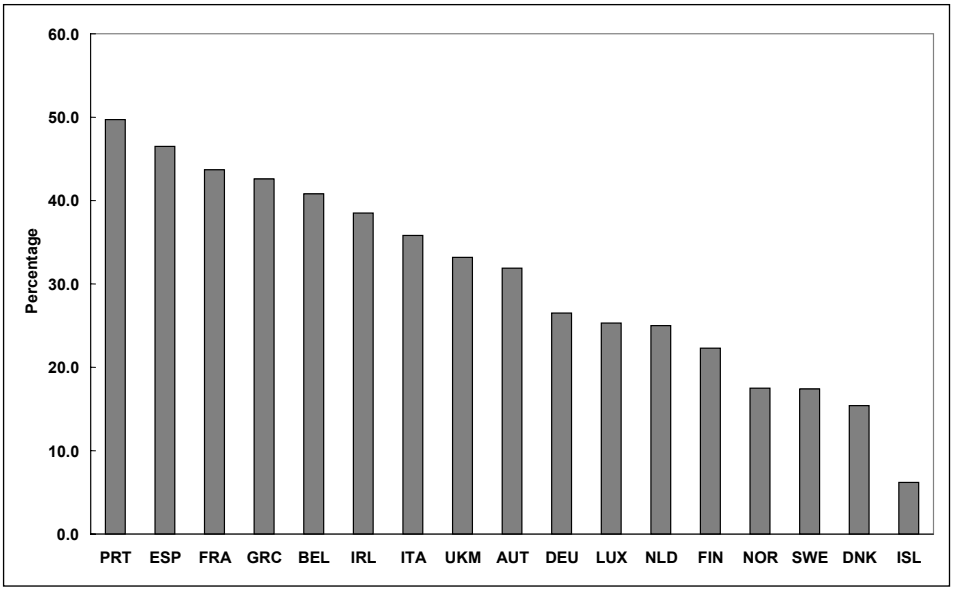
There are a range of obstacles that hinder participation in adult learning and ICT use and contribute to increasing inequities. Understanding the reasons behind these inequities can help sharpen policy focus on how ICT can cater to the diversity of potential needs. The reasons for low participation include lack of information, lack of time, lack of motivation, lack of incentives, lack of access and lack of funding – not to mention lack of computers. ICT might help to address many of these problems.

Lack of motivation is an important reason for not participating. A large proportion of adults do not think learning is necessary for them and will not engage in it at all (OECD, 2003a). These are generally people with low levels of educational attainment and low skills. This reinforces the message that initial educational attainment and participation in adult learning are very much complementary. The data confirm a strong correlation between adults' level of interest or motivation in learning and national adult learning participation rates. A recent European Union survey (CEDEFOP, 2003) reveals that in countries such as Portugal, Spain and France, 40% or more of all persons aged 15 and over did not participate in learning in the previous year and said that this was because they were not interested (Figure 3.3). On the other hand, in Norway, Sweden, Denmark and Iceland, less than 20% of the population aged 15 and over reported that they were not interested in learning and did not participate in it the previous year. Some stated that they would not want to go back to school (9%), they were not good at studying, they would not know what to study (11%) and that they are too old to learn (13%). Others said they would never want to take up learning again (14%).

In certain cases, ICT can be an effective tool to help raise motivation for learning. It can provide information on learning opportunities and also greater access to learning. Evidence in Gorard *et al.* (2003) shows that ICT has proved beneficial to special groups who are beginning to learn through attending skills classes. Other evidence shows that more individualised instruction and other interactive learning can also help those who do not "want to go to school" to take up learning again (*e.g.* Pelgrum, 2003; Wagner and Kozma, 2005).

There are some adults who do not take part in education and training and who nevertheless would like to participate (OECD, 2003a). Among the many reasons given by this non-participant group, the most common is that they are too busy or *lack time*. The above-mentioned European Survey (CEDEFOP, 2003) showed that among different reasons for not taking up learning activities in the future, family commitments (21%), job commitments (19%) and giving up free time (16%) were cited. Most of these were viewed as time-related obstacles. More flexible learning methods introduced with ICT or less travel to learning centres can also target time constraints for adults.

Figure 3.2. Percentage of all persons aged 15 and over who did not participate in learning during the previous year because of lack of interest, 2003



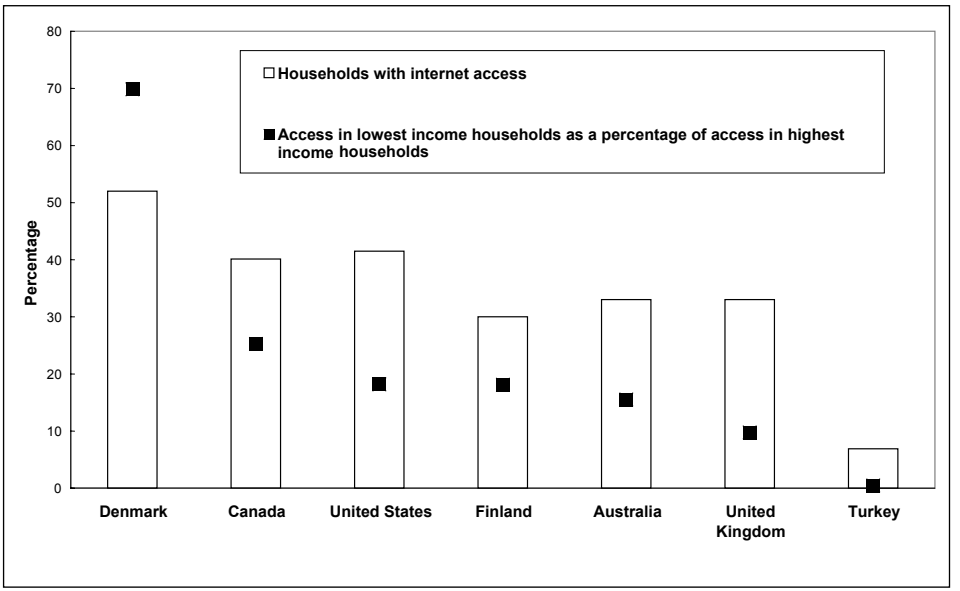
Source: CEDEFOP (2003), *Lifelong learning: Citizens Views*, Luxembourg, Office for Official Publications of the European Communities, Figure 8.

Another reason noted for not participating in adult learning is the fact that *people think they learn best in informal ways and in informal settings*, rather than through formal instruction in formal educational institutions. These can include involvement in activities at home or at work, leisure activities, or use of the Internet. Informal settings, then, are important in providing a variety of adult learning contexts. This implies that the number of adults engaged in formal education and training is only a portion of those

actually engaged in learning. It is also interesting to note from the CEDEFOP survey that when people were asked to think about how to improve or update their professional skills, half said they would take part in an organised formal course. Only 12% indicated that they would think about open and distance learning and related channels for updating skills.

In the same survey, European citizens were asked about the incentives that would influence them to take up learning. The most common responses were the possibility of flexible working hours (21%); the existence of individualised programmes of study (20%); and personal choices of methods of study (20%). This may suggest that to increase participation in adult learning, policies and practices need to focus on flexible and individualised approaches that enable people to combine learning with other activities. ICT could play an important role in providing such flexibility and individualisation.

Figure 3.3. Internet access in the home and household income, 2000



Note: In each of the seven countries, lowest- and highest-income households refer to those in the lowest and highest quartiles of the national household distribution.

Source: OECD (2002), *Information Technology Outlook 2002: ICT and the Information Economy*, Paris, Annex Table 6.4.

The potential for adults to use ICT for learning is strongly influenced by whether they have access to and know how to use ICT in the first place.

Access to computers by different groups of adults tends to reflect the types of differences and inequities in adults' access to learning that were outlined in Section 2 above. Those with low levels of educational attainment, those with lower incomes, those living outside urban areas and older age groups are less likely to have computers or access to the Internet in the home (OECD, 2002). For example, Figure 3.4 shows that, in seven countries in 2000, high-income households had significantly greater Internet access than low-income households. Figure 3.4 also shows that inequalities in Internet access are greatest when overall Internet access is low. In Turkey, where less than 10% of all households have Internet access, only five low-income households have access for every 100 high-income households with access. In Denmark, over 50% of all households have Internet access and close to 70 low-income households have Internet access for every 100 high-income households with access. Schmitt and Wadsworth (2002) show that such inequalities in ownership increased between 1984 and 1998 in the United States and in the United Kingdom, and recommend public action to reduce them.

Use of computers at home is strongly influenced by use at work and also by family characteristics, factors that may also be strongly related to the uptake of ICT for learning purposes. The employed have higher rates of access to computers than those who are out of the labour force. A recent study in the United States suggests that whether or not someone uses the Internet at work may be a key factor in whether a household has an Internet connection; the effect of household income upon Internet access is reduced once Internet use at work is taken into account. These findings suggest that familiarity with ICT outside of the home might help explain differences in adoption among various demographic groups (US Department of Commerce, 2002). These findings are corroborated by the fact that family characteristics also have a strong impact on computer ownership and use. Table 3.3 provides data from a number of countries in 2000 that show that households with children have higher rates of both PC ownership and Internet access than do households without children. United States data show that the availability of PCs in the home increases with household size (US Department of Commerce, 2002). Thus, introduction of ICT outside the home – be it at work or at school – can help give adults greater access at home, which may lead them to recognise the potential ICT has for learning.

Table 3.3. Percentage of households with PC and Internet access by type of household, 2000

	PC Access		*Internet access*	
	With children	Without children	With children	Without children
Australia	76	42	46	25
Canada	n.a.	n.a.	56	38
Denmark	n.a.	n.a.	65	44
France	51	19	21	8
Netherlands	81	52	33	22
United Kingdom	n.a.	n.a.	36	26
United States	74	53	61	43

Note: In France, data on households with children refer to those with 2 children. In the United Kingdom, data refer to households with two or more children.

Source: OECD (2002), *Information Technology Outlook 2002: ICT and the Information Economy*, Paris, Figure 13.

Furthermore, there is a strong *relationship between literacy levels and the availability of ICT at home*. Using PISA data, Sweet and Meates (2004) show that in almost all OECD countries, the best 15-year-old readers have significantly more access in the home than do the worst readers to a range of ICT resources; they have more computers in the home, more Internet access, and more educational software. This can be compared to a much more modest relationship observed between literacy level and the availability of ICT in the school. These results emphasise the importance of the school as a source of access to ICT by low achievers. They also emphasise the importance of schools and school systems attempting to ensure that low achievers can access and use ICT outside of the classroom and outside of normal school hours. It seems reasonable to use a similar argument in the case of access to ICT by adults with low literacy skills and low qualifications; it is important to examine ways to increase the availability of ICT for adults outside the home to help them combat this digital divide, which gets replicated in the family setting for the children.

Responding to the diversity of needs in adult learning through ICT

Different uses of ICT can be grouped into the following categories of adult learning: adult basic education, including literacy and basic skills, ICT skills, and other continuing learning opportunities provided by a myriad of public, private and non-profit institutions; post-secondary education; and

corporate learning, normally provided by the firm or outsourced. To different degrees, ICT or e-learning has been adopted in all of these sectors. However, more successful experiences in the use of ICT in adult learning have been concentrated in the corporate sector and in some higher education institutions. Other good examples can be seen in access points and ICT training provided for adults who do not have ICT at home. While the trend is changing and more varied uses of ICT in adult learning can be observed, the major use of ICT in adult learning to date has been for the development of ICT skills rather than for the use of ICT to deliver other forms of education and training. Developments in ICT to increase adults' access to other forms of learning or to improve the quality of teaching and learning have been less noticeable.

E-learning for adult basic education and other needs

In recognition of the need to provide access to ICT and learning opportunities to adults who otherwise would not have the opportunity, most OECD countries have made public efforts to establish virtual learning centres for adults. This corroborates the finding above by Sweet and Meates (2004) emphasising the importance of educational opportunities that may counteract the digital divide and help increase the availability of ICT for adults outside the home.

Adult learning centres cater to widely different needs, ranging from literacy and adult basic education to more specifically vocational offers, with a special focus on ICT skills. In Finland, virtual studies are possible for all education levels. Norway has the NKI Distance Education and Norway-net with IT for Open Learning (NITOL). In the United Kingdom, the University for Industry/learndirect aims to drive up demand for learning, to help adults improve their employability by acquiring new knowledge and skills, and to help businesses become more competitive. It is developing learning materials that allow people and businesses to learn in "bite-sized chunks", online through the Internet at a pace and at times that suit them, at learning centres, at home or at work. The Mentor Programme in Spain is a web-based learning forum for adults to study a broad range of educational activities. It is an open system based on modules that can be followed at home or in specific classrooms located throughout the country. More and more, the borders across different types of provision are blurring and virtual platforms are trying to cater to a large diversity of needs.

Table 3.4 provides a list of OECD country approaches to the introduction of ICT in adult learning; it includes a wide range of programmes that have targeted different needs. Community centres or access points for adults to use ICTs or to provide a platform for learning opportunities through the use of computers have become common. Many

countries have also used ICT for the provision of information on potential learning opportunities for adults. The provision of ICT skills for low-skilled adults has also been the focus of a large number of public and private initiatives in different countries. Most of these policies are analysed in Section 5.

E-learning in post-secondary education

ICT has been used extensively in post-secondary education. Virtual universities, corporate and public or semi-public universities that provide post-secondary degrees and more vocational types of training have been created in many countries. At the onset, there was hype about the growth and replacement of higher education through e-learning. Although the hype is now over, successful experiences remain. While a number of universities and companies have lost resources on e-learning investments – examples include the closure of NYOnline and difficulties experienced by the Cardean University – there have been more successful ventures, such as the Phoenix University Online or the Universidad Operta de Catalunya (Open University of Catalunya, or UOC) in Spain. Phoenix University Online for example provides undergraduate and graduate degrees in business, technology and education, completely online. In the United Kingdom, the National Health Service (NHS, one of the largest employers in Europe with more than one million staff) has established its own corporate university that will focus on training and education to support its modernisation. It is intended to provide learning for staff, patients, carers and volunteers. The Open University of Catalunya is an online university that provides undergraduate, graduate and lifelong learning programmes in a diverse range of fields, from technology or e-learning to Asian studies to law (www.uoc.edu). In Sweden, there are plans to introduce the Netuniversity.

E-learning seems likely to occupy a growing part of the landscape in post-secondary education in the long run, although maybe not in its present state. A 2002 survey of e-learning in 102 higher education institutions conducted by the Association of Commonwealth Universities[3] has shown that 10% of students studied online for more than 50% of their time, and 18% of these were non-residential international students. The survey found that the principal reasons for the adoption of ICT in teaching and learning were the enhancement of teaching and learning on campus (94%), improved flexibility for on-campus students (92%), widening access (65%), enhancement of e-learning (55%) and entry into international markets (53%). This suggests that e-learning is being used more to enhance learning for campus students and to make it more flexible than to capture new, non-traditional students.

Another study on participation in post-secondary distance education in the United States (National Centre for Educational Statistics, 2002) reveals that it is older working adults with family responsibilities who are most likely to study part-time through distance education using ICT. The study showed that distance education participation rates were low, accounting for only 8% of undergraduates and 10% of graduate and first-degree professional students. Furthermore, many of those who studied by distance education using ICT did so for only part of their studies.

Most of these ICT applications have focused on existing students and on enhancing teaching on-campus, and as such have been relatively unambitious and risk-averse. Other initiatives have, however, been bolder. Through collaborative partnerships between the public and the private sector they have focused on the development of new markets to provide learning opportunities and to obtain profits. The private sector has adopted a more focused strategy based on the commercial viability of study programmes, targeted markets, especially working adults and business administration, and the provision of IT skills.

E-learning in the corporate sector

The more developed sector in ICT for learning use has been the corporate learning market. According to one consultant, the largest market for e-learning, and the sector that is most inclined to innovate, is the corporate sector (Levis, 2002), even though much corporate learning is still classroom-based. Within the corporate sector e-learning is being used for activities that range from full MBA programmes to just-in-time short instruction and responding to specific customer questions. The largest single application of e-learning within the corporate sector to date has been IT training itself. This is partly because of the nature of the subject matter but also because of the rate of obsolescence of the knowledge itself and the speed with which online learning has been able to adapt to this. In addition, there has recently been relatively fast growth in the use of e-learning for the development of soft skills and in the application of technology to the administration of learning and training (learning management systems).

Most of the successful corporate examples of e-learning programmes have tried to modify learning patterns. They have adopted views of learning broader than just information gathering and transfer, and have engaged the learner and the company into a more holistic process. Many companies (for example Cisco, IBM, FT Knowledge, Apollo, Skandia, Shell, Epic) have integrated learning needs into corporate strategies and appear to have been extremely successful in doing so. What has been most evident from these and other corporate examples is that they have adopted individualised solutions, for example by defining customised content providers. Many

firms that act as learning brokers have emerged to provide individual learning solutions for companies. Small e-learning suppliers have developed in the European and North American markets and have been very successful. Epic, one of the largest British providers of customised e-learning content, has many corporate clients. Celemi is an interesting learning design company that aims to help companies improve business performance using learning as a strategic resource. In Sweden, Luvit is a small Swedish company that provides a combination of learning and content management. In Germany, Hyperware is a provider of collaborative knowledge management systems (Levis, 2002). Another global example, a private virtual learning enterprise called skillsoft[4], sells e-learning to the corporate sector in areas such as information technology, business, e-business, management, interpersonal and desktop skills, healthcare, and environmental, safety, and health training.

According to a study on e-learning in 285 public and private enterprises in Denmark (Shapiro, 2003), expectations for the future are positive. Around 19% of the firms that responded to the survey used e-learning and around 40% not presently using it are considering its use. Most firms replied that e-learning is not just related to competence development and human resource development functions, but is increasingly used in relations to customers, suppliers, dealers and other external collaborators. Forty-three per cent of the enterprises that use e-learning do so as a marketing and service tool, targeting customers. It has been used for internal employee development but also for customers/users and other external parties to support external functions such as sales, marketing or services. Larger firms use it more as an internal corporate strategy while smaller ones use it for competency development. Public enterprises have been quite enthusiastic in adopting e-learning. Application is a matter of leadership, corporate strategy and organisational choices. Almost half of the firms analysed developed their own learning strategy, 40% in collaboration with an external suppliers to use for their own products and the challenges facing their own enterprises. Strategic support from management is crucial.

Public policies can play a key role in improved access

This section examines how public policy has attempted to stimulate adult learning through the use of ICT. Responses to a questionnaire sent out to OECD country representatives in preparation for this roundtable, and other information obtained from the OECD's thematic review of adult learning[5], show that many countries have, to different degrees, taken measures to target the use of ICT in adult learning. Most of these measures can be classified into one of four different categories: the provision of IT skills for adults; the introduction of ICT in the adult learning process; the

creation of virtual schools or centres; and the development of IT infrastructures and actions to increase access. Most of these measures accord with the objectives of general information technology policies within OECD countries so that households, enterprises and governments can take advantage of the benefits of ICT: ensuring access to ICT; enhancing ICT skills and ICT-related organisational change; creating digital content; and promoting trust and security online (OECD, 2003c). These are directly relevant to the effective use of ICT for adult learning. If adults are to gain benefits from the uses of ICT within education, their access needs to be increased, their ICT skills need to be enhanced to allow them to use the technology, digital content in education needs to be improved, and trust in online content and in exchanges over the Internet is required.

The same study has analysed the experiences of selected OECD countries (Australia, Canada, Finland, the Netherlands, Sweden and the United States) that have been successful in profiting from the benefits of ICT to enhance growth performance[6]. It found that the key policy areas for maximising gains from ICT are:

- Providing basic and applied ICT skills in schools – this includes defining strategies for integration of ICT in schools and providing schools and adult learning centres with assistance to buy computers and Internet connections – and providing ICT training for teachers and using them as agents of change.
- Stimulating ICT supply by speeding up the process of competition, building platforms and networks, improving connections and supporting research.
- Implementing e-government by putting the most-used government services online.

These suggest that key issues for effective use are *infrastructure, access, skills* and *content*.

Extensive *infrastructure* is a necessary condition for reaping the benefits of ICT, as it can also provide cheaper and increased access. Infrastructure includes both hardware and connectivity. Australia, Canada and the United States for example have the highest number of personal computers in the business sector, while Australia, Finland and Sweden are among the countries with highest Internet access. ICT infrastructure in households is also very well developed in these countries. In most countries that were analysed, different policies have tried to use ICT as a way to develop the infrastructure of adult learning. However, these have to be co-ordinated with the broader ICT infrastructure, as it is imperative that adult learning centres, access points, and other locations where adults might benefit have the

appropriate infrastructures ready, in terms of computers, printers and other hardware and software, and in terms of appropriate and speedy connections.

Several differing examples exist of national policies to develop infrastructure in adult learning[7]. In Denmark, the Ministry of Science is exploring how to provide options for further e-learning to adults. In Hungary, there have been tax deductions geared towards ICT investments. In Sweden, since 2002 a public programme called ITIS (www.itis.gov.se/english/index.html) has provided massive national investment in ICT for education institutions. In Finland, the Virtual School, Virtual Polytechnic and Virtual University have been established to promote ICT use to provide courses through distance learning. However, one of the biggest problems in adult learning is the continued investment in infrastructure. Often, investments are one-time events that bring computers to learning centres but without follow-up, no updating of resources or infrastructures, and no further investments to make initial investments sustainable. This implies the need for coherent policies between ministries of education and ministries of communications or technologies to ensure that centres are connected and have the appropriate resources for ICT use in learning.

Access goes together with the availability of infrastructure. Many public policies have been designed to provide ICT access points for adults. Some have adopted the form of community access points, such as the *Centros Comunitarios* (community centres) in Mexico, the *Aulas Mentor* (Mentor Classrooms) in Spain, community access centres in Canada, and the availability of ICT resources in regular adult learning institutions, such as in Austria and Sweden. Other common access points are libraries, or other community resources that might be open to citizens. Another method of access that has recently developed attempts to benefit from existing investments in educational institutions by bringing parents or other adults into schools during non-school hours. This approach has been successful in Mexico.

Another very successful example of community access points exists in the United Kingdom. UfI/learndirect centres can be situated in sports clubs, leisure and community centres, churches, libraries, university campuses or railway stations. They act as "learning brokers", either for their own courses or for providing information on other suppliers' courses, and provide access to a computer. They also offer support facilities, which range from crèches, cafés, parking and free Internet access points to lending libraries, game rooms and desktop publishing facilities. UfI/learndirect also provides a range of virtual learning centres and a direct telephone educational and career advice service to help adults make appropriate choices between available learning opportunities.

ICT access for unemployed adults has also been opened through unemployment or career centres in some OECD countries. These have proved an effective venue to reach disadvantaged adults. The case of the Saskatchewan Career and Employment Centres in Canada is a good example. The centres provide access points and information on finding employment, learning opportunities and information and counselling in one-stop shops. In Austria, employment agencies also provide some access to computers and information on adult learning opportunities.

The possession of *ICT skills* is fundamental if adults are to be able to benefit from e-learning opportunities. Here a distinction can be made between professional ICT skills (for example the ability to develop, create or repair software); applied ICT skills (for example the ability to apply simple ICT tools in general workplace settings); and basic ICT skills or ICT literacy (for example the ability to use ICT for basic tasks and as a tool for learning) (OECD, 2002). Many governments have focused their education and ICT strategies on the provision of basic and applied ICT skills. To provide those skills in schools involves defining strategies for the integration of ICT in schools; providing schools and adult learning centres with assistance to buy computers and Internet connections; and providing ICT training for teachers and using them as agents of change.

Just as children in households can help their parents to use computers, so it is imperative that efforts are made to develop ICT skills throughout the adult teacher workforce as well as throughout adult populations in general. Many employed people have been able to upgrade their ICT skills through their employment. This implies that public policies to develop adults' ICT skills should place a greater emphasis on those distant from the labour market or from possibilities to access ICT by themselves.

All countries for which information is available on policies to increase adult access to learning through ICT have to some extent developed programmes and possibilities for adults to obtain ICT skills. This has been done through adult learning networks, vocational training services, the private sector and the non-profit sector, and by providing incentives for people to take this type of training. In Europe, for example, the European Computer Driver's Licence has become a standard for recognition of ICT skills. In Italy, investments have been made in providing ICT courses for executives, secretaries and teachers. In Finland, there are study voucher-like mechanisms for the retired population, for the unemployed and for immigrants to cover the costs of obtaining ICT skills. In Korea, 30% of Korean citizens had had basic ICT training by 2002. In Switzerland, the Migros "club schools" are private training centres that offer a range of courses and are sponsored by a supermarket chain, and many of these offer courses on computer science and ICT training. In the United Kingdom, adult

and community learning centres include ICT "taster" sessions and basic computer literacy courses. All of the countries included in Table 3.4 have developed measures for the provision of ICT skills for adults, either by courses for the European Computer Driver's Licence or the provision of other specific ICT skills courses. In fact, many national strategies have focused on this aspect as key to the development of the knowledge society.

Table 3.4. Policies and approaches for ICT in adult learning in selected OECD countries

Country	Strategy/Key players	Description	Results
Austria	E-fit (education part of E-Austria initiative): specific strategy for all education, including adults. Ministry of Education. AMS (Public Employment Service). Ministry of Economic Affairs and Labour.	General education programme to make all education institutions and people fit for the knowledge society. Programme includes eight aspects: new media for teaching and learning, ICT vocational qualifications, infoportal, ICT at universities, ICT and adult learning, ICT and culture, ICT administration and IT infrastructure. AMS. Ministry of Economic Affairs and Labour also provides unemployed with training offers and information.	Apart from sustainable ICT structures, more than 12 000 adults have taken short courses and 4 000 long courses. BMWA 2 700 students in apprentice examination for ICT sector. AMS courses: many students. Information cannot be measured.

Country	Strategy/Key players	Description	Results
Denmark	Better Education (2002). ICT use included in general policy. Ministry of Science, Innovation and Development to explore barriers and options to further e-learning to adults. Creation of a National Centre for Technology Supported Education. Ministry of Labour.	To promote chance through ICT. Changes in attendance provisions to accommodate adult personal situation with the introduction of virtual working methods. Also, reform of general upper secondary education for adults (HF) with ICT. Plan to explore ways to provide more flexibility and e-learning. 1999 national ICT policy for skilled and semi-skilled workers in Denmark. One of the issues was to develop and implement "ICT action plans for vocational training" in the vocational training institutes.	It is estimated that in 2002 about 10 % of all vocational training in Denmark would use ICT in distance learning or as an interactive media. Some projects show that ICT-based learning is an option in vocational training no matter the educational background of the student, and that interactive media in some cases have facilitated work-based and blended learning.
Finland	Ministry of Education information strategy for education and research 2000-2004. To secure opportunities for all citizens to avail themselves of ICT, and opportunities for ICT-based learning for all.	ICT skills for the knowledge society. Information services (Opintoluotsi) study guide. Virtual school, polytechnic and university. Study voucher pilot. Subsidies. Education and training providers have freedom to cater to needs of adults.	Web of information and guidance services available to consult. Virtual school for vocational (around 300-400 students at present) and liberal adult education.

Country	Strategy/Key players	Description	Results
Hungary	Ministry of Labour. Ministry of Informatics and Communications. Ministry of Education. Varied acts and legislation.	Tax deductions for ICT purchases (30-50% of value). Tax deductions for studying fees (30% up to EUR 240 per year). Special purchase possibilities for training providers.	Better access by supporting lifelong learning. Improving learning facilities. Around 250 000 adult students have ICT access and contact and 30 out of 812 qualifications directly target ICT.
Italy	Ministry of Education, Research and University has special service SAIIT for ICT in education.	SAIIT to collaborate on distance training, advise institutions and experiment on e-learning. Provide support structures. Plan to strengthen areas, and provide adult learning and distance learning in developing countries.	ICT for adult learners: has been used for 60 000 executives and administrative secretaries; 64 000 teachers and 160 000 teachers for ECDL, technology teaching and infrastructure.

Country	Strategy/Key players	Description	Results
Korea	Adapting ICT into Education Master Plan 2001-2005. Education Informatisation Affirmative action plan 2003. Supporting citizens' equipment with ICT skills 1999-2002. e-Korean 2002-2004. Narrowing down Digital Divide Act.	Supporting citizens equipped with ICT skills. ICT adaptation into LLL. Have many diverse programmes with distance education (high school and university; special information banks, Korean language learning on the Internet, etc.). Many courses for economically disadvantaged parents, other programmes to promote digital opportunities. Website for information, education and training. Cyberair and correspondence high school with online curriculum.	30% of citizens have had basic ICT course training by 2002. Education credit bank.
Spain	New plan to push information society Espana.es will have educacion.es and navega.es (2003).	Aulas Mentor: Community centre for adult learning. Distance university UNED. Expected to have special access centres connected to Internet in small communities.	Aulas Mentor has been successful in providing adults with a place for using ICT and learning.

Country	Strategy/Key players	Description	Results
Sweden	Use of ICT to improve overall adult learning participation and quality. ICT are introduced in many different policies and adult learning systems. ICT IS 1999-2002: Massive national investment for development of Swedish schools, which also included municipal adult education and folk high schools.	Swedish Agency for School Improvement and Swedish Agency for Flexible Learning (CFL), to promote the development of flexible learning in formal and non-formal education. Netuniversity introduced. Knowledge Foundation to promote IT in society. "Upgrade Sweden". ICT Commission to analyse use of ICT. ITIS 1999-2002. Liberal Adult Education Net: Electronic conference system.	ICT IS: 75 000 school staff skilled online users. 13 000 people took distance education courses through CFL funding. Increased skills and awareness.
United Kingdom	United Kingdom online centres for people in need of basic skills, unemployed…. Ufi/Learndirect. Scotland and N. Ireland also have ICT policies.	Ufi/learndirect provides online learning at home and also at learndirect centres. Adult and Community Learning include ICT "taster" sessions and basic computer literacy courses.	Learndirect is having a strong impact on individuals, with many users on the telephone line and a large number of people having registered for courses. Also, other programmes of ICT in the further education sector.

Source: Documentation from the OECD thematic review of adult learning and information provided by OECD countries in preparation for the roundtable.

Information on adult learning opportunities is quite commonly provided through the Internet across OECD countries. The use of ICT and Internet can broaden information and guidance for potential learners. Examples include the electronic learning portal in Austria, www.bildung.at, and in

Finland the Opintoluotsi portal, www.opintoluotsi.fi (study guide), which is a comprehensive information and advisory service providing access to information available on the net about education and training. In terms of information, Korea's Education Bank can be seen as a good practice. There, credits earned by adults throughout their learning career are stored in the "Education Bank" (http://edubank.kedi.re.kr) and retrieved for degree conferment. There are other sites in Korea that include online databases with information on lifelong learning and vocational training.

Has the use of ICT in public adult learning helped to increase the number of learners? The diversity of experiences presented above suggests that there have been successful steps taken towards the achievement of this objective. There are special policies focused on the more disadvantaged – as in Austria, where less expensive tuition fees, less expensive opportunities to buy or borrow technical equipment, and cheap or free provision of childcare (through financial grants of the European Social Fund) have been provided for disadvantaged participants. In Korea, during 2001-02, 123 000 economically and socially disadvantaged parents completed ICT skills courses (2% of all students' parents).

The above examples are indicative; it is still difficult to know what the overall impact has been of the uses of ICT within adult learning. Policies are too diverse and many are too recent to understand their impact. In addition, most have focused on developing adults' ICT skills, and to date there has been no international measurement of ICT skills in adult populations. A recent study of adult learning in the United Kingdom (Gorard *et al.,* 2003) surveyed students, mostly older women from lower socioeconomic groups, who were beginning to learn to use ICT in community-based settings, and who had registered for ICT skills courses. It showed that while under appropriate circumstances those who are older, less qualified or unemployed can be more likely to use ICT in drop-in centres, experience in the use of ICT itself does not make people any more likely to participate in education and start learning again, with minor exceptions. ICT can do something to create access to learning, but is not a panacea. Other measures needed for it to have an impact are enhancing teaching and learning, and providing improved flexibility for those who are already learning.

Unleashing the potential of ICT in adult learning

Although ICT may eventually become an extremely important tool for adult learning, to date it has had a relatively limited impact on adult learning programmes and policies, especially when compared to formal schooling and corporate learning environments. Overall, around 10% of adult learning in most countries has been delivered with the use of ICT in most OECD countries for which there are data. Those who have used ICT for learning

are mostly adults with work and family responsibilities, who have enrolled primarily because of time and spatial constraints. It is mainly those who have access to computers at home or at work who have been able to take up this learning option.

Problems remain in access, in the development of infrastructure, and in the development of the skills that adults need in order to be able to use ICT. To date ICT has been used within adult learning mainly for limited and specific purposes, and in limited and specific settings, both public and private. These include the teaching of ICT skills; post-secondary education (mainly universities); corporate learning; and some adult basic education. It has also been used as an information and guidance tool. The results of these limited and specific applications have been mixed, with the most innovative and flexible developments appearing to have taken place in the corporate world. There have been efforts in some countries to raise the levels of basic skills and basic educational qualifications. Public policies in OECD countries have tried to shape the distribution and use of ICT in adult learning, with different types of results.

Because of the higher concentration of ICT-based adult learning within tertiary education and the corporate sector, and the higher concentration of learning on those with higher educational attainment, it seems fair to conclude that adults who have already benefited most from learning have benefited most from the introduction of ICT into adult learning. The still relatively limited number of publicly funded ICT access centres that can be used by those without access to the Internet means that mainly those who have access to computers at home or at work have been able to take up this mode as a learning option. We know from PISA data that young people with poor literacy skills are also more likely to be in ICT-poor homes. It seems reasonable to conclude that the same is true of the homes of adults whose literacy skills are weak.

A further limitation on the capacity of ICT to become a dominant mode for the delivery of learning to adults is the preference of most people to learn with others rather than in isolation (Finkelstein *et al.,* 2000; Carnoy, 2002; CEDEFOP 2003). It is significant that even where many post-secondary programmes are completely available online, many adults have registered only for part of them, as shown in Section 4. For ICT skills learning, much is still delivered through regular classroom-based courses.

Content

The corporate world has used mostly individualised solutions or those customised for specific economic sectors, in many cases using ICT as a tool not only for internal personnel training but also for links to customers and

providers, as part of the corporate strategy. The public sector has been active in this field at different levels. Efforts have concentrated on improving the ICT infrastructures, on improving access to ICT, on developing ICT skills throughout adult populations, and on broadening learning opportunities – through, *inter alia,* the wider use of guidance and counselling, which in turn can include ICT-based assistance.

A key question is whether ICT has been able to change participation levels, or whether it has just added another learning option for the same groups of individuals. The country examples presented in this chapter show that there have in fact been many efforts to attract the most disadvantaged to learning through ICT. The use of vouchers, the creation of *learndirect*, and the opening up of schools to parents are among these examples, as is the creation of community access points in most countries analysed in the OECD's thematic review of adult learning (see as examples material from Canada, Mexico, Spain and the United States).

It remains to be seen whether ICT can also improve the motivation for adults to learn. It may be able to act as an effective tool for adult learning. It can help to provide much greater flexibility and individualisation of learning processes, open up the possibility of learning through simulations, and expand access to wider sources of knowledge and learning. However, while ICT has the potential to modify adult learning, it needs to be embedded in coherent approaches to adult learning. The first step is that learners must be motivated to learn, whether through classroom-based or online learning. Only then can ICT be used effectively. If the appropriate infrastructures are in place – that is, if ICT is easily accessible, connections are not too costly or difficult, material is available and adults have the skills to use them – then it can contribute to improving motivation. ICT could provide for an easier, more flexible route for adults to return to learning. We still have some way to go before content is well developed and ICT is fully integrated into the adult learning realm. Improvements in management, improvements in delivery, and improvements in flexibility need to be continued.

Lessons from successes in the corporate world can be applied, but they will depend very much on cost. Most of them have been based on the integration of ICT not only for learning, but also as a corporate strategy in relations with clients and others – thus there have been more incentives for higher expenditures. The most successful cases of the use of ICT for learning have developed personalised learning options for individual enterprises or groups of enterprises. The adult learning institutions will have to focus on the learner, on what would make him/her learn, and on what they are expecting out of the learning process, which in some cases may be to make new acquaintances together with personal satisfaction and general knowledge. To date there has been some innovation in some areas of adult

learning as the result of ICT. However, there are strong chances that the world of adult learning could undergo a much larger revolution than the primary and secondary school systems as a result of ICT. The market is much more atomised and has much more competition from the private sector and from international markets; there may be less reliance on teachers and more on already made packages that require tutoring systems rather than teachers. A major challenge for public policy to address, however, is to increase access to ICT on the part of those adults who at present are least likely to have it in the home or at work. These are precisely the adults who are the principal targets of many countries' adult learning policies: the low-skilled, the poorly qualified and the disadvantaged.

Notes

1 The definitions of adult learning adopted for policy purposes vary across OECD countries, as do the definitions of what constitutes an adult. Adult learning can include general education and vocational education, formal, non-formal and informal learning. It focuses on a range of needs: adult literacy and basic education programmes; adult continuing education programmes, which may be vocational or general in nature and provided by the public education system or through private providers; and other post-secondary learning possibilities. A more complete discussion of definitional issues can be found in OECD (2003a). Chapter 2 of that volume contains a description of individual country definitions of adult learning, and Chapter 3 includes a description of different providers of adult learning. In this discussion the term adult education and training is used interchangeably with adult learning.

2 This is related to the European employment strategy, which requires the unemployed to be "activated", or offered an active form of labour market assistance such as training or career guidance, before the expiration of a specified period of unemployment, depending upon age.

3 The survey can be found at www.obhe.ac.uk/products/surveys.html

4 www.skillsoft.com

5 National Background Reports and Country Notes on participating countries' adult learning policies can be found in www.oecd.org/edu/adultlearning

6 As part of an OECD project on the determinants of economic growth, an effort was made to identify effective micro-policies applied in selected countries for reaping the benefits of ICT to enhance growth performance. This involved using ICT performance indicators and available data to benchmark the business environment and performance across countries. The six selected countries were among the top performers on ICT indicators. Lessons learned can give clues as to which are the important policy areas for maximising gains from ICT (OECD, 2003c).

7 For further information concerning investment in ICT infrastructure see OECD (2002).

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Chapter 4

Connections between in-school and out-of-school ICT programmes for youth

Anthony Wilhelm

Introduction

Five young commandos plunge down ropes onto the floor below, bent on infiltrating a top-secret enemy missile base. As the Latina commander barks orders at her subordinates, she focuses on one eager soldier clutching a laptop computer. She glances at him. His stunned look is followed by the skit's comic punch line, "I thought I was only supposed to carry the computer – I don't really know how to use it!"

This 30-second public service announcement aired on Univision, a Spanish-language broadcast station in the United States, and targeted disadvantaged young people unlikely to have home computers. Its aim was to use humour and peer pressure to motivate youths to visit a library or community centre to connect to the Internet. A voiceover at the end of the spot requests "everyone should know the basics, like how to use a computer". A toll-free telephone number appears connecting youths or their caregivers to a call centre where operators search a database of over 20 000 libraries and community centres with free Internet access and training for a nearby location where youths can sharpen their skills.[1]

The "knowing the basics" ad conveys two critical messages to its audience. First, using humour, the ad makes the case that information and communications technologies (ICTs) are essential. The ad's punchline that "everyone should know the basics" suggests ICTs are comparable to traditional literacy and core academic competency as base components of the "DNA" of 21st century learning. Individuals, institutions, communities and countries are imperilled to the extent they discount these tools as critical attributes in their development. As services migrate to online environments – and as the demands of modern living expand – individuals, institutions, communities and countries cannot avoid orienting their development around a new set of skills and practices. Decision makers who assert that ICTs should be jettisoned to fuel more critical needs or relegated to the backburner, behind support for other literacy such as early reading, ignore a

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stark reality: ICTs are vital to address core public concerns[2] and in sharpening other fundamental arenas of cognition, in ways that are self-directed and customised to diverse learning styles.[3]

Second, the dearth of digital fluency has repercussions for everybody, not just the underclass. Botching the task of jamming an enemy missile guidance system is an uncommon example of the cost of unpreparedness. The evidence is mounting of OECD countries whose future prosperity is at risk given that a significant portion of their populations lacks the requisite cognitive and technical capacities to find gainful employment and to manage life successfully. Failing to cultivate the latent talents of the millions of youths and young adults with no credentials and low skills costs societies, immensely over these cohorts' lifetimes, jeopardising economic productivity and political stability.[4] Since we are in the early stages of the ICT revolution – in terms of the speed, interactivity, portability and customisation of tools in education – effective policies and practice can evolve to expand productivity while simultaneously enhancing social inclusion.

In educational settings worldwide, ICTs are playing an expanding role – from the mundane to the extraordinary possibilities of the virtual school. Weaving ICTs into educational practice remains a relatively young enterprise, its potential largely untapped in renewing teaching and learning.[5] Technologists forecast an emerging world of pervasive, portable networked computing, customised tools and intelligent machines that will soon make the world of the desktop computer appear antiquated. While these tools promise breakthroughs in the manner and degree to which lifelong learning occurs, concerted action is required among governments, civil society organisations and private enterprise to ensure that they do not exacerbate divides in learning opportunities and outcomes within and between communities and countries.

Most OECD countries face daunting challenges at the dawn of the new century in cultivating learning societies that meet the acute needs of disadvantaged populations. Young people with learning disabilities, immigrants, the indigent, victims of war and civil unrest, the disaffected and the incarcerated can all benefit from expanding access to and effective use of ICTs. Groups pushed out of formal schooling owing to social stigma, such as pregnancy, or bullying due for instance to sexual orientation have found more supportive non-formal settings for learning in cyberspace, such as the successful NotSchool.net project in the United Kingdom.[6] Incarcerated youths and those under court supervision in the United States are telling their stories with digital cameras and multimedia, building self-esteem and restoring their social footing in an environment in which many feel marginalised and disposable.[7] And significant rates of youth depression and disaffection in the former Soviet Union and Eastern Europe have led to

promising experiments with individualised interactive software to approach, analyse and treat social anxiety in a safe environment.[8] Much of this innovation is occurring in non-formal spaces, in part due to the pressure on formal education to focus on core curricula.

In each of these experiments, outcomes have improved dramatically for youths who, for whatever reason, languished in formal schooling. Importantly, from a policy perspective, entrepreneurial leadership promoting alternative approaches to learning has met with success, and thus merited ongoing support from governmental and other large funding sources. In this respect, alternative approaches are spreading due to persuasive change agents breaking through with support from public and private underwriters. These programmes – including creative after-school and community-based programmes – have pressured monolithic school systems to change, with a new demand for quality and innovation coming from parents, students and concerned citizens who have been energised by what they have seen. The Intel-supported Computer Clubhouse network, for example, has established modestly successful creative after-school programmes where disadvantaged teenagers work with mentors to design and create robotics, art, music and video using technology in collaborative, supportive environments.[9] Given that these experiences are often very different from school-day learning rituals, stakeholders are beginning to build bridges – pedagogical, technological and social – between school-day and after-school ecosystems.

Formidable obstacles must be overcome to fully develop some of these promising programmes, not the least of which is overcoming the pervasive discrimination and marginalisation facing many subgroups in society. More broadly, the old youth stereotypes need to be dropped in favour of a view of young people as critical assets and responsible partners in building the learning society.[10] Many of these corrosive frames of reference (*e.g.* the prevailing mass media depiction of youths as delinquents rather than as future assets) impinge on the allocation of resources directed at the education of hard-to-serve young people. In this climate, raising performance levels and softening the impact of economic disadvantage and social stigma will require perceiving the youth population in a new light – and the allocation of new resources. Programmes such as the Intel Computer Clubhouse network, Notschool.net and Urban Learning Spaces in Glasgow, Scotland consider youths as future assets with huge untapped potential, unlocked in part through experiential, project-based learning.

The challenges of raising performance

In many instances, ICTs are introduced into educational systems unprepared to integrate them effectively to improve performance, particularly that of low-achieving learners. Outworn organisational

structures and human-capacity deficits often go against the grain of forward progress in e-learning. Poor teacher morale and qualifications coupled with shortages of material and educational resources also hinder the effective integration of ICTs – and ultimately student performance.[11] Low-achieving students with limited exposure to high-quality teachers and modern computing devices are clearly less likely to benefit from them than students with greater exposure, all else being equal. The quality of physical infrastructure, then, affects technology diffusion, including electrical upgrades and building maintenance.[12] Parachuting ICTs into these environments without addressing underlying issues of organisational readiness, continuous professional development and infrastructure would be precipitous. A significant period is required to integrate ICTs across academic subjects – allowing for the development of technology plans, management training and professional development. This is a painstaking process requiring patience on the part of decision makers.

Often, teachers feel unready to integrate ICTs in the classroom.[13] Few opportunities exist for continuous learning for many time-pressured teachers. In high-poverty school districts in the United States, for example, many teachers lack the pedagogical, academic and class management skills to instruct low-achieving students. Further, widespread teacher shortages, where demand outstrips the supply of new teachers from training schools, thwart the imperative to raise the quality of the teaching cohort. In initial teacher training, moreover, ICT instruction is patchy, at least in Europe[14] and the United States.

It is not uncommon for pupils to express frustration because they can outperform their instructors with the tools.[15] Rather than a source of tension, young people's fluency with technology should be channelled into creative mentoring programmes where youths tutor their peers and seniors alike, such as the successful Seniorenansnsnetz programme in Leipzig or a promising experiment in Bonn called Computer-Training for Underserved Youths [Computer-Training für benachteiligte Jugendliche].[16] In after-school and community-based programmes – catchments for many disillusioned and under-performing youths – organisational readiness and staff training are quite uneven, as are public and private budget commitments. There are clear implications for introducing ICTs into educational and social work aimed at disadvantaged youths. Organisations such as EDC's YouthLearn in the United States and the Digital Chances Foundation [Stiftung Digitale Chancen] in Germany have developed manuals and courses for youth centre staff; the latter also run a telephone hotline to provide technical assistance where appropriate.[17]

While the challenges of professional development are daunting, examples of successful practice do exist. Beginning in 1997, the state of

Idaho in the United States required 90% of all certificated personnel in a school to pass one of three state-approved technology assessment models by 2001. Through robust collaboration with state colleges of education in the preparation and in-service training of teachers, as well as creative integrating of technology into instructional practices, this goal has been achieved. With 15 000 teachers in geographically dispersed districts in the state and only 20 training staff within the colleges, creative distance education programmes and train-the-trainer models proved successful in meeting the state government's proficiency goals for teachers.[18] In Finland, moreover, according to the Finnish Ministry of Education, approximately 20% of teachers receive government-funded advanced in-service training every year, a EUR 2.5 million programme complementing institutionally supported professional development.

In most "networked-ready" economies (as the World Economic Forum describes economies poised to reap dividends in productivity due to ICTs),[19] substantial investments in infrastructure preceded any serious initiative to train teachers effectively in their use. The goal to wire every classroom was part of national policy making in the United States, beginning in 1994 with the launch of a variety of public and private initiatives; meanwhile training and curriculum development have had a difficult time catching up. In the United States[20] and virtually every European country except Finland,[21] federal infrastructure expenditures greatly outpace investments in human-capacity building. In short, technology investments often trump training the cadre of teachers who will effectively integrate ICTs.

In this milieu, the theme of ICTs and equity is of critical importance to policy makers and other decision makers, owing to the fact that technology can provide a platform to equalise access to critical resources and opportunities to learn. Article 26 of the Universal Declaration of Human Rights states that everyone has a right to an education directed to the full development of the human personality. In order to ensure equal educational opportunity, adequate facilities and resources, technological and otherwise, are required – as well as a shared belief in equal dignity and respect. In the American context, recent debates over school equity have proceeded along two fronts: the "resource parity" argument suggests that per-pupil expenditures ought to be roughly equal and flow from a fair tax or revenue model; and the educational "adequacy" approach looks at resource inputs (*e.g.* teacher pay, class size, facilities) and student performance outcomes as indicators for courts to determine whether school systems are inadequate and thus unconstitutional in the US system.[22]

Achievement gaps in many OECD countries have led to civil rights and equity movements. These are particularly visible in Germany and the United States, where substantial variation in reading achievement is evidenced

between the highest one-quarter of students and the lowest.[23] The dual challenge is that student performance is strongly correlated with economic, social and cultural status[24] as is access to and frequent use of ICTs.[25] One might expect in the short term, therefore, that ICTs would contribute to a widening, not a shrinking, of the achievement gap unless good programmes are ramped up, thereby providing motivation and technical fluency while simultaneously offering remediation in cognitive skill development and core academic subjects. Without comprehensive and systemic policy strategies for e-learning, it remains to be seen at the macro level how strategic investments in ICTs may mitigate these gaps. Clearly targeted interventions are necessary to address at-risk young people's complex emotional, social and academic needs (including in-school and out-of-school young people, the latter largely under-skilled and underemployed), and ICTs can play a vital role in facilitating these interventions.[26] Yet some policy leaders are actually narrowing instructional approaches and assessments[27] at this critical juncture in which ICTs have begun to exhibit promise in customising solutions to learners' diverse cognitive and environmental profiles.[28]

The good news is that many young people seem to be attracted to technology; it sparks their curiosity in learning and may even provide a healthy discontinuity in the experience of social disadvantage. At the micro level, innovation has yielded transformational results for many underserved youths, with the promise of closing the achievement gap for the slice of learners impacted by good programmes.[29] Technology has been instrumental in expanding self-esteem and feelings of self-efficacy.[30] Successful practice, where leadership interventions break the cycle of poor performance and underachievement using ICTs, however, are exceptional, affecting only a small portion of the millions of disadvantaged youths and young adults in OECD countries. Leadership seems to have met with success when a concentrated, systemic approach is employed to empower staff and students in school renewal. Given that ICTs are capital-intensive investments, these reforms require dedicated funds (a combination of reallocated and new revenues) through a mix of constant public and private sources.

One example of this process is from the United States, in the Union City School District in New Jersey, a district lying across the river from New York City. Robust collaborations from a variety of partners, including deep community partnerships, as well as a strong steering role for staff, led to the decision, over several years of planning, to implement comprehensive curricular reform, major scheduling changes, increased in-service training and an infusion of technology into homes as well as schools to enhance co-operative learning.[31] A school district that in 1989 was below state averages in attendance rates and standardised test score performance, and above in

dropout and transfer rates was transformed; today its eighth-grade readiness test results are among the highest in the state.

The level of technology infusion occurring in Union City could not have happened without dedicated resources. As Fred Carrigg, executive director for academic programmes for the district declared, "None of this happens without money, but a lot of that can be and should be a restructuring of how money is expended".[32] First, in 1989 the state courts found the funding and resource levels for schools in poor communities to be inadequate and hence unconstitutional. The subsequent increase in per-pupil expenditure allowed Union City to experiment with new approaches to learning, including implementing comprehensive curriculum reform focusing on a literacy curriculum to sharpen thinking, reasoning and collaboration skills. Second, other state and federal funding for high-poverty communities were also leveraged. And, finally, Bell Atlantic (now Verizon, the largest telecommunications company in the United States) made substantial hardware investments, in schools and in homes, in order to explore how pervasive technology diffusion would impact learning.

One lesson to draw from the US experience in general, and from Union City in particular, is that successful policy approaches need to be comprehensive and holistic: they must empower stakeholders and address youth development in its broadest sense. Union City leadership turned the established order on its head – in deputising staff to make decisions at the school level; in altering the cadence of the school day; in building bridges to the home and broader community – such that students from the toughest backgrounds excelled in this new environment. In the United States and Germany, the desire to develop more comprehensive and scalable learning experiences has focused on extending the school day to allow youths and the community to access facilities, including ICTs, in the after-school environment. The 21st Century Community Learning Centers programme in the United States and a new initiative in Germany to extend school hours in the afternoon both address the challenge of enhancing student achievement while also searching for more inclusive approaches to bridge the world of formal and community-based learning.

Cross-country comparisons: Finland, Germany and the United States

Can ICTs be used to close achievement gaps and address the range of needs of underserved youths as a matter of effective national policy making? Or is this approach fated to be a piecemeal exercise, dependent on the exigencies of local circumstances, washed along by the current of inexorable social forces? National policy making in three OECD countries – Finland,

Germany and the United States – demonstrate how ICTs can be an important component in strategic interventions to reduce social exclusion. Germany and the United States suffer from significant social divides, the former due in part to reunification effects, the latter to historic discrimination against racial and ethnic minorities. Do we witness signs that ICTs are mitigating these gaps? Finland is juxtaposed to Germany and the United States as a country with a relatively modest variance in performance across a range of economic, social and cultural variables. Have ICTs played a role in achieving this egalitarian state of affairs?

Germany and the United States: Closing the achievement and technology gaps?

In the United States and Germany, demographic shifts in urban centres, coupled with job flight to the suburbs and the loss of manufacturing jobs due to automation and business migration, signal tumultuous times for low-skilled urban youths.[33] Successful strategies to mitigate these inequalities focus on macro-level fiscal policies, such as negative tax policies, broadening educational and workforce preparation opportunities (where an adequate tax base and public support for education exist) and cultivating an attractive business climate for entrepreneurs and innovators to take root and blossom.[34] In short, promising government policy embarks on initiatives to raise performance while softening the impact of socioeconomic disadvantage. One favourable lesson from Germany, given its low youth unemployment rate relative to other OECD countries, is to get youths into jobs early and to keep them employed.[35]

Germany and the United States possess significant achievement gaps, and it is worth examining whether ICTs are mitigating these differences. One can find some striking examples of effective practices: Union City (see above) and the Web.Punkte project in Bremen, Germany are good examples. At the macro level, various support programmes such as the E-rate in the United States and Germany's New Media in Education programme aim to stimulate ICT access and effective use in schools. Many programmes exist, but what difference have they made?

Strategies to harness the potential of ICTs for educational advancement in OECD countries began in earnest in the mid-1990s. The Clinton Administration ushered in the National Information Infrastructure (NII), promising to connect institutions and streamline service delivery. Between 1993 and 2001, national funding in the arena of educational technology and universal service soared from USD 23 million to USD 3.5 billion,[36] almost all of which was targeted at economically, socially and culturally marginalised communities. Categorical funding has since declined,[37] and

state funding has retrenched;[38] yet overall federal education funding has increased significantly, including more funding for teacher training.[39] Other countries entered the fray at roughly the same time. In Finland the first national information-society strategy document was written against the backdrop of the recession of 1993–94. At this time in Germany, Chancellor Kohl was focusing more on digital television than on computerisation.[40] Four years later in 1998, Chancellor Schröder, in his very first statement as Head of Government, underscored the central importance of spreading the fruits of the information society to all residents. The prevailing educational technology doctrine came to be premised on accomplishing three interrelated goals, what Vice President Gore called the Internet ABCs: achieving universal Access to ICTs; expanding Basic training for teachers; and ensuring relevant Content was produced to optimise network use. Similarly, the German model was predicated on three pillars to support the modern school: infrastructure, competence and content.[41]

In implementing this three-pronged approach, it remained unclear what an appropriate balance among the three would resemble in terms of funding and sequence, particularly to diffuse knowledge and skills rather than just technology. In the United States this question was answered *de facto* by the passage of the Telecommunications Reform Act of 1996, in which an important new provision called the E-rate provided significant resources for telecommunications infrastructure diffusion. The programme's purpose is to expand universal service to essential communications tools to schools and libraries according to economic need and geographic isolation. Operating on a sliding scale with recipients (*e.g.* state education agencies, school districts, individual schools and library systems) eligible for up to a 90% discount on certain telecommunications services, including telephony and Internet service, E-rate discounts vary depending on the degree of poverty and rurality.[42] Eligible educational institutions apply for the discounts or reimbursements from a nongovernmental organisation set up to administer the fund.

The priority for much of this funding was to meet the goal of modernising infrastructure in schools, a goal now accomplished in a quantitative sense for both schools and libraries in the United States – the latter due in large measure to the work of the Bill and Melinda Gates Foundation. With such a large investment targeting infrastructure development, school systems quickly began to train teachers and develop curricula; tasks fell by and large to local, regional and state educational agencies, as we shall see.

School systems with the expertise, economies of scale and/or flexibility to develop technology plans tied to curricular and school reform goals were

often able to garner enough public and private support to begin to implement programmes with the wherewithal to affect student performance markedly. As was clear from the Union City example, ubiquitous communications tools linking the school to the larger community, including the household, expanded learning – and the accountability for learning – to that larger community, greatly increasing parent and caregiver involvement in the educational enterprise.

In September 1999, Germany released its comprehensive strategy for the information society, a plan called "Innovation and Jobs in the Information Society of the 21st Century".[43] The programme defines specific targets through 2005, including increasing Internet subscribership, equipping schools with multimedia PCs, developing a leading position worldwide in education software development and integrating the new media into a renewed approach to lifelong learning.[44] Not unlike other countries, installing hardware was a priority, propelled by partnerships with industry (*e.g.* Deutsche Telekom provided ISDN and some DSL connections to schools), including the creation of a marketplace for new and second-hand PCs.

Popularised and promoted by Chancellor Schröder in 2000, "the Internet for All" (Internet für Alle) ten-point campaign aimed to articulate the benefits of ICTs through public education campaigns, thereby countering the dangers inherent in unwittingly fostering digital inequality by targeting specific underserved groups: senior citizens, people with disabilities, immigrants, women and the indigent. A national outreach programme, however, is tempered by the fact that schools and other learning institutions are run by local governments, churches and non-profit organisations. For the most part, funds were not provided to link local activities to the national campaign, let alone to sustain their efforts.

What the Internet for All campaign found was that Internet "objectors" (Internet-Verweigerer) cover almost half of the German population over 14 years old. This category of objectors is heterogeneous, comprising diverse demographic groups with differing rationales for not using the Internet.[45] A large percentage of non-German speakers are offline, yet scant government and social service information is available in any non-German language. Segmented and specialised approaches are therefore necessary to motivate them to use the Internet, approaches most likely to develop successfully in localities, with support from local, state and national sources.

The targets of the Internet for All campaign in Germany mirror the groups identified as being on the wrong side of the digital divide in the US government's 1999 report, *Falling through the Net*. At the time, Assistant Secretary of Commerce Larry Irving called the issue of the digital divide a

civil rights imperative for our times,[46] and the US government leveraged its power to provoke widespread private-sector activity. Today the latest surveys on Internet use in the United States are not dissimilar from the German findings: 42% of Americans say they do not use the Internet, many either evading the technologies by having others navigate the tools for them or dropping out of cyberspace due to economic hardship or disillusionment.[47] The United States and Germany are surely not alone in experiencing a flattening of take-up and demand for services, due not only to the deflationary economic climate but to the perceived lack of relevant content and curriculum meeting diverse information and communication needs.

Following their respective national information society roadmaps, both countries witnessed significant increases in ICT penetration in elementary and secondary schools. In terms of sheer diffusion, by early 2002 Germany reached 23 primary education students, 17 secondary education students and 13 vocational education students per Internet-connected computer.[48] At the same time in the United States, there were six primary education students and four secondary students per instructional computer connected to the Internet,[49] putting the United States on a par with Nordic countries, and approximating the ratio some American experts consider optimal from an educational viewpoint.[50]

The US Department of Education's Preparing Tomorrow's Teachers to Use Technology grant programme (PT^3)[51] for several years supported high-quality reforms in teacher preparation programmes. This programme responded to the dilemma that elementary and secondary schools are now universally connected to the Internet, yet many teachers still feel uncomfortable using technology in their classrooms. The programme was eliminated in 2002. A programme in Germany to test the introduction of e-learning materials in everyday classrooms called New Media in Education will run until 2004 and is funded by the Federal Ministry of Education and Research. The use of new pedagogical methods – online teacher preparation, electronic portfolios and Internet-based teacher programmes – are all innovations to assist teachers if they have the time and support to absorb these approaches.

In mid-2003 an important report, *Learning for the 21st Century*, was released in which the US Department of Education, a handful of ICT companies and the National Education Association agreed to a national framework describing the types of skills young people ought to master to be successful in the information society.[52] The report has been a lightning rod in the United States, sparking conversations in communities about ways to impart new cognitive and technical skills. Given how overtaxed many school districts are in terms of their accountability structures under the new

education law, communities are searching for ways to expand constructively the mandates of schools and forge interesting links between schools and other community-based learning institutions to prepare youths for gainful employment and citizenship.

The Finnish model

At the end of 1998, the Ministry of Education in Finland set up a working group to prepare a proposal for a national strategy for education, training and research in the information society for 2000-2004. This national strategy document is a sequel to the previous five-year plan adopted in 1994.[53] In the late 1990s Finland devoted substantial resources to diffuse ICTs in schools and other learning institutions; this included modernising a well-established library system.[54] The government's partnership with ICT companies, including Nokia, to promote mobile communications as an educational tool is promising. Since Finland has the highest mobile phone penetration in the world[55] – approaching the diffusion of colour televisions – it may well become an exemplar among many efforts within OECD countries to promote portable, wireless tools to improve collaborative learning.

Finland is one of the few OECD countries spending at least as much on training and research at the national level as on infrastructure.[56] In 1999 teaching techniques across universities and other educational institutions were heterogeneous, with only about one-fifth of educational staff applying ICTs extensively to support teaching.[57] Today the picture is quite different. Since the Finnish Ministry of Education launched the Teacher Training Project (OPE.FI), over one-third of teachers have received advanced in-service training. In terms of research and development, Finland is leveraging its competitive advantage in telecommunications applications to explore pervasive modes of lifelong learning in the information society[58] with an eye toward co-operative learning. Open-source tools are being tested in Finnish schools and open learning environments are encouraged, expanding self-directedness, solidarity, teamwork, communications and the possibilities of collective decision making in environments that flatten the distinctions between experts and laypeople.

Finland has achieved an overall high level of education in its population, stemming from a national development strategy from the 1960s onward to create new universities all around the country. The impact of this policy – coupled with a strong link with regional economic development and research – have sustained an egalitarian society with a high standard of living in which the information society and the welfare state manage to coexist relatively amicably.[59] Promoting a culture of lifelong learning, supported by strong links among diverse learning institutions (*e.g.* schools,

libraries, workplaces and homes), is a vision that can be realised. Education policy fosters close contact with working life, a practice linked to increased retention rates and skills building among disadvantaged young people. The imperative also exists to build educational support structures extending throughout life, in part through the de-compartmentalisation of traditional learning arenas. Increasing parental involvement in young people's educational lives is a critical lever to amplify learning outside school walls for disadvantaged youth.

Finland's commitment to equal educational opportunities so that no region or subgroup in the country lags behind others is a central component of its information society strategic action plan. With the near-universal diffusion of mobile phones in Finland, even in remote regions,[60] the emergent learning society bodes well as mobile phones become the "central processing units" (CPUs) for information and communications exchange as the naught-decade unfolds. Computer and Internet access and use do tend to vary across regions in Finland, with digital divides separating urban centres from rural areas, as well as along educational lines, with over 80% of Finns with a tertiary education using the Internet compared to under 50% of those with only a basic education.[61] But unlike other countries where lack of interest is a major barrier to Internet use, many Finns (with the exception of middle-aged and senior citizens in remote regions) say they do not require home connectivity because they are afforded access on the job, in the neighbourhood library or at a nearby cyber café.[62] These gaps appear less pronounced than in most other OECD countries, although a concerted effort to reach seniors and poor residents in remote areas of Finland remains a significant policy challenge.

In Finland, therefore, youth achievement in schools tends to be relatively unvarying across geography and economic strata,[63] suggesting that underlying macro-level social and educational policies are fundamental in nurturing an egalitarian ethos. Indeed, the notion that ICT diffusion and purposes tend to amplify pre-existing institutional goals, strategies and relationships appears to have merit in the instance of Finland, where regional development over several decades coupled with rapid modernisation of educational policy and practice have generated a climate in which technology development broadly serves the needs of the population as a whole. This *modus vivendi* can be contrasted to that of Germany and the United States where digital divides and achievement gaps are more acute notwithstanding substantial advancements in ICT diffusion.

Policy implications

Four broad policy implications may be derived from the above discussion of national ICT and education policy making in the United States, Germany and Finland:

- The vital importance of public and private sector leadership in developing and realising ICT objectives, with an eye toward broad stakeholder involvement and a long-term vision for inclusion and excellence.
- A focus on comprehensive and holistic approaches to ICT integration. Too much fragmentation and superficiality of policies and programmes leads to inefficiency and benign neglect of the underlying causes of marginalisation.
- The importance of dependable and equitable funding streams to sustain and scale national initiatives.
- Human-capital development as the "driver" to raise performance and productivity for civic and economic inclusion.

In the late 1990s, OECD countries developed e-learning action plans, strongly supported by public and private sector leaders, to usher in the information society. This period's economic expansion allowed for unprecedented investments in infrastructure, digital content and personnel training so that demonstrable productivity and learning gains began to occur. These large investments today have yielded a widespread digital infrastructure in many OECD countries, with broadband diffusion becoming the new technological hurdle to cross *vis-à-vis* ICT equity. This first wave of ICT investments represents the end of the beginning, not the beginning of the end, both in renewing teaching and learning and in realising significant efficiency and productivity gains from the tools. Indeed, the journey toward an equitable, high-performing learning society in the information age is in its early stages. Standards for integrating digital literacy skills into most learning institutions' curriculum and assessments have yet to be formed let alone adopted in the United States. Substantial expansion of equity provisions, professional development and R&D have been strongly endorsed under the mantle of a long-term investment strategy increasing educational technology funding as a proportion of the total education budget to 5%.[64] In the coming months and years, the Partnership for 21st Century Skills (mentioned above) will deepen its work to influence the development of curriculum and assessments as these tools truly become basic to learning in the 21st century.[65] A key component of this mandate is to link schools with the broader assets of communities, in order to deepen the sets of skills and experiences of young people, particularly in non-formal settings.

With various ministries and departments in OECD countries motivated by different goals and accountability structures taking divergent approaches to an information society agenda, clearly gaps and redundancies will remain in composing comprehensive solutions for underserved youths. Piecemeal approaches to content development, training, R&D and infrastructure coverage will hinder countries in reaching their information society goals. For example, according to the President's Information Technology Advisory Committee in the United States, "education and learning R&D are dramatically under funded", consisting of less than 0.1% of the total federal education budget.[66] PITAC recommended increasing this proportion to no less than 0.5% or approximately USD 1.5 billion in order to fund innovation in educational applications, such as virtual or mobile learning, digital content and learning models customised to the needs of disadvantaged communities.[67] This R&D, including rigorous evaluation of programme effectiveness, should direct a country's strategic policy interventions, particularly on behalf of disadvantaged subgroups, to transcend the one-size-fits-all solutions often pervading a national policy agenda.

Developing human capital is the hallmark of an information society, including embarking on a process in which continuous learning opportunities are culturally acceptable and readily available. Beginning with the case of teachers, there are infrequent opportunities to learn new skills in new environments. The CEO Forum recommended that the US federal government should apply at least 30% of federal education technology funding to durable and intensive high-quality professional development by 2003; the actual investment today is far afield of this figure.[68] Realising an inclusive learning society in this climate is not easy. Even though American adolescents spend upwards of seven hours a day outside of school consuming media, this is mostly watching television and listening to music. And the videogame craze has eclipsed Hollywood as a global commercial venture with uncertain effects on children and adolescents. Migrating young people's affinity to ICTs into more active and collaborative *educational* purposes will be a formidable challenge – and a ripe arena for R&D and potential policy intervention – in the years ahead.[69]

In the realm of ICTs and equity, there is considerable room for stakeholder engagement. The guideposts for the information society are still being established and citizen engagement is essential, as well as strong leadership from governments, industry and civil society. A message must be sent by concerned citizens – and received by elected representatives – that the information society is for everyone, not just rhetorically stated, and must be sustained in the pursuit of its actualisation. At a time when inequalities are growing in many OECD countries, ICTs offer the potential to close achievement gaps and provide manifold opportunities for disadvantaged

youths to enter the mainstream. However, this will not happen without concerted attention and collective action toward creative solutions and bold new initiatives.

Notes

1 These ads were part of a public education campaign launched by the Kaiser Family Foundation, AOL Time Warner, the American Library Association, the Leadership Conference on Civil Rights and the Benton Foundation. The database of community technology centres underlying the campaign is maintained by the Digital Divide Network (www.digitaldividenetwork.org), a project of the Benton Foundation. A similar campaign has run in Germany under the umbrella of the "Internet für Alle" campaign, and a database of technology centres is administered by the Berlin-based Stiftung Digitale Chancen (www.digitale-chancen.de).

2 Robert E. Litan and Alice M. Rivlan, eds. (2001), *The Economic Payoff from the Internet Revolution,* Brookings Institution Press, Washington, DC.

3 See Organisation for Economic Co-operation and Development (2001), *Knowledge and Skills for Life: First Results from PISA* 2000, OECD, Paris. Available at www.pisa.oecd.org; Educational Testing Service (2002), *Digital Transformation – A Framework for ICT Literacy: A Report of the International ICT Literacy Panel,* ETS, Princeton, NJ. Available at: http://www.ets.org/Media/Tests/Information_and_Communication_Technology_Literacy/ictreport.pdf

4 Organisation for Economic Co-operation and Development (2003), *Financing Education – Investments and Returns,* OECD, Paris, p. 19ff. For estimates of the cost of youth educational deficits in the US context, see Marion Pines, ed. (2000), *The 21st Century Challenge: Moving the Youth Agenda Forward*, Johns Hopkins University, Baltimore, MD.

5 U.S. Department of Commerce (2002), *2020 Visions: Transforming Education and Training through Advanced Technologies,* US Department of Commerce, Washington, DC. Available at www.ta.doc.gov/reports/TechPolicy/2020Visions.pdf.

6 Notschool.net is an online research project looking at ways of re-engaging young people of school age into an environment in which they are able to develop new ways of learning. It is essentially a 24/7 virtual community, offering young people the

opportunity to develop their self-esteem and expand self-directed learning, achieved through the support of tutors, mentors and the strategic use of ICTs.

7 See Street-Level Youth Media (www.street-level.org), a programme educating Chicago's inner-city youths – including gang members and youths under court supervision – in media arts and emerging technologies for use in self-expression, communication and social change. Street-Level programmes build self-esteem and critical thinking skills for urban youths historically neglected by policy makers and mass media. Another project, called *The Beat Within*, is a weekly web publication through which the voices of young people from insidce juvenile hall can be heard. This outlet allows detained young people to express feelings of isolation and hope in connecting to a larger community within and without (pacificnews.org/yo/beat/about.html).

8 Comments made by Andrei I. Podolskij, professor of cognitive development at Moscow State University, at the Teens and Technology Roundtable II, Jacobs Foundation Communication Center, Oehningen, Germany (7-8 November, 2002).

9 Tisha Pryor *et al.* (2002), *Evaluation of the Internet Computer Clubhouse Network: Year 2 Report,* Center for Children & Technology, New York. Available at www2.edc.org/cct/admin/publications/report/Intel_CCN02.pdf.

10 See Franklin D. Gilliam, Jr. and Susan Nall Bales (2001), "Strategic Frame Analysis: Reframing America's Youth", *Social Policy Report* XV, 3(1). Available at http://www.srcd.org/Documents/Publications/SPR/sprv15n3.pdf. According to the authors, the three most frequently reported topics of youth news on local newscasts were crime victimisation, accidents involving young people and violent juvenile crime.

11 Organisation for Economic Co-operation and Development (2001), *Knowledge and Skills for Life: First Results from PISA* 2000, OECD, Paris, Chapter 7. Available at www.pisa.oecd.org,

12 Andy Carvin, ed. (2000), *The E-rate in America: A Tale of Four Cities,* 17, Benton Foundation, Washington, DC. Available at http://www.benton.org/publibrary/e-rate/e-rate.4cities.pdf

13 Education Week (2002), "Capacity to Use Technology: Teacher Proficiency State Data Table", *Technology Counts 2002: E-Defining Education,* 21(35), p. 62. Available at www.edweek.com/sreports/.

14 Eurydice (2001), *Basic Indicators on the Incorporation of ICT into European Education Systems – 2000/01 Annual Report,* Eurydice, Brussels, p. 26.

15 Douglas Levin and Sousan Arafeh (2002), *The Digital Disconnect: The Widening Gap Between Internet-Savvy Students and Their Schools,* Pew Internet and American Life Project, Washington, DC.

Available at http://www.pewinternet.org/pdfs/PIP_Schools_Internet_Report.pdf

16 See www.seniorenansnetz.de and www.digitale-chancen.de/content/projects/indexdeep.cfm?key=278.

17 See www.youthlearn.org and www.digitale-chancen.de.

18 John D. Mergendoller (1999), *An Analysis of the Progress of the Idaho Educational Technology Initiative in Meeting Goals Established by the Idaho Council for Technology in Learning,* The Buck Institute for Learning, Novato, CA. Available at http://www.bie.org/research/tech/summary.php?id=130 (summary) and http://www.bie.org/files/researchreport1.pdf (full paper).

19 World Economic Forum (2002), *Global Information Technology Report, 2002-2003: Readiness for the Networked World,* Oxford University Press, New York.

20 In the arena of K–12 technology expenditure in the United States, for example, of the USD 7.2 billion spent in fiscal year 1998 (approximately 30% of which came from the national government), about USD 51 million went for software and USD 29 million – *or about 4%* – for training expenses and release time for teachers. See Ronald Anderson and Henry Jay Becker (2001), "School Investments in Instructional Technology", *Teaching, Learning and Computing: 1998 National Survey,* Center for Research on Information Technology and Organizations, Irvine, CA, p. 5.
Available at www.crito.uci.edu/tlc/findings/report_8/REPORT_8.PDF.

21 Eurydice (2001), *Basic Indicators on the Incorporation of ICT into European Education Systems – 2000/01 Annual Report,* Eurydice, Brussels, p. 10.

22 Marilyn J. Gittell, ed. (1998), *School Equity: Creating Productive Schools in a Just Society,* Yale University Press, New Haven.

23 Organisation for Economic Co-operation and Development (2001), *Knowledge and Skills for Life: First Results from PISA* 2000, OECD, Paris, pp. 57-58. Available at www.pisa.oecd.org.

24 Ibid., pp. 187-188.

25 Ibid., p. 118.

26 Kay Livingston (2001), "Disadvantaged Teenagers and Technology: Summary Results from a Transatlantic Research Inventory", *Toward Digital Inclusion for Underserved Youth,* Benton Foundation, Washington, DC, pp. 33-40. Available at http://www.benton.org/publibrary/ttr/TeenTechBooklet.pdf

27 For a riveting account of the tension between traditional accountability measures and those made possible through small schools and smart use of ICTs, see Elliot Washor and Charles Mojkowski (2003), "Accountability in Small Schools", *Education Week on the Web, 9 April* . Available at:
www.edweek.com/ew/ewstory.cfm?slug=30washor.h22&keywords=elliot%20washor
(registration required). As the authors suggest, "most small schools feel a special responsibility to be accountable to the community, families, students, and themselves for each one of their children. Not only are they concerned about not leaving any child behind, but their practice of personalizing their schools with advisories, learning plans, internships, exhibitions, professional development, and portfolios aims to ensure that no child is left *unknown*, as a learner and as a person."

28 Howard Gardner (2000), *Intelligence Reframed: Multiple Intelligences for the 21st Century,* Basic Books, New York.

29 Project TELL traced the effects of home computers with network access on the lives of disadvantaged students and their families over a seven-year period. Researchers followed a group of New York City public school girls and boys from low-income, minority families in segregated inner-city neighbourhoods. 125 middle-school students scoring below proficiency on their standardized reading test were chosen with an appropriate comparison group chosen from the same middle school. Results were not universally encouraging, particularly for severely at-risk students. For a subset of the treatment group performance gains over four years were significant, and each person in the subgroup eventually graduated from high school and enrolled in local colleges. William Kornblum, City University Graduate Center, "The Digital Divide and the Severely At-Risk Student", unpublished paper delivered at the Teens and Technology Roundtable I, Benton Foundation, Washington, DC (4-5 October 2001).

30 Alexander Grob (2002), "Improving Learning and Professional Perspectives of Disadvantaged Adolescents by Peer Tutoring", Presentation given at the Teens and Technology Roundtable II, Jacobs Foundation Communication Center, Oehningen, Germany, 7-8 November.
Available at www.digitale-chancen.de/transfer/assets/102.pdf.

31 Center for Children and Technology (2000), *The Transformation of Union City: 1989 to Present*, EDC Center for Children and Technology, New York. Available at www2.edc.org/CCT/admin/publications/report/uc_transform00.pdf.

32 Diane Curtis (2003), "Urban Renewal: The Union City Turnaround", *Edutopia,* 8, Spring.

33 David G. Blanchflower and Richard B. Freeman, eds. (2000), *Youth Employment and Joblessness in Advanced Countries,* University of Chicago Press, Chicago.

34 Andreas Breiter (2003), "Regional Learning Networks – Building Bridges Between Schools, University and Community" in Tom van Weert and Robert K Munro (eds.), Informatics and the Digital Society: Social: Ethical and Cognitive Issues, Kluwer, Boston.

35 David G. Blanchflower and Richard B. Freeman, eds. (2000), *Youth Employment and Joblessness in Advanced Countries,* University of Chicago Press, Chicago, p. 403 ff.

36 Anthony G. Wilhelm (2003), "Leveraging Sunken Investments in Communications Infrastructure: A Policy Perspective from the USA", *The Information Society,* 19(2), May.

37 Impact", *Policy Brief No. 1,* Benton Foundation, Washington, DC. Available at http://www.benton.org/publibrary/policybriefs/brief01.html

38 See Corey Murray, "Budget Ax Falls on School Tech Programs", *eSchool News Online.* Available at www.eschoolnews.com/news/showStory.cfm?ArticleID=4407.

39 See www.ed.gov/

40 Herbert Kubicek (1997), "Multimedia: Germany's Third Attempt to Move to an Information Society" in Brian Kahin and Ernest Wilson (eds.), *National Information Infrastructure Initiatives: Vision and Policy Design*, MIT Press, Cambridge, MA.

41 Federal Ministry of Education and Research (2000), *Online-Offline: IT in Education,* 7, BMBF, Berlin. Available at www.bmbf.de/pub/itkon_e.pdf.

42 For an overview of the programme, see the Universal Service Administrative Company's website at www.sl.universalservice.org/overview/

43 Federal Ministry of Economics and Technology and Federal Ministry of Education and Research (1999), *Innovation and Jobs in the Information Society of the 21st Century,* BMWI and BMBF, Berlin. Available at www.bmbf.de/pub/inno21e.pdf.

44 Ibid, p. 9.

45 TNS EMNID (2001), "Der Verweigereratlas – Basiserhebung" (Bielefeld: TNS EMNID. Available at www.digitale-chancen.de/transfer/downloads/MD8.pdf.

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47 Amanda Lenhart *et al.* (2003), *The Ever-Shifting Internet Population: A New Look at Internet Access and the Digital Divide,* Pew Internet & American Life, Washington, DC, p. 3. Available at www.pewinternet.org/reports/pdfs/PIP_Shifting_Net_Pop_Report.pdf.

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50 President's Committee of Advisors on Science and Technology (1997), "Report to the President on the Use of Technology to Strengthen K-12 Education in the United States", Office of Science and Technology Policy, Washington, DC, §3.1. Available at www.ostp.gov/PCAST/k-12ed.html#3.h.

51 For more detail about the now defunct programme, see www.ed.gov/teachtech/.

52 Partnership for 21st Century Skills (2003), *Learning for the 21st Century,* Partnership for 21st Century Skills, Washington, DC. Available at www.21stcenturyskills.org.

53 Finnish Ministry of Education (1999), *Education, Training and Research in the Information Society: A National Strategy for 2000-2004,* The Ministry of Education, Helsinki. Available at www.minedu.fi/julkaisut/information/englishU/welcome.html.

54 Finnish Ministry of Education (2001), *A Wide Range of Culture and Quality Information Retrieval in the Library: The Salient Points and Proposals in the Finnish Library Policy Programme 2001–2004,* The Ministry of Education, Helsinki.

55 Juha Nurmela, Lea Parjo and Marko Ylitalo (2003), *A Great Migration to the Information Society: Patterns of ICT Diffusion in Finland in 1996-2002,* Statistics Finland, Helsinki, p. 14 (Figure 2.5).

56 Eurydice (2001), *Basic Indicators on the Incorporation of ICT into European Education Systems – 2000/01 Annual Report,* Eurydice, Brussels, p. 10.

57 Finnish Ministry of Education (1999), *Education, Training and Research in the Information Society: A National Strategy for 2000-2004,* The Ministry of Education, Helsinki, §1.1. Available at www.minedu.fi/julkaisut/information/englishU/welcome.html

58 Juha Nurmela, Lea Parjo and Marko Ylitalo (2003), *A Great Migration to the Information Society: Patterns of ICT Diffusion in Finland in 1996-2002,* Statistics Finland, Helsinki, p. 12 (Figure 2.3), 24. According to the report, "The Finnish national economy relies heavily on the ICT sector, both in terms of value added and employment: on these measures there is no other OECD country where the ICT sector is more important."

59 See Manuel Castells and Pekka Himanen (2002), *The Information Society and the Welfare State: The Finnish Model,* Oxford University Press, Oxford, p. 115.

60 Juha Nurmela, Lea Parjo and Marko Ylitalo (2003), *A Great Migration to the Information Society: Patterns of ICT Diffusion in Finland in 1996-2002,* Statistics Finland, Helsinki, p. 35 (figure 3.16).

61 Nordic Council of Ministers (2002), *Nordic Information Society Statistics 2002,* Statistics Finland, Helsinki, §2.2. Available at http://stat.fi/tk/yr/tietoyhteiskunta/nordic_iss_02.pdf.

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63 Organisation for Economic Co-operation and Development (2001), *Knowledge and Skills for Life: First Results from PISA* 2000, OECD, Paris., pp. 58, 60, 308. Available at www.pisa.oecd.org

64 CEO Forum on Education & Technology (2001), *Education Technology Must Be Included in Comprehensive Education Legislation: A Policy Paper,* CEO Forum, Washington, DC, pp. 7-8. The report notes educational technology funding was less than 2% of total K-12 spending in 1999-2000.
Available at www.ceoforum.org/downloads/forum3.pdf.

65 See www.21stcenturyskills.org.

66 President's Information Technology Advisory Committee (2001), *Using Information Technology to Transform the Way We Learn,* National Coordination Office for Information Technology Research and Development, Arlington, VA, p. 14. Available at http://www.nitrd.gov/pubs/pitac/pitac-tl-9feb01.pdf

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68 CEO Forum on Education & Technology (2001), *Education Technology Must Be Included in Comprehensive Education Legislation: A Policy Paper,* CEO Forum, Washington, DC, p. 9.

69 Anthony G. Wilhelm (2002), "Wire-less Youth", *National Civic Review* 91(3), p. 294.

Chapter 5

Reaching the most disadvantaged with ICT: What works?

Robert Kozma and Daniel A. Wagner

Introduction

This chapter is about the use of information and communication technologies to reach the most disadvantaged learners. Reaching this group has become a national and international educational priority, as articulated in such policy statements as *No Child Left Behind* (NCLB) (United States Department of Education, 2002), *Investing in Competencies for All* (OECD, 2002b), and *Education for All* (UNESCO, 2000). An important goal of the NCLB legislation is to ensure that even the most disadvantaged students succeed in their education (United States Department of Education, 2002). Education Ministers from OECD countries have committed themselves to the goal of tackling the long-standing educational inequities related to socioeconomic background, community, gender, and ethnic and other disadvantages (OECD, 2002b). And the United Nations and UNESCO have extended this goal to reaching every citizen in every nation (United Nations, 2000; UNESCO, 2000).

This issue raises a fundamental question: "Who are the most disadvantaged"? A strong case could be made that the most disadvantaged are those disabled by severe physical or mental handicaps or those with little or no schooling from the lowest economic rungs within a country or around the world. However, in this discussion, the focus is mainly on OECD countries and on programmes for those who have dropped out of school. The case is made that there is never a clearer sign that a national education system or international policy has failed to educate all than when large numbers of youth – including those who are disabled or economically disadvantaged – enter school but leave before they complete their education. For example, in the United States, recent reports have established that 11% of the population between 16 and 24 did not complete four years of high school education, with percentages more than three times higher than this for urban minority populations (National Center for Educational Statistics, 2002); and approximately 15% of the population aged 25 or older did not

complete high school (United States Census Bureau, 2003). A recent OECD report (2002a) found that among 16 of the countries participating in that study, 11 had a national secondary school dropout rate of higher than 10%.

While in economically advanced countries secondary school dropouts are only 10% or so of the youth population, they disproportionately suffer from and account for a number of social problems. Studies in the United States (National Center for Educational Statistics, 2002; Kaestle *et al*., 2001; Coley, 1995; Schwartz, 1995; Rumberger, 1987) indicate that high school dropouts are more likely to be unemployed than those who complete high school; they are more likely to go on public assistance; and they earn less money when they are employed, usually in low-level jobs. In 1992, high school dropouts earned on average about one-third less than high school graduates. High school dropouts are also more likely to have health problems, to engage in criminal activities, and to become more dependent on government programmes than are high school graduates (Rumberger, 1987). Dropouts comprise nearly half of the heads of households on welfare, and a similar percentage of the prison population. Dropouts are more likely to have babies and/or to be married by the age of 18. Unsurprisingly, the highest rate of adult illiteracy is for those who have dropped out of high school, and dropouts are the least likely to engage in literacy activities (Kaestle *et al.*, 2001). Further, US employers reported providing approximately 7% of their employees with training in basic skills, such as reading, writing, arithmetic and English language skills (United States Bureau of Labor Statistics, 1996). Only a small number of dropouts, about 15%, report returning to complete secondary schooling later in life.

The main question addressed by the chapter is: Can ICT be used to reach this important group of very disadvantaged people, and if so, how? The discussion begins with an analysis of the characteristics of the most disadvantaged students and of the reasons for dropping out of high school. It provides an analysis of how ICT might be used to address the academic, social, and linguistic needs of disadvantaged, out-of-school youth and of adults – with a focus on the United States and OECD countries more generally. In analysing these applications, specific projects and programmes will be cited. However, it should be noted that ICT is still not in widespread use for out-of-school youth and disadvantaged adults. Consequently, some examples are drawn from in-school programmes for younger students and other projects that seem to have implications for youth dropouts and adults. Finally, the implications of these analyses for educational policy and future research will be discussed. Specifically, policies will be considered that relate to ICT access for the disadvantaged and those that relate to integration of ICT applications with other educational interventions. This review also raises the need for a revised definition of what works, and for a more

rigorous approach to research that will allow practice to build on accumulating scientific evidence.

Causes and characteristics of disadvantaged students

In order to understand the potential that ICT may have to reach disadvantaged learners, we must first understand who these youths are and why they drop out of high school. In a comprehensive review of United States research on dropouts, Rumberger (2001) identified two types of causes: those related to individual students; and those associated with context – the students' families, schools, communities and peers. At the individual level, Rumberger contends that student disengagement and withdrawal from school is a long-term process that can be influenced by students' early school experiences. Numerous studies reviewed by Rumberger and others (Jimerson *et al.,* 2000; Coley, 1995; Schwartz, 1995; Simner and Barnes, 1991; Valverde, 1987) found that poor academic achievement is a strong predictor of dropping out. Almost one-fifth of dropouts had been held back a grade and almost half had failed a course. However, dropping out is not simply a result of academic failure. Student disengagement can be both academic (students stopping doing their homework is an example) and social (*e.g.* students not getting along with their peers), and is strongly associated with dropping out. Almost half of high school dropouts missed at least ten days of school during a school year; one-third of the dropouts were put on suspension or probation. Dropouts were twice as likely as school completers to have run away from home.

At the contextual level, family background is widely recognised as the single most important contributor to success in school. Research cited by Rumberger (2001) and others (Valverde, 1987) has found consistently that socioeconomic status, most commonly measured by parental education and income, is a powerful predictor of school achievement and dropout behaviour. Poorer, less educated, and single parent households tend to have less money, time, and parenting skills that they can contribute to their children's education. On the other hand, when parents monitor and regulate their children's activities, provide emotional support, encourage independent decision making and are generally more involved in their children's schooling, the students are less likely to drop out of school.

Further, Rumberger reports that the dropout rates of African American and Hispanic students are significantly higher than those of other racial groups. However, it is not clear from the research whether this is due to the socioeconomic conditions of high poverty and low parental education associated with these groups, or due to socio-cultural factors, such as cultural differences in language, values, attitudes, and behaviours of communities, parents, and peers.

Communities and peer groups also influence students' withdrawal from school. Poor communities have fewer resources, over and above the influence of the school, to contribute to children's well-being (playgrounds, after-school programmes), and communities may influence parenting practices, beyond the direct influence of parental education and income. Students living in poor communities are more likely to have friends that are dropouts.

Finally, schools themselves exert a powerful influence on student achievement and dropping out. Studies reviewed by Rumberger as well as others (Lee and Burkham, 2003), found that small school size and low pupil/teacher ratios have a positive and significant effect on high school and middle school dropout rates, even after controlling for a host of individual and contextual factors that might also be at work. The impact of small school size is particularly evident for low socio-economic status schools. Teacher guidance and support are also significantly associated with lower dropout rates, especially for disadvantaged students (Croninger and Lee, 2001). Apparently these arrangements promote more student engagement, academically and socially. Schools may also have a positive influence on withdrawal through policies and practices designed to promote their own overall effectiveness. Conversely, schools may have policies and practices that foster low grades, poor attendance and misbehaviour that can lead to suspensions, expulsions or forced transfers – and, hence, more dropouts.

The summary picture painted by research in the United States is one in which the most disadvantaged youth come from homes in which parents, for a wide variety of reasons, are not able to support school success. Their community and peer values, attitudes and behaviours may conflict with school success and their schools may not provide the necessary resources, programmes or policies to afford them that success. As a result, after a lengthy history of disengagement and academic failure, a large number of these American students – who are often African-American or Hispanic – drop out of school. As adults they have difficulty finding jobs and when they do, they have low-level jobs and lower incomes than high school graduates. They are more likely to be on government support and engage in criminal behaviour. They have low levels of literacy and rarely engage in literacy activities. When they enrol in training, it is often to learn basic skills of reading, writing, numeracy, and the English language.

This rather bleak picture of the condition of the most disadvantaged out-of-school youth and adults in the United States is meant to provide the reality check that confronts any application of ICT for the disadvantaged. While this represents a statistical portrait of the contemporary US trends, evidence suggests similar portraits in other OECD countries (see other chapters in this volume). The mere use of ICT, however sophisticated, will

not address the extensive, persistent, and interlocking personal and social factors that account for school dropouts. Consequently, this chapter does not merely look at a range of hardware and software. Rather, it considers the application of ICT as it is integrated into systematic and comprehensive approaches that address the academic, social and linguistic needs of the most disadvantaged.

ICT and the needs of the disadvantaged

Cognitive and social research and theory provide a number of insights into how programmes and policies can address the needs of the most disadvantaged students. And ICT can provide significant added value to these programmes and policies, if used appropriately. This section first examines general principles of effective learning environments and then examines how ICT can contribute to these to meet specific needs of the disadvantaged.

Creating effective learning environments

Significant strides have been made over the past several decades in developing a science of learning. Research and theory in cognitive psychology, social psychology, anthropology, education, and technology have converged to create a body of knowledge that forms the science of learning and informs the practice of teaching (Bransford, Brown, and Cocking, 2000). This multidisciplinary approach to educational research and theory is more likely than any single discipline to provide useful answers to the complex social problems of the sort addressed here. Within this domain, researchers have examined the causes of dropping out of school, the needs of disadvantaged students, and programmes designed to reach disadvantaged learners (McPartland and Jordon, 2001; Means and Knapp; 1991; Rumberger, 2001; Slavin and Fashola, 1998). Given the factors that account for school dropouts, effective learning environments need to address the needs of disadvantaged students comprehensively. Effective environments for the disadvantaged can be characterised by those that address three kinds of needs, as follows.

Academic needs

Actively engaging students in challenging tasks: Effective environments involve disadvantaged students in sustained academic engagement that fosters deep understanding and application of important concepts and principles. Clear expectations are set for high standards of achievement. Basic skills are learned in the context of complex, everyday problems and situations. Such tasks motivate the learning of basic skills and allow students

to integrate those skills with the higher-level skills needed to address complex problems.

Focusing on individual learners' skills and needs: Students bring with them to the learning setting knowledge, skills, attitudes, and linguistic and cultural practices that affect their learning. Effective learning environments build on this base of skills, interests and experiences and address students' individual needs. Goals and tasks are made challenging enough to maintain engagement but not so difficult as to lead to discouragement. Students are given the time needed to master the skills. Multiple approaches are used that acknowledge student differences. For example, students from one cultural background may be more comfortable working in group settings, while other students may be more oriented toward independent learning environments.

Providing students with structure and support: Disadvantaged students need the guidance and support of a teacher or more knowledgeable peer as they attempt more challenging and complex tasks. Complex cognitive skills are explicitly displayed and modelled. Meta-cognitive skills are nurtured that allow students to monitor, structure and begin to manage their own learning and continue this into the future. As the students become more skilled, this support is withdrawn so they can perform on their own and support the learning of others.

Presenting frequent assessment and feedback: In effective learning environments, students are regularly provided with opportunities to display, examine, revise and improve their thinking. They receive constructive and detailed feedback on their efforts early and often along the way. Progress is recognized and rewarded.

Social needs

Creating a supportive learning community: Effective learning environments develop group norms that value and support learning and success. The social atmosphere is supportive and non-threatening. Students collaborate in groups on joint projects. They help one another solve problems by building on each other's knowledge, asking questions to clarify explanations, and suggesting avenues that would move the group forward. Interpersonal problems are addressed and social problem-solving skills are developed. Schools or programmes are small, as is the student/teacher ratio. Strong relationships are fostered with a teacher or other supportive adults.

Connecting with the outside community and resources: Positive classroom communities can be strengthened by the outside community. Effective environments build connections between classroom-based goals and values, and the participants' situations, tasks and structures in the outside world in

order to support success in learning. They develop the support and involvement of parents and other adults and enlist community resources and services. They also build on cultural experience and practices in the community. For example, cultural practices that encourage knowledge sharing within the community can become an effective model of co-operative learning and problem solving in the classroom.

Linguistic needs

Building on current language skills and developing new ones: Disadvantaged students often have limited literacy skills in the dominant national language. Effective learning environments draw on current language skills and literacy practices to support learning. Equally important is the development of new literacy skills. A positive sociolinguistic context is especially important if students come from immigrant families, which is the case in many OECD countries.

A number of programmes for the most disadvantaged students have incorporated these principles (Rumberger, 2001; Slavin and Fashola, 1998). For example, the Coca-Cola Valued Youth Programme (described at www.youthdevelopment.coca-cola.com/ach_ccvy.html and reviewed in Slavin and Fashola, 1998) is a cross-age tutoring programme designed to increase the self-esteem and success of high school students at risk of dropping out by placing them in positions of responsibility as tutors of younger students. The programme was originally implemented in San Antonio, Texas among predominantly Spanish-speaking students but has since been widely replicated throughout the southwest United States and elsewhere. In this programme, students are required to enrol in a special tutoring class that develops their basic academic skills as well as their tutoring skills. Home-school partnerships are also developed. Slavin and Fashola (1998) report significant reductions in dropout rates for students in the programme compared to matched students in a comparison group, and improved student scores on other academic and attitudinal measures.

In Europe, a pilot programme was instituted by the European Commission (2001), in which 13 "second chance" schools were set up in 11 countries to address the needs of students who had dropped out of secondary school. The programme is a partnership between local authorities, social services, associations and the private sector in which the latter offers possible training places and jobs to pupils. The teaching and counselling approach focuses on the needs and abilities of individual pupils. Students are actively engaged in learning modules that combine basic skills development such as numeracy, literacy and social skills with practical training in and by enterprises. There is a central role for the acquisition of skills in and through

ICT. The initial evaluation of this programme documents its positive impact on school completion and dropout rates.

ICT in support of effective learning environments

Given the extensive, persistent, and interlocking personal and social factors that account for dropping out of school, how can the use of ICT reach the most disadvantaged out-of-school youth and adult learners? This can happen only if ICT is used in the context of comprehensive programmes that address the academic, social, and linguistic needs of these learners. ICT by itself will not make a difference. But the capabilities of ICT can be used to supplement, support, reinforce and extend these programmes.

A number of articles and reports have reviewed the research and theory on the use of ICT with disadvantaged youth and adult learners (Kozma and Croninger, 1992; Office of Technology Assessment, 1993; Wagner, 2001; Haddad and Jurich, 2002; Stites, forthcoming). The interactive capabilities of ICT can engage learners in the extended consideration of important concepts and principles while providing extensive assessment and feedback. The processing capabilities of computers can individualise learning and customise instruction to specific learners. Various productivity tools can be used by students to create significant intellectual products. Multimedia capabilities can provide multiple approaches to learning, can visualise difficult concepts, and connect school learning to real world situations. Simulations and models allow for deep exploration of complex systems. And the networking capabilities of ICT can connect students to a range of informational and social resources outside the classroom.

There are two fundamentally different but potentially reinforcing approaches to the use of ICT in support of the learning goals of disadvantaged learners. These can be referred to as the instructive and the constructive approaches. With the instructive approach – often typified by computer-assisted instruction (CAI) – computers and other technologies are used to provide students with direct instruction on some subject matter topic. Often the skills acquired in this way are relatively basic in nature. With the constructive approach, computer tools and other technology resources support students as they solve some problem or produce some product and in so doing, acquire higher-level skills. Such skills can include the ability to search for information, reason with models, analyse data and communicate ideas. Both approaches are examined in the analysis below.

ICT and the academic needs of disadvantaged learners

Instructive applications of technology, or CAI, support engagement in learning by providing students with frequent opportunities to respond to

instruction. With these applications, subject matter is broken down into small segments or chunks, with each chunk of information followed by an opportunity to respond to or apply this information. Students progress through these chunks at their own pace, which is determined by their performance. Early success allows students to quickly progress to more challenging work; early failures quickly result in additional support and opportunities to respond. CAI focuses on individual learners' skills and needs by providing them with instruction specifically tailored to the type of errors or misunderstanding that they display in their responses. Instructive applications of ICT provide students with support and structure by giving examples and models of desired performance and procedures as well as explicit instruction. In addition to providing frequent opportunities to respond to instruction, CAI applications also provide frequent feedback to students. In this way, students can chart their progress as they acquire basic skills. A variety of media is often used in CAI. Recent applications often incorporate animations and digital video and audio; these media can provide reinforcing messages that increase students' understanding and transfer of learning (Mayer, 2001). They also compensate for students' limited text literacy. Recent applications of artificial intelligence (Graesser *et al.,* 2001; Koedinger *et al.,* 1995) have made CAI programmes much more sophisticated in their assessment of students' knowledge and in tailoring the subsequent guidance so as to be appropriate to the students' problems.

Several recent reviews of research studies examining the impact of CAI on student learning have established the effectiveness of this approach (Fletcher, 1996; Murphy *et al.,* 2002). One effective programme that illustrates the capabilities of this approach is the *Algebra I Cognitive Tutor* (Anderson and Lebiere, 1998; Corbet *et al.,* 1999). Cognitive Tutor calls on artificial intelligence technology to monitor and model students' problem-solving activity and uses this information to provide the student with customized step-by-step advice, specific to the kind of problem the student is working on and the nature of the student's difficulty.

An alternative approach to using ICT is the constructive approach. Unlike CAI, constructivist approaches support student academic engagement through the use of complex, real-world tasks. In these tasks students use a variety of ICT tools to produce a range of academic products, such as research reports, designs, solutions to complex problems and group presentations. Many of the tools are common productivity applications, such as Internet browsers, word processors, presentation software, and multimedia and web-based authoring tools that learners would encounter in the work world. In the context of a complex, meaningful task, students use these tools to access information on the web, organise and analyse the

information, and create some product, such as a multimedia presentation or web page.

With constructive approaches, learning is individualised around the specific tasks and issues that motivate students' work. However, the primary responsibility for structuring and guiding student work remains that of the teacher. The teacher plays an important role in structuring and managing the learning experiences to fit individual student needs. Database management applications of ICT can help teachers keep track of individual goals and of the problems of the various students in their charge. Frequent feedback is also an important component of the constructive approach to education for the disadvantaged. With this approach, ICT is often used as a way of sharing students' work to obtain feedback from others. Students may give PowerPoint presentations in class or post their work on an intranet or on the Internet, often in electronic portfolios. Feedback may be provided by the teacher, by other students, or by a wider public. Since the frequency of this feedback is important, students often present or post initial drafts or partial products, specifically requesting reactions that can be used for revisions and refinement. To maintain engagement and motivation, it is crucial that this feedback be structured around learning goals – particularly the students' own learning goals – and that the feedback be constructive so as to support revision and further learning.

In the constructive approach, multimedia may also be used for expressive purposes. That is, students often use video, audio, animations and multimedia software to create presentations and productions that convey their understanding of what they have learned, as illustrated in case studies below. In addition, computer-based simulations and models are occasionally used to allow students to build, explore and reason with systems that make underlying concepts and principles visible and concrete. Further, ICT can be used to connect learning to real-world contexts, for example through the use of video case studies in which students apply skills that they have learned in reading, math or science to solve a lifelike problem as presented in an interactive video. Finally, as more and more of the "real world" is moving online, students can use the Internet to access libraries, museums, databases, subject matter experts and potential employers.

The constructive approach to the use of ICT is, as yet, seldom seen in programmes for out-of-school youth and disadvantaged adult learners, although Stites (forthcoming) makes a strong case for why it should be. On the other hand, it is used quite extensively in formal primary and secondary education around the world. A recent international study (Kozma, 2003) conducted in 28 countries identified 174 case reports of highly selected, innovative classroom practices using technology. Many used ICT in constructive ways. Of the 174 cases, nine were targeted at secondary school

students at risk of failure or at ethnic or language minorities. For example, at a French upper secondary school near Paris, students participated in a year-long, multidisciplinary media project in conjunction with taking an international trip to Italy. The subject areas of French and history were addressed through searching the Internet, watching Italian films, analyzing images, and writing the scenario for a short film that focuses on the end of the Roman Empire. During the trip, students collected documents and made daily entries in a trip diary. The teachers guided their students in finding information that was relevant to their scenarios. Students collaborated with one another, providing assistance to each other and giving each other assessment feedback. Students used ICT to retrieve information, to write documents (such as a journey diary or a scenario), and to produce products (such as making and assembling a film, creating websites inserted into the school site, or creating a CD-ROM).

Another case that illustrates the constructive approach is a project in Norway in which students created and built an authentic bathroom with all the fittings. The project consisted of three main phases. The first phase was planning of the whole work process and working out all the details about what the bathroom each group would build would look like. The second was the practical phase, where each group worked on their bathroom. The third phase was presentation and documentation of the results. ICT was an integrated element in all three phases. Each group set up a daily schedule and at the end of the day each student wrote what they did that day in their logbook. The students used Excel to make budget calculations for the project. They had to use email and the web to order materials. And as part of their project the students had to write a report for Norwegian and English classes.

Instructive and constructive applications of computers may be used together, as students find that they need specific basic skills in order to move forward with their project. For example, the *Higher-Order Thinking Skills* programme is a technology-supported curriculum that makes use of popular discrete educational software programmes, such as the Learning Company's Oregon Trail, as a means to motivate and engage children in teacher-supported learning activities. The goal is to develop high-order thinking skills as well as basic skills in reading and writing (Pogrow, 1999).

ICT and the social needs of disadvantaged learners

As mentioned earlier, many the most pressing needs and problems of disadvantaged learners are social. Dropping out is often the result of social disengagement from school as well as of academic disengagement from learning. Often disadvantaged students have had motivational or behavioural problems that have affected their relationships with adults and with peers in

school. Conversely, the values, beliefs, and behaviours of adults or peers at home or in the community may have worked against continued effort in school. All of the effective programmes for the disadvantaged cited by Rumberger (2001) and Slavin and Fashola (1998) had a significant social component. The emphasis was on providing positive adult role models and relationships, and creating strong positive relationships among peers that reinforce success and continued effort.

This has two important implications for the use of ICT with the most disadvantaged. First, ICT should be used in group situations to support social engagement with learning. Often, this is accomplished by collaborative, project-based learning in which pairs or groups of students use a variety of ICT tools and resources to work on a project of shared interest (Brown, 1997). Students in these groups may divide up components of the task based on specific interests or complementary skills. Much learning goes on in the course of student interaction around these join projects, as students seek to understand and to explain their various contributions. Feedback is a natural product of the discussion. The instructor plays an essential role in these group interactions, both in structuring the activities to accommodate the goals and skills of group members, and in structuring the social interaction to assure that it is constructive and contributes to success. Such projects and social interactions may take place in a formal school setting.

The use of ICT by groups of students can occur outside of school. Increasingly, work-based or community-based technology centres (CTCs) have been set up to provide both access to technology and the supportive academic and social environment needed by disadvantaged out-of-school youths and adult learners (Michalchik and Penuel, 2003; United States Department of Housing and Urban Development, 1999). For example, the Seattle Community Technology Alliance (reported in Michalchik and Penuel, 2003) supports community technology centres that provide after-school activities, adult and family literacy programmes, career development and job preparation services, and small business support to low-income areas across Seattle. It provides funding, technical support, leadership, professional development, and opportunities for communication and collaboration to the seven CTCs it currently supports.

A second implication drawn from the social needs of disadvantaged learners is that ICT can be used to create social environments and opportunities for academic interactions for disadvantaged learners. That is, networked computers can allow learners within a group to store, share, and build off of each other's contributions. For example, *Computer-Supported Intentional Learning Environment* (CSILE) allows a group of students to study a specific area of mutual interest over an extended period of weeks

and months and to create shared knowledge. The intent is to support the building of a literate community – to provide students with an ongoing, shared, knowledge-building capability. This is in some ways similar to how scholars and other professional communities create knowledge by sharing the products of their intellectual efforts for a common purpose (Scardamalia and Bereiter, 1999). In CSILE, students create written, online note cards that contain information about what they have learned, what they think, what they are trying to learn, or what they have found in their research. The knowledge base is developed as other students respond to questions, elaborate on statements, give examples, agree or disagree with conclusions, and so on. As students' responses and contributions accrue and become increasingly interconnected, the group collaboratively creates knowledge – sometimes convergent, sometimes divergent – related to their shared topic.

Alternatively, networked computers may allow learners to communicate with people they would not otherwise be able to contact. This might include supportive adults within the community, distant experts, and students in other communities with similar interests. For example, a project in Chile from Kozma (2003), entitled Mi Lugar (*My Homeland*; http://es.geocities.com/milugar_muermos/), had students conduct research on the local traditions, historical events works of art and cultural items of their communities. They used tools such as word processors, spreadsheets and presentation software, and then shared the results with students doing similar projects in schools from other countries, using e-mail and a website specially created for the project.

The social engagement of disadvantaged learners has, perhaps, a third implication for the use of ICT – or rather for its inappropriate use. Distance learning, or virtual schools, is a growing phenomenon in post-graduate, higher and even secondary education (Tabs, 2003; Zucker and Kozma, 2003). One approach in distance learning involves giving the student access to online instructional materials. Students then progress through these materials on their own. Online tutors may be available if students encounter difficulties (Zucker and Kozma, 2003). A second approach looks more like an actual classroom. It involves a teacher, a syllabus, online assignments, and regular meetings – either synchronous or asynchronous – in which the teacher and students do things such as discuss topics and share assignments. The advantage of this approach is that distance learning provides students with access to courses that might not otherwise be available, and their learning is often not dependent on time and place. This advantage can be considerable for adult learners faced with many constraints and competing demands. And it may be an advantage to secondary school students when it gives them access to otherwise limited educational opportunities.

However, there are a number of factors that make this approach ill advised for the most disadvantaged learners. First, disadvantaged learners are least likely to have access to the technology in their homes that would be needed to participate in these programmes (United States Census Bureau, 2001). Secondly – and most importantly – this approach does not provide disadvantaged learners with the social support they need to maintain their engagement in learning. Zucker and Kozma (2003) found that in one virtual school that used online discussions, the interactions between students and teachers and among students were not as frequent or as rich as those in a comparable face-to-face class. Other versions of online schools do not provide even this much social interaction, as students work independently in their home. This may be the reason there is such a high dropout rate reported for virtual schools (Bigbie and McCarroll, 2000; Hittelman, 2001).

ICT and the linguistic needs of disadvantaged learners

The most disadvantaged learners often have serious problems as a result of limited literacy skills. They may also have problems because the language that they speak at home is not the dominant language of the formal education system or of their work situation. Effective learning environments accommodate these issues by building on current linguistic skills and supporting the acquisition of new skills.

A variety of CAI programmes have been developed that specifically focus on the needs of literacy students. Over the past several years, the power of these applications has increased considerably: digital video and audio have been integrated with them, and artificial intelligence technology applications have been incorporated. Literacy tutorials can use the interactive capabilities of computers to help learners build their cognitive skills of decoding and comprehension. Tutorials focusing on decoding skills (which are explained below) can be used to teach word recognition, phonetics, pronunciation, grammar, word usage, and vocabulary. These tutorials are often delivered on a disk or CD-ROM. They typically present information on a target skill – such as a description of a decoding strategy. They then give some examples of the use of the strategy, and problems or exercises in which the learner applies the strategy.

For example, in developing a phonetic decoding strategy in English, the software programme might present several words with the same phonetic base both as text and sound, and note the similarity in the graphemes (letter groups) and phonemes (sounds) of these words. The tutorial might then present additional words with the same phonetic base and students would be asked to apply the decoding rule to read these words. The computer could analyse the student's response, comparing it to the right answer and various phonetic errors that students typically make. It would then provide feedback

based on this analysis. Extensive practice can build speed and fluency, so tutorials could provide many similar exercises in which the rules and strategies are applied. Tutorials that emphasise comprehension could provide students with text passages of increasing length and complexity. The presentation of pictures along with the text can help students use their knowledge of the text topic to support both comprehension and decoding (Mayer, 2001). The software could ask students for responses that show their understanding of the meaning of the text. The computer could, in turn, provide feedback. For some examples of the use of CAI with the disadvantaged in developing countries in the work of Wagner and colleagues in South India, in the Telugu language, see Wagner and Kozma (2005) or the website *www.bridgestothefuture.org*.

Applications of artificial intelligence (AI) allow the computer to understand the students' responses. They allow the computer to adjust the instruction in order to further challenge students or to accommodate specific errors or misunderstandings. Initial applications of AI could accommodate only fairly simple responses from students, such as multiple-choice or a well-anticipated, simple, constructed response. Current AI technology accommodates lengthy responses of relatively unexpected content, although this technology is still not widely available. Recently, AI technology has been combined with new speech recognition technology. This has important implications for first and second language learners (Mostow *et al.,* 2001). With speech recognition technology, the user speaks a word or phrase into a microphone hooked to a soundboard in the computer, and the computer matches the sound to a model sound pattern in its memory. In this way, the computer can determine if the response matches a correct speech pattern or perhaps one of several standard errors in pronunciation, word choice, verb ending, and so on. The software can then make the next instructional move to accommodate the specific response of a learner, perhaps using digital audio. This technology is already being employed in some simple ways that are useful for students with limited language skills. Speech recognition technology is also beginning to be used for children's learning of literacy decoding skills (*e.g. Let's Go Read* [manufactured by Edmark, Novato, CA]) and in commercially available second language tutorial software (*e.g.* the *Learn to Speak* series [manufactured by Broderbund, Novato, CA]). With these packages, the student can read a word or answer a question with a simple spoken response.

Text-to-speech technology can read aloud from emails, web pages or typed text. This can be a big help in giving learners with limited reading skills access to the growing body of digital text on the web and elsewhere. For example, *CoolSpeaking* (Peach Seed Software, Powder Springs, GA) can read text from emails, web pages, or typed text. Advances have also

been made in machine translation. There are now also products, such as *Systran,* that are plug-ins for Microsoft Office and that automatically translate Word, PowerPoint, or Excel documents from and into common European and Asian languages. And there are a number of web-based services, such as *Babelfish* (http://babelfish.altavista.com/) or *FreeTranslation* (http://www.freetranslation.com/web.htm) that produce the automated translation of text materials found on the Web. In certain situations this technology can help learners with limited skills in the dominant language. For example, native Spanish-speaking students in the United States who are still learning English can use these services to translate difficult English passages on a Web page into Spanish and thus both receive help in building their English vocabulary and gain access to information on the Web that may not otherwise be available to them.

Finally, applications of ICT can also support the needs of the most disadvantaged by providing them with a new set of literacy skills. Certainly, the operation of a variety of hardware and software applications is becoming increasingly important in everyday life, and using these applications in the educational environment will prepare students for their use elsewhere. But regular use of technology in the ways discussed here can foster a more complex and important set of skills that are often referred to as "information literacy". From this perspective, literacy is defined as a broader set of text and technological skills that includes not only the decoding and comprehension of text but the ability to access, analyse, evaluate, communicate, and use information to solve problems and create new knowledge (Partnership for 21st Century Skills, 2003; Quellmalz and Kozma, 2003; Wagner and Kozma, 2005; Educational Testing Service, 2002; 21st Century Workforce Commission, 2000; OECD, 2000; International Society for Technology in Education, 1998). Consequently, ICT is not just a means for delivering literacy skills but an integral part of an information-literate society (European Commission, 2000). From this perspective, participation in society not only involves text literacy skills but the skills to use technology to access, disseminate and create new information and knowledge for the benefit of the individual and society. As more and more resources and work opportunities appear online, disadvantaged people – whether in school or out – will need to be prepared to participate in such an information-driven society.

Implications for policy and research

ICT can play an important supporting role in addressing the academic, social and linguistic needs of the most disadvantaged out-of-school youth and adults. This has important implications for policies targeted at this special group of students. There are also implications for the kind of

research that is needed to establish and validate the applications of ICT that work best for these students.

Implications for policy

Two policy implications are clear from this review. First, the use of ICT to reach the most disadvantaged learners must be part of a comprehensive programme to address the academic, social, and linguistic roots of school failure. Technology alone, however advanced, will not address those needs. Dropping out of school is not simply the result of academic failure, and it cannot be addressed merely by developing more advanced technology or more effective educational software. The social and cultural roots of dropping out of school require co-ordinated policies and programmes that involve not only ministries of education, but also those of labour, welfare, and cultural and community services. Such comprehensive programmes must involve multiple layers of the social system – national, state or provincial, and local governments. Programmes must provide academic offerings and job training customised to the needs of school dropouts and disadvantaged adults. These must be combined with programmes that develop home and community environments that value and support school success. If governments expect to bring disadvantaged citizens into the global economy in their respective societies, there is little doubt that education and technological literacy will need to be a core component, or that ICT tools will provide an important scaffold for new and nascent skills. When integrated into a comprehensive programme designed to meet the academic, social, and linguistic needs of disadvantaged learners, appropriate uses of ICT can engage students in sustained academic work, build and support learning communities, and compensate for and develop linguistic and literacy skills. However, it must be noted that inappropriate use of ICT can isolate disadvantaged learners from teachers, fellow students, and community members that could otherwise support their learning and success.

A second implication has to do with access to the computer and network resources that are necessary if ICT is to reach these learners. At both the national and international levels, significant investments have been made to put computers in schools and connect them to the Internet (Anderson and Ronnkvist, 1999; Pelgrum and Anderson, 1999). But only a very small fraction of this investment has been made for out-of-school and at-risk youth or for poor adults (Wagner and Kozma, 2005). While discussions of the digital divide most often contrast ICT resources in the developed and less-developed countries (United Nations Development Programme, 1999), there are also digital divides within countries, and these parallel the "advantaged-disadvantaged" fault lines. A recent National Center for Educational

Statistics report (2003) indicates that approximately 65% of African-American and Hispanic students have access to computers in their schools, compared to 79% of non-Hispanic white students. On the other hand, African-American and Hispanic students are far less likely to have home use of computers: approximately 30%, compared to 60% for non-Hispanic whites. Consequently, dropping out of school eliminates the primary source of access to ICT for African-American and Hispanic students and reduces the prospect that ICT can be used to address their needs. Any programme that attempts to use ICT to reach the most disadvantaged students will need to draw these learners back into schools or invest heavily in out-of-school computer access. Alternatively, investment in community technology centres might be the best way to provide access, particularly if such centres also house the co-ordinated academic and social services that would support improved learning in disadvantaged youth and adults.

Implications for research on what works

Both policy makers and practitioners seek to know what works in all areas of education, and especially so in the relatively expensive world of ICT. While there are some examples of programmes that assist youth and adults, most of these are as yet inadequately investigated by researchers. Often reviews that consider ICT programmes for out-of-school youth and adults, such as this one and those of others (Office of Technology Assessment, 1993; Stites, forthcoming), must rely on studies conducted in formal school settings and on software packages designed for much younger learners. More research needs to be conducted (and, for that matter, more programmes need to be developed) that focus on the use of ICT that is specifically designed and structured for out-of-school youths and adults.

What is needed is more than just further and better research. Too often a claim that something works relies only on case studies or self-reports by programme staff. These studies often examine programme implementation rather than measure outcomes. Or, claims of improvement are based only on pre/post measures, rather than on comparisons with alternative approaches or current practices. What is needed, the authors believe, are new approaches to determining what works when ICT is used in education. This would apply, in particular, to the most disadvantaged – those who come to the learning situation with the greatest diversity of home and social backgrounds. Slavin and Fashola (1998) call for more rigorous research in education generally, and Murphy (*et al.,* 2002) directs this challenge at ICT research more specifically. The authors reiterate this call. Research is needed that uses experimental designs. In such designs, well-defined programmes are compared to alternative approaches or current practices that are equally well defined. Control or comparison groups must be matched for

background characteristics of the participants, particularly age, ethnicity, literacy skill, previous academic success, and school and community characteristics. Standard outcome measures need to be used along with new measures designed to assess information literacy skills (Quellmalz and Kozma, 2003) and any measures that are specifically designed for the programme. Standard approaches must be used to analyse the data for individual studies and to aggregate the results across multiple studies. At the same time, in order to understand the social and linguistic dimensions of success and failure as discussed earlier, qualitative and ethnographic studies are crucial in assuring that the data collected from standardised measures are appropriately gathered upfront and interpreted downstream (Wagner, 2004).

These efforts would be greatly facilitated, especially in aggregating studies across countries, if researchers from international organisations such as the Organisation for Economic Co-operation and Development and the International Association for the Evaluation of Educational Achievement could agree on a common definition for the most disadvantaged out-of-school youth and adults; a common taxonomy for describing programmes (including those that are ICT-based) that address the needs of these students; a common set of standards and instruments for measuring the outcomes of these programmes; and a common approach to analysing data.

Clearly this renewed approach to determining what works requires significant policy and budgetary commitments. But such commitments are also required for the comprehensive services needed by out-of-school youths and adults. Until these commitments are made and acted upon, we will not know with confidence how ICT can reach the most disadvantaged learners and exactly what works best.

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Chapter 6

Lessons on the uses of ICT for out-of-school youth and adults in developing countries

Bob Day and Rod Grewan

Summary

Over the past three decades, the convergence (both in terms of technology and markets) of telecommunications, the mass media, networked computing environments and the Internet has changed the way the developed world works and plays. This information and communications technology (ICT)-based "network society" is seen as the generator of a "new economy", manifested in such icons as Silicon Valley and the Asian Tigers. However, almost all of these dramatic changes have been taking place in the developed world, while the developing world, especially Africa, appears to be falling ever further behind. This "digital divide" will continue to widen as long as Africa is excluded from the network society and the new economy. This chapter proposes that the universal provision of a broader vision of literacy, including informational literacy, is an essential first step in reversing this exclusion and stimulating sustainable development.

The chapter is in three sections. First the evolving definition of literacy is examined, from provision of the basic "3Rs", to the much broader vision of informational literacy, where each individual is empowered to become an active member of the emerging information society. ICTs are seen to be having an ever-growing impact on global literacy issues in two ways. As a disruptive technology, they are providing much more flexibility in the ways in which literacy programmes are being designed, developed and delivered in response to a wide variety of learner circumstances. Secondly, as the precocious tool of the information society, ICTs and information literacy are establishing themselves as essential components of the basic skills set needed by all people, including those in the poorest and most remote communities.

In the second section, Sub-Saharan Africa's response to these ICT challenges is discussed from three viewpoints: the ways ICTs are impacting on the design, development and delivery of traditional literacy programmes; what is being done with regard to ICT and information literacy, especially

for all sections of society; and the impact the broader vision of informational literacy is having. Although this vision does appear to be impacting some policy processes in some parts of Africa, at the implementation level ICT and information literacy generally continue to be regarded as peripheral issues, especially when considering (again) the poorest and most remote communities.

In the final section the relationship between informational literacy and sustainable development is discussed. On the basis of the UNDP's technology-knowledge-innovation-economic development cycle, individual participation is thought to begin with general, ICT, and information literacy. The fascinating case history of the Finnish Information Society, which lends significant tangible support to the UNDP and other models, is summarised. The culture of "citizen innovation" appears particularly relevant to Africa, together with the Finnish national policy of *ICT-led* regional development via coherent strategies to establish local information societies in the most remote and disadvantaged communities.

The Changing Face of Literacy[1]

Despite considerable effort over the last half-century,[2] there has been disappointing progress in overcoming the fundamental problems of literacy in both the developed and developing worlds. When UNESCO was established shortly after the Second World War, literacy was a key component of its mandate and, over the decades that followed, it has been included on the agendas of nearly all the international and bilateral agencies. Indeed, literacy has been emphasised as a global problem by many international conferences since the mid-1970s. The 1990 UN World Conference on *Education for All* (EFA) in Thailand was particularly important for this issue, since it resulted in a number of educational goals related to youth and adult education, including:

- To reduce the number of adult illiterates to half of the 1990 level by the year 2000, while reducing the male-female disparity.
- To improve learning achievement to an agreed percentage of an appropriate age cohort (which might vary from country to country).
- To emphasise a new approach to learning that focuses on measurable learning achievement (rather than mere class attendance or participation).

Worldwide, a disproportionately small 5% of national education budgets are spent on the much higher proportion of the population that is functionally illiterate. A recent UNESCO review[3] estimates that there are nearly 862 million illiterates in the world above the age of 14, over 60%

women. Some 27% of the total population in developing and underdeveloped countries is illiterate, although some improvements in literacy rates have been noted since 1990. While UN data are widely used for such analyses, comparisons of illiteracy rates among countries and across time should be made with some caution and are likely to be underestimates.[4] In addition, national and international assessments of literacy based on traditional definitions have serious limitations.[5]

The evolution of the definition of literacy is, in itself, a fundamental issue. At the 1990 EFA Conference, the limited traditional view was broadened to include basic learning needs or competencies, *i.e.* mastery of the "3Rs" together with other knowledge, problem-solving and life skills.[6] Useful contemporary definitions fit the above model and describe literacy in relative rather than absolute terms, *e.g.*:

> The ability to understand and employ printed information in daily activities, at home, at work and in the community – to achieve one's goals, and to develop one's knowledge and potential.[7]

With the advent of the United Nations Literacy Decade (2003-2013)[8], the International Action Plan[9] calls for an even broader, renewed vision of literacy, stating that:

> Literacy for all is at the heart of basic education for all and creating literate environments and societies is essential for achieving goals of eradicating poverty, reducing child mortality, curbing population growth, achieving gender equality and ensuring sustainable development, peace and democracy.

In addition, the International Action Plan specifically includes information literacy in this vision:

> [It] has become necessary for all people to learn new literacies and develop the ability to locate, evaluate and effectively use information in multiple manners.

How do ICTs impact on this vision, both in the immediate and longer terms?

Literacy and ICTs: A complex relationship

The arrival of personal computers (PCs) a quarter of a century ago turned everyone (theoretically) into a potential computer user. It was inevitable that these PCs would be linked to the Internet, which had been established in the United States in the 1960s and 70s. In the 80s and 90s, the PC-Internet combination converted the Internet from a tool used mostly in military and academic circles into the global phenomenon we are still trying

to come to terms with today. This in turn has changed the nature of the PC (and its most popular applications) from being predominantly a processing tool into a powerful and highly flexible communications platform.

In the context of the PC-Internet combination, three powerful trends appear to be driving the information revolution:

- *Cost of communicating:* The transmission cost of sending digital data has decreased by a factor of 10 000 since 1975. This is largely due to technological developments in fibre optics enabling considerable bandwidth at lower cost, and microelectronics that have reduced costs of telephone networks by replacing electromechanical switching. Smart wireless technology is also having a huge impact, as evidenced by the phenomenal growth in global cellular telephony.

- *Power of computing:* Computing power per dollar invested has also increased by a factor of 10 000 since 1975. Integrated circuits combined with the increase of transistor density on microchips and significant gains in the economies of scale in the production of these components mainly account for this progress.

- *Convergence:* Analogue technologies are being replaced with digital technologies. Using a single binary code system, digital technology is capable of dealing with voice, video and computer data over the same network; in the era before convergence, independent carrier technologies were necessary.

Taken together, these trends have given rise to the merging of the computing (IT) and communications sectors into a single sector, now referred to as the "Information and Communications Technology" (ICT) Sector.

We have already seen that literacy is a multi-factorial issue with an ever-broadening definition. ICTs are disruptive, cross-cutting technologies, having the potential to impact on all aspects of human society. The inevitable combination of literacy provision and ICT, therefore, has created a complex matrix full of exciting opportunities. However, it is problematic for the wide range of stakeholders involved in global and local literacy issues – whether policy makers, researchers or practitioners – to understand and stay abreast of the immediate and potential impact of ICTs, especially given their dynamic nature. We should not allow this initial threshold of intimidation to prevent (or delay) the significant benefits that can be provided, particularly to those most in need.

How are ICTs currently being used to support the acquisition of literacy and basic skills? At this stage, the discussion will remain within the OECD's definition of literacy set in 2000[10], as described above. Two approaches have dominated the application of ICTs to traditional literacy[11], *i.e.* ICT-based instructional tools and ICT-enhanced distance learning.

ICT-based instructional tools: In this approach, the capabilities of ICTs can be used to deliver instruction. Unlike earlier technologies, the growing interactivity of ICTs provides an input-processing-output capability that can be used to develop computer-based tutorials that support the cognitive processes involved in reading and understanding text. New developments in ICTs are likely to continue to increase their impact via such interactive tools.

One of these emerging technological advances that is of particular interest in Africa is human language technology. Speech recognition software now runs on high-end PCs, and can process input from a variety of users with little or no training. Also, text-to-speech technology is beginning to find commercial applications that can read text from emails, web pages, or typed text. These technologies have only recently become commercially available, but, as with similar technological advances in the past, their costs are dropping quickly, while their power is growing.

They hold particular promise for the near term in the developing world because of long-standing concerns regarding the language of instruction (LOI).[12] In rural Africa, the importance of literacy in the local language is clear, yet many argue that the provision of such programmes is impractical, and that international languages are more cost-effective. Problems associated with the provision of literacy programmes in local LOIs include:

- Poor and insufficient materials in local LOIs.
- Lack of research-based materials in local LOIs.
- Teachers who are poorly trained in local LOIs.

The development and application of ICT-based human language technology tools now offers the real opportunity to cost-effectively address these problems, and to give learners and teachers the option of language of choice.

ICT-enhanced distance learning: In this approach, ICTs are used for learning at a distance when and where sufficiently trained teachers and other resources are lacking. The earliest distance learning programmes in the developing world were correspondence based and mostly at the tertiary level, *e.g.* in the Philippines (in 1940), South Africa (in 1946) and Indonesia (in 1955). More recently, developing countries have used radio and television to broadcast literacy programmes to remote populations.

Distance learning is playing an increasingly important role in developing countries.[13] There is a growing realisation that mass provision represents the only viable solution to many aspects of the global education (and literacy) crisis, operating as a major alternative form of education. However, there is a grave danger that many forms of ICT-enhanced distance education currently being practiced will be misinterpreted as the "massification solution", since, according to Dhanarajan,[14] "...there is as much ignorance among many in education as among those outside it about what distance education can do and cannot do, what does and does not constitute good practice in distance education, its efficiencies and governance."

ICTs and an ever broader vision of literacy

The foregoing discussion has adhered to a definition of literacy that, in effect, limits the role of ICTs to the provision of a set of potential delivery and instructional tools, used to help people acquire the skills associated with traditional notions of literacy. However, an even broader vision emerges when literacy and ICTs are considered in the light of the knowledge society, which is fundamentally changing most aspects of people's activities (work and leisure) in both the developed and developing worlds.

The United Nations Development Program (UNDP) has produced a model[15] of the multi-factorial relationships between technology, skills development and economic development, where:

- A country's ICT investments can directly enhance the capabilities of its citizens.
- Increased skill capacity can, in turn, support the further development and increase the productive use of the technological infrastructure.
- The growing sophistication of the skill base and the technological infrastructure can lead to innovation and the creation of new knowledge and new industries.
- New knowledge and innovation can support the growth of the economy that, in turn, provides resources needed to further develop the human, economic, and technological infrastructure and the welfare of society.

In this vision, ICTs are an integral part of an information-literate society and personal participation in this technology-knowledge-innovation-economic development cycle begins with literacy. Hence, literacy includes not only the decoding and comprehension of text but the ability to access, analyse, evaluate, communicate and use information to solve problems and

create new knowledge.[16,17] ICT, therefore, plays a much more fundamental and multi-factorial role than merely providing a delivery and instructional mechanism. This broader vision of literacy better addresses the needs and realities of youth and adult literacy learners and users within communities that can generate, share, and use knowledge for the benefit of all.[18]

Literacy and ICTs in sub-Saharan Africa: The current situation

ICT and literacy programmes in sub-Saharan Africa

In most African countries there are insufficient data on actual literacy rates, and challenges remain in finding meaningful ways to measure progress in terms of literacy on a country-by-country basis.

There are many initiatives through bilateral and multilateral institutional arrangements that are in place, including NEPAD, UNESCO, EFA, ECA, and the AU. In 1999, the Economic Commission for Africa (ECA) hosted the African Development Forum (ADF), to establish an African-driven development agenda that reflected the consensus of the major partners and that led to specific programmes for country implementation. The theme of ADF '99 was "The Challenge to Africa of Globalisation and the Information Age". The ADF '99 Post-Forum Summit considered concrete action programmes covering four theme areas: youth and education; health services; e-commerce; and ICT policy. The three sectors under the youth and education theme, named the African Learning Network[19], are school-based programmes (SchoolNet Africa), programmes for out-of-school youth (OOSYNET), and university-based programmes (VarsityNet).

Prior and post ADF, other donor initiatives have been ongoing in Africa:

- UNICEF have also established a youth rights Internet project, Voices of Youth[20], operated within the framework of the UN Convention on the Rights of the Child to provide learning materials and activities (including photo essays, quizzes, case studies, discussion on social issues and youth rights issues. One of its most frequent activities is organising discussion forums (youth-youth and youth-policy maker) via web discussion (message boards) or chat. Topics have included HIV/AIDS, Water Rights, Gender Discrimination, Armed Conflict and Peace, Inter-country Adoption, Religion and Tolerance.
- Childnet International[21] is a non-profit organisation that seeks to promote the interests of children in international communications. Childnet's priority is to ensure that governments, industry and child

welfare groups work together at the strategic international level to protect children by:

- Promoting wide access to new technology and quality content for children.
- Seeking to spread good practice in promoting media awareness and Internet skills to those who guide children.
- Challenging governments and industry to develop child-friendly media policies.

There is an impressive list of further donors[22], private corporations and NGOs with ICT-based African initiatives related to literacy (either explicitly or implicitly), and involving youth, schools or education[23]. However, there is growing concern over an apparent lack of co-ordination as well as over a limited differentiation of the challenges and appropriate interventions. As a result, there is often a replication of efforts and exclusion of specific interventions for explicit, predefined subgroups like out-of-school-youth.

Radio and television, as broadcast technologies, have the advantage of leveraging costs to address the needs of a large number of learners over distance and, with rebroadcast, over time, making them attractive in Africa. Historically, educational broadcast programmes started off in "talking head" format and were designed to distribute information to large numbers of students very inexpensively. However, the lack of interactivity and, in the case of radio, the lack of visuals significantly limit the instructional support that can be provided to students.[24]

More recent developments have found ways to "work around" some of these limitations. For example, interactive radio instruction (IRI) uses a methodology that requires learners to stop and react to questions and exercises through verbal response to radio and engages them in group work and physical and intellectual activities while the radio programme is on the air.[25,26] In South Africa, rural students participating in IRI showed higher gains, relative to control groups, than did participating urban students, and girls gained more than boys.

Probably the best-known application of educational television is *Sesame Street*, which is preparing children in 140 countries around the world to begin school and literacy. In South Africa it is called *Takalani Sesame*, and in Egypt it is known as *Alam SimSim*. In Egypt, more than 90% of children under age eight (over 4 million) in urban areas and 86% in rural areas watch the show.[27, 28] Significantly, 54% of mothers regularly view the series.

While broadcast radio and television have had a long history in distance education, the use of the computer to create virtual classrooms at a distance

is quite new and remains at the experimental stage in most African countries. However, at the post-secondary level, the African Virtual University (AVU), organised by the World Bank in 1997, has established 31 learning centres at 17 currently participating African universities. Its initial results, based on international, synchronous video conference-based lectures, were disappointing. However, the ICT strategy has now broadened to include a combination of online materials, online chat, video broadcasts, CD-ROMS and DVDs in both synchronous and asynchronous modes.

Literacy in South Africa

South Africa has a long history of adult literacy initiatives.[29] Some key policy documents for Adult Basic Education and Training (ABET) Policy Reform by the post-Apartheid government since 1994 include:

- The African National Congress's Implementation Plan for Education and training of April 1994, produced by the Centre for Education Policy Development.
- The Education White Paper of March 1995.
- The National Department of Education's "A National Adult Basic Education and Training Framework: Interim Guidelines" of September 1995.
- The research project report of 1996 on Adult Basic Education and Development, compiled by the Department of Education, Congress of South African Trade Unions, Development Bank of Southern Africa, the Centre for Education Policy Development, and National Literacy Co-operation.
- The Department of Arts, Culture, Science and Technology Language Plan Task Group's final report of 1996, "Towards a National Language Plan for South Africa".
- The Department of Education draft policy document of 1997, "Adult Education and Training in South Africa", as well as its draft: "A Four Year Implementation Plan for Adult Education and Training: Provision and Accreditation".

Despite South Africa's long history of adult literacy activities, estimates today suggest that 3.5 million adults over the age of 16 have never attended school. Another 2.5 million adults have had some schooling but were ill taught or lack practice and so have lost their prior ability to read or write. Hence, 6 million South African adults today are either illiterate or "low literate".

In 2000, the ABET Act and the regulations for a National ABET Board provided a legislative framework for the establishment, governance and funding of ABET centres. Through the Adult Education and Training Multi-year Implementation Plan (MYIP), the qualities of both ABET provisioning and delivery have been actively addressed. The National ABET Board monitors the progress of the MYIP, and acts as an advisory body to the Minister. In the same year, the Department of Education also launched the South African National Literacy Institute (SANLI), to oversee the establishment of a voluntary service to reach an estimated 3.3 million illiterate adults. The engine for this literacy campaign is a partnership between UNISA's Adult Basic Education and Training Institute (ABET) and the Department. They aim to achieve a target of 2 million adult learners completing the literacy programme by 2004.

Today, ABET and literacy is provided through many South African government departments, donors, agencies, NGOs and corporations. Most projects in South Africa have yet to be evaluated for their contribution to broader literacy issues. Unfortunately, linkages between theory and practise have not been developed in an integrated and holistic manner. In addition, formal links do not exist with other related programmes, *e.g.* poverty relief; land reform; agriculture; water and sanitation; entrepreneurial skills development programmes.[30]

Given the above variety of ABET and literacy projects being deployed in South Africa, a report in 2000 [31] identified certain general observations, including:

- The predominance of English, both as a subject and as a language of instruction, is overwhelming.
- The extent of ABET numeracy and mathematics learning support materials (LSMs) is a source for satisfaction, since there was virtually no material in this area before about 1994. The quality and number of programmes is impressive.
- Many courses supply facilitators' guides of varying usefulness. In spite of these, the evaluations indicate that the finest materials, including those created for distance education, cannot do without adequately trained and supported ABET facilitators.
- The existence of Unit Standards and outcomes-based assessment has had a strong positive influence on the design and quality of LSMs.
- There is a strong tendency to publish ABET LSMs as substantial sets of workbooks. Whether this is necessary, desirable or affordable seems seldom to be considered.

- Most workbook-based programmes are self-sufficient, which is useful yet problematic in not opening up to learning beyond the course.

It is clear from the numerous ABET LSMs that ICTs have been neglected in low-literate groups, because of the perceived high costs in low-income areas and their limited profit potential.

There are many organisations investing in youth in South Africa.[32] Many of these organisations played a significant role in South Africa's political liberation. However, these organisations mobilise youth around political issues, while civil society youth organisations mobilise youth around sports and religious issues. Other organisations such as Soul City and Love Life are trying to reach out to youths on the topic of HIV/AIDS and health awareness. Importantly, these latter organisations are said to be more in touch with youth at grassroots levels than are the political youth associations.[33]

Very few youth development organisations are seen as mobilising youth around economic issues or ICTs for development. Most are geared towards life skills and basic computer literacy. The role of these organisations in supporting youth ICT skills development is seen as essential, particularly since the school system is considered unable to cope alone; the quality of career guidance is seen as poor; and tertiary educational institutions are seen as out of touch with the needs of the job market and employers. One expert said that while many of the issues about failures in youth ICT training provision were systemic, that did not mean that youth organisations had to wait for this to change before doing something. It is suggested they transform themselves organisationally and begin addressing the issues in proactive and solution-oriented ways.[34]

Within the education system itself, SchoolNet South Africa (SNSA, a Public Benefit Organisation) has helped catalyse the adoption of ICTs within the school system. Since its establishment in 1997, SNSA has deployed computers in over 1 300 schools and trained more than 10 000 teachers in basic ICT literacy. In addition, donors and South African corporations have pushed computers into schools via a variety of mostly unco-ordinated projects of variable quality. As a result, the percentage of schools with computers for teaching and learning increased from 12.3% in 1999 to 26.5% in 2002 (*i.e.* 8 000 of the 28 000 schools in South Africa). The numerous projects have stimulated awareness of at least some of the multiple benefits of ICTs in schools among students and teachers. The potential advantages of ICTs in the broader education system have recently been acknowledged by the National Department of Education which, in its draft White Paper on eEducation[35], suggests that by 2013 all learners

graduating from the school system should be ICT literate. What is the next phase?

Emerging evidence from research studies demonstrates that the opportunities ICTs present to create associations and make appropriate contextualised meaning are enhancing learning. ICTs in a relevant educational context expand access to new information and support people's efforts to make meaning and opportunities for their lives.[36] Yet there is complementary evidence that "no learning" can also result from the inappropriate use of ICTs. SNSA has observed that poorly managed schools and/or poorly designed programmes have derailed any excitement for learning that the introduction of ICTs had originally introduced.

ICT and information literacy in sub-Saharan Africa

Over the past three decades, the convergence (in terms of both technology and markets) of telecommunications, the mass media, networked computing environments and the Internet has changed the way the developed world works and plays. This ICT-based "network society" is seen as the generator of a "new economy", manifested in such icons as Silicon Valley and the Asian Tigers. However, almost all of these dramatic changes have been taking place in the developed world, while the developing world, especially Africa, appears to be falling ever further behind. This "digital divide" will continue to widen as long as Africa is excluded from the network society and the new economy.

A recent study for UNESCO of ICTs and the African tertiary sector (*i.e.* the development of "e-Campuses" or "Virtual Campuses" in Africa), carried out by one of the authors (Bob Day), involved both study tours to a variety of higher education institutions (HEIs) in Senegal, Ghana, Ethiopia, Kenya, Uganda and South Africa, and desk-based investigations of Tanzania, Mozambique, Mauritius, Madagascar, Zimbabwe and South Africa. One of the areas of investigation included "ICT Literacy and the Role of the Tertiary Sector - Staff, Students, and Broader Society". Some of the relevant findings of the report[37] are summarised below.

National policies or initiatives to promote ICT literacy throughout broader society, including the poorest communities, were not reported. However, some governments are promoting ICT access and literacy for the general public via initiatives such as the promotion of school and community centre connectivity (particularly via VSAT), and the improvement of vocational ICT training in high schools. The participants recognised that if HEIs were not yet playing a central role in promoting universal ICT literacy for the rest of society they should be doing so, since they arguably have the best capability. Although a few HEIs are

collaborating with school connectivity initiatives (*e.g.* SchoolNet), generally HEIs are not yet involved in co-ordinated strategic initiatives to provide the general public (particularly the poorest communities, women, and the disabled) with access to PCs and the Internet, to ICT literacy courses, or to other ICT-enhanced services.

With few exceptions, Africa's HEIs (whether large or small, public or private) have no co-ordinated institutional policy or strategy for promoting the ICT literacy of staff or students, let alone the needs of the general public. The lack of ICT literacy within the executive management teams of most large African HEIs may help explain this, as well as emphasising the importance of promoting universal ICT literacy. Conversely, the majority of students, irrespective of their course, put computer labs as a high priority, linking the spread of universal ICT literacy with the availability of PCs.

In general, large public HEIs in Africa lack sufficient network infrastructure, PC laboratories and quality ICT instructors to provide most staff or students with adequate access. The set-up, upgrade and maintenance costs are crippling most HEIs, seriously inhibiting further growth of these facilities. However, the new opportunities being offered by open source software (OSS, particularly Linux) are being recognised more widely.

In contrast, many medium-sized private HEIs promote ICT literacy both for staff and all students, often emphasising email which has become a major administrative/communications tool for these more cost-disciplined institutions. Most are successfully providing ICT literacy courses to their full student body, having already achieved the "reasonable" 1/20 ratio via PC laboratories which also provide Internet access. In addition, these PC labs are often made available to the general public after hours and at weekends, using a wide variety of business models, including "cyber cafés". Therefore, the medium-sized African institutions are often more advanced than the larger public HEIs in the drive for universal ICT literacy, albeit for non-strategic reasons.

Concerns were raised regarding the poor quality of some of the ICT literacy training courses that are frequently used in Africa. It was also emphasised that ICT training is of little value when not quickly and regularly reinforced. The best results are said to be produced in teacher training colleges, where young potential teachers (especially science teachers) adopt ICTs much more readily. The issue of teachers (especially older teachers), acting as a bottleneck, rather than providing a "multiplier effect", in disseminating ICT skills to the young merits further investigation.

In general, young people (including pre-teens) were found to assimilate to PCs and become ICT-literate much faster than adult trainees. Indeed, the best of these youngsters can extract significant value out of even the oldest

machines by investigating their inner workings rather than simply using them to run the usual applications. In some cases, this experience has led to "reverse mentoring", where ICT-literate students help with the learning of ICT-illiterate teachers and other adults.

Recent trends in ICTs in South Africa

To date, ICT industries have not been major players in the economies of most African countries, which tend to be consumers (and only in large organisations and elites), rather than producers to any significant degree. Africa, led by South Africa, has been importing developed-world ICTs and employing them in a variety of ways for more than two decades, but with negligible impact on the exclusion and poverty of the vast majority of its people. South Africa has the largest ICT Industry in Africa. In 2002 it was the 20th largest country market for ICT products and services, accounting for 0.6% of worldwide revenues.[38] If the telecommunications market is included then the total ICT market in 2000 was ZAR 79 billion.[39] But is this an indigenous ICT industry?

The corridor between Johannesburg and Pretoria can be described as an ICT cluster, centred on the MidRand region. But very few of the ICT products are South African in origin, and so do not contribute directly to substantial local productivity. South Africa's ICT industry is made up of multiple outposts (satellites, or fully dependent subsidiaries) of mostly multinational companies that find MidRand the best environment from which to sell on their products (developed elsewhere, and mostly for different markets) – primarily into the developed component of the South African market, but also into any organisation in the rest of Africa that has the funds. Much of the income derived, therefore, is siphoned back into other components of the multinationals elsewhere in the world, draining the already depleted African economy.

There is significant evidence that the growth of South Africa's ICT industry (and particularly its indigenous component) is being seriously stunted by the insufficient supply of appropriately qualified, trained and/or experienced people. It is estimated that up to 165 000 students will be needed to address ICT skills shortages in the near future.[40] A recent study[41] undertaken by the Department of Trade and Industry that examined the rate of diffusion of ICT within eight industry sectors showed that higher education institutions (HEIs) were hardly considered by industry as sources of information or training in ICTs.

The fundamental message is that South Africa's current education system – given the pressures described above, and compounded by the dynamism and expansion of the ICT "realm" – cannot alone even begin to

satisfy the wide range of training and education needs that are required in the immediate future. And this particularly includes ICT literacy. Hence, there needs to be a holistic national strategy to address this problem, otherwise the full potential of ICT will not be achieved. There is a growing belief that the extensive inclusion of open source software at all levels of ICT education and training has become essential in South Africa's current circumstances.[42]

It seems clear that South Africa can only create genuinely indigenous ICT industries by actively producing, and in large numbers, innovative ICT-based solutions to satisfy genuine, local developing world needs. In a sense, MidRand is counter-productive in achieving this end. It looks good and it impresses locals and visitors alike. It is useful to have, and creates some benefits. But MidRand is not, and has not been set up to be, an indigenous ICT industry.

Visions of literacy in sub-Saharan Africa

Throughout Africa, continued pervasive illiteracy, poverty and inequality are the major threats to prosperity, stability and peace at the beginning of the Information Age. It seems an aberration that, while extensive discourse continues around the "United Nations Literacy Decade: Education for All", and globalisation and ICT development initiatives encourage nations to become e-ready, the analysis of the reports received over a five-year period by the UNESCO Institute for Education show few signs of change.[43] The unfortunate fact is that the gap between North and South is much wider today than it was in 1997 during the time of CONFINTEA V.

UNESCO, being the lead agency for both Education for All (EFA) and the Literacy Decade, stated:

> The Dakar Framework for Action contains two fundamental conditions which must be fulfilled at the national level before partner members of the international community will contribute resources required for the implementation of the national EFA plan:
>
> Condition-1, is that specific national conditions for EFA development (and for the development of the education sector as a whole) must be in place and functioning, including among others, government leadership, systematic consultation with national civil society and implementation reforms addressing the EFA goals, a sustainable national funding framework, and a coherence and synergy of all human development activities within the national development framework; and

Condition-2 is that a credible EFA plan must be in place to support condition-1.

Two years later, in April-May 2002, the UNESCO regional bureau in Dakar (BREDA) conducted a survey of progress during the first phase of EFA. A questionnaire was sent to all 44 countries of sub-Saharan Africa. Only 30 countries responded. Of those 30, only 9 had finished setting up and establishing administrative steering bodies; only 2 had mobilised all the resources required for drawing up the EFA plan and start-up activities of their national forum; only 4 had completed the phase of technical preparation; only 1 had finished consultations; and only 1 had completed the phase of plan validation.[44]

The critical factors required for achieving tangible results were identified in a review and prepared by Jomtien.[45] But the declarations and commitments have had little or no impact on decision making or action in many African countries. The complex issues and lack of funds that African nations face are proving difficult to prioritise across a range of basic human needs that are yet to be fulfilled.

A broader vision of literacy in SADC

In facing the challenges around an expanded vision for basic education, the Southern African Development Community (SADC) Protocol on Education and Training has as its ultimate objective to progressively achieve equivalence, harmonisation and standardisation for education and training systems in the SADC region.[46] The preamble of the SADC Education Protocol points out that "no SADC Member State can alone offer the full range of world quality education and training programmes at affordable costs and on a sustainable basis". To strengthen regional co-operation, the SADC Education and Training Sector adopted the idea of establishing regional Centres of Specialisation and have launched a feasibility study on an intra-regional skills development programme.

SADC has recognised that their current education and training systems are rapidly becoming obsolescent, particularly because of developments in ICTs and globalisation.[47] Furthermore, SADC faces a conundrum in that the very foundations for an information society – basic literacy, numeracy and technology skills – are lacking in most SADC member countries. The need for appropriate, purpose-directed education and training, to quickly make people productive and competent, cannot be overemphasised, whether the learner is a subsistence farmer in a drought-stricken land or an information worker in a highly industrialised country. To be able to better sustain oneself, complete tasks more competently and improve one's position or

standard of living are but a few of the needs that remain. Education must support both employment and self-employment.[48]

Pointers to the realisation of the broader vision of literacy in Africa

In the previous sections we have seen that the broadest vision of literacy involves each individual being empowered to become an active member of the emerging information society. Although these insights are being included in policy processes in some parts of Africa, *e.g.* SADC, the evidence is that they are yet to filter down to the implementation level, in either the education sector or the ICT industry. Throughout Africa, ICT and information literacy continue, in general, to be regarded as peripheral issues, especially when considering the poorest and most remote communities.

However, history shows that the sustainable development of these communities will not happen unless and until it is actively driven by individuals and groups from within them. This concept is inherent in the UNDP's technology-knowledge-innovation-economic development cycle,[49] where individual participation begins with general, ICT and information literacy. In addition, the United Nations Industrial Development Organization[50] encourages developing countries to take the "high road" to development not only by building new institutions and infrastructure, but also by providing the support needed to create new skills, information, and capabilities at all levels of society. A recent World Bank report[51] argues that skills needed for lifelong learning not only prepare citizens for competition in the global market but also improve their ability to function as members of the community, thereby increasing social cohesion, reducing crime, and improving income redistribution.

It seems appropriate to end this chapter with a fascinating case history that lends significant tangible support to these models and theories.

Finland's remarkable success story: Special relevance to Africa?

The recent analysis by Manuel Castells and Pekka Himanen entitled *The Information Society and the Welfare State: the Finnish Mode*[52] provides a range of refreshingly new insights into this global phenomenon from the perspective of a country whose impressive success was not anticipated (either globally, or within Finland) even twenty years ago. From the African viewpoint, what is most compelling is not only the dramatic local and global economic success, but also that it appears *inclusive to all* in Finnish society.

Only three generations ago Finland was one of the poorest countries in Europe, with a mostly peasant population largely dependent on its forest

resources. It was a poor agrarian society, like much of present day Africa. But in 50 short years it has transformed into Europe's most innovative and technologically advanced society at the forefront of informational development, with almost no poverty. This growth came from the multi-factorial development of *all* its people, particularly in the areas of science, technology and engineering, as well as more recently from general, ICT and network literacy.

In terms of the technological-economic dimension, Finland is as advanced as Silicon Valley or Singapore. But Finland's model stands out not only when we consider that dimension but also (and especially) when we consider social justice. The global trend is for the informational economy to leave unconnected to its network those who are "valueless", thereby increasing social injustice in the form of income inequality, polarisation, poverty and social exclusion. Individuals who are least valuable to the networks of informational capital are left on their own, in a position from which it is very difficult to change their fate. In the developed world this affects minorities, usually due to educational, health, or social reasons. But in Africa, this applies to the majority of the population.

In sharp contrast to the one-dimensional views of many futurologists, Castells and Himanen argue that the Finnish model gives the lie to the dogma that there can be only one model (earlier thought to be Silicon Valley) that information societies should follow. Instead, they propose that the significance of the Information Age is that it is a global, diverse, multicultural reality.

The following model appears to underlie Finland's dramatic rise to success:

- The fundamental driving force appears to be Finland's unique, holistic approach to the stimulation of *innovation* in all areas of society, including the most disadvantaged.

- In parallel with the emergence of this highly innovative environment, Finland has experienced several *major transformations of its private sector* in particular, and its economy in general, and appears to have set itself up to continue to do so.

- The Finns have discovered that it is not possible for all sections of society to develop at the same pace, nor is it healthy to try to force them all to develop in the same way. Yet they have succeeded in *overcoming the urban-rural divide* by aiming to include everyone in their informational society.

Of course, this model is simplistic. There are many more major issues which should be seen not in isolation but as interacting components of a greater whole. However, fundamental to both the first and third points is the issue of universal literacy, in its broadest informational sense.

The Global Information Society: Relevance to Africa?

Castells and Himanen[53] propose that the foundation of the Information Society is *informationalism,* which exhibits some common structural features around the world:

- It is based on knowledge generation and information processing, with the help of information technologies.
- It is organised in networks.
- Its core activities are networked on a global scale, working as a unit in real time thanks to the infrastructure of telecommunications and transportation.

The argument is often made that Africa is not ready for the information society. The reasoning is that before it can graduate to this "highest state yet" of society's development, Africa must pass through the previous stages of the industrial and even agrarian paradigms. However, this argument appears to misinterpret the information society as being primarily about ICTs and organisational information processing. A useful definition in this context is: *the information society is a new paradigm that emphasises the value of each and every human mind, rather than "automating human muscle"*. This makes it clear that, in the knowledge paradigm, ICTs play the crucial role of enabling and enhancing the unique power and capabilities of individual and collective human minds, no matter how disadvantaged.

An alternative argument, both in Africa and the developed world, is that Africa can and must become part of the global information society as quickly as possible. The fear is that Africa is being left ever further behind, and the hope is that the information society is the way to "leapfrog" out of poverty and exclusion. The reasoning is usually based on a mindset of catching up by blindly copying the developed world's activities.

The list of benefits attributed to the information society in the developed world is long and often repeated, from the spread of democracy and democratic processes, through unprecedented economic growth, to widespread improvements in prosperity and the quality of life. However, the information society is as yet far from having been perfected or well understood in the developed world. Not only is the developed world's

engagement in the information society imperfect, but, as described above, its benefits are also far from being equitably enjoyed even within first world societies. This implies that the "digital divide" is only a symptom, exposed by the emerging information society, of the more fundamental problem of exclusion that is found in every society, even in the world's richest and most developed countries.

Of course, the developing world should learn as much as possible from the developed world's valuable and extensive experience. But if Africa is to develop its component of the global information society to equitably satisfy both its local and global needs, then much more is required than to blindly follow the developed world's lead.

Innovation about innovating: The key to Africa's development?

According to Castells and Himanen[54], at the national level, the growing significance of networking for innovation leads to a critical question: what kind of innovation network does a country's public, private and citizen sectors form together? The decisive point about the Finnish innovation system is the combination of these factors – its holistic approach. It is not a list of factors but a unique network of interactions. As pointed out by the UNDP development cycle, issues around innovation and literacy are fundamental to Africa's sustainable development. Hence, in the most disadvantaged and remote areas (where Africa's majority live) the role of "citizen innovation" becomes a high priority. A "citizen innovator" is an individual who wishes to realise his or her creative passion, driven by an idea whose realisation he or she feels is important in itself, even energising and enjoyable. "Citizen innovation" stems from a social culture beyond the normal drivers of money and education.

The idea of citizen innovation is particularly problematic in Africa. It is barely understood at any level of society, including the HEIs. (In Finland by contrast, the HEIs recognise and welcome them.) In Africa the proportion of recognised citizen innovators is much lower due not only to the inadequacies of the education systems, but also to the lack of encouragement within organisations or in general society. Consequently, citizen innovation is minimal in African society, unless it manifests itself outside the accepted social structures, *i.e.* via various forms of informal and even "criminal" activity.

The concept of citizen innovation appears to provide a significant opportunity to stimulate sustainable development, especially within Africa's poorest communities. As the Finnish example shows, citizen innovators are not only resident in and produced by the HEIs. Potential citizen innovators, particularly social innovators, exist even in the poorest of communities.

Therefore, they represent a currently unrecognised major resource – triggers for the UNDP's positive development cycle – just waiting to be unleashed. The direct application of the power of the latest ICTs to the broad literacy and other social needs of sub-Saharan Africa's poorest communities by citizen innovators from those same communities may well be an excellent place to start.

Overcoming the urban-rural divide in Africa via local information societies

Castells and Himanen[55] talk of the growing marginality of rural areas and less-developed regions in Finland. Without the infrastructure and technical ability to connect to the network, they are functionally and symbolically switched off from the metropolitan nodes, each other, and the rest of the world. Linked to this is the diminishing capacity of local governments outside the capital, Helsinki, to cope with the economic development of their localities. These problems are at least an order of magnitude more severe in sub-Saharan Africa, and compounded by the fact that, unlike Europe, the majority of the population lives in these remote, disadvantaged and rural areas. So, what is a secondary issue in Finland is of fundamental importance to development in sub-Saharan Africa – where, to have a genuine information society, the benefits must reach the poorest and most disadvantaged people not in some far-off future, but with immediate effect.

Hence, those wishing to promote the information society in Africa should seriously consider the successful ideas used in Finland, particularly their model of *"local information societies"*. Earlier there was a description of the range of projects across the continent looking at the impact of ICTs on development, especially involving school connectivity (SchoolNets) and multi-purpose tele-centres (MPTCs). However, these projects have not yet had the positive impact on development that was originally hoped for, and certainly have not created an information society in any form. Sadly, the national governments and the international development and donor organisations that have been primarily involved in establishing and funding these projects have usually done so in an unco-ordinated, incoherent, *ad hoc* fashion, resulting in much wasteful duplication and little quality monitoring of the results.

The early focus on providing computers for community use and access to the Internet (albeit with very low bandwidth) is now generally recognised as having been too simplistic. It is clear that many other issues need to be addressed in parallel, including the need to:

- Promote widespread general, ICT and network literacy.

- Provide content that is relevant to local, community needs, and that is linguistically and culturally sensitive.

- Create local human capability and capacity to provide local ICT support, maintenance and training.

- Identify and support local champions and early adopters wishing to establish valuable community services.

A significant leap of vision and political will is needed to go from these unco-ordinated, often repetitive initiatives that experiment with the role ICTs might play in advancing development in remote and rural areas, to the Finnish national policy of *ICT-led* regional development via coherent strategies implemented by all levels of government to establish local information societies. The Finns have decided that the development of remote and rural areas depends on their being turned into information societies that are fully integrated into the national and global information economies – a policy that is already having a significant impact. Is this too ambitious for sub-Saharan Africa's poorest and most remote communities? Is it not worth trying to develop such local information societies in the African context?

It is also interesting to note that Finnish ICT-led remote area development initiatives showed most success where the young were given the opportunity to fully participate by gaining ICT and net literacy (which they do much more quickly than older people) and having full access to PCs and the Internet. In sub-Saharan Africa, young people (and women) in poor communities are usually only given secondary access, the primary focus of development usually being teachers and community leaders (usually older men). Does this Finnish experience not offer a real model for a new, ICT-led approach to development in Africa, in that it provides direct access and literacy opportunities to women and youth in parallel with the many current initiatives to "train the trainers"?

Finally, it is worth re-evaluating in the rural context Castells and Himanen's statement that "the current trends in the expansion of the information society, worldwide, point toward the increasing importance of the social uses of ICTs" (*i.e.* "ICTs with a soul"). This is a very exciting message for Sub-Saharan Africa. It suggests that by focusing much more effort on applying ICTs to satisfy the needs of the poorest and most remote areas (*i.e.* by applying the Finnish concept of local information societies), sub-Saharan Africa is not only likely to accelerate sustainable development on a broader scale, but also likely to stimulate the emergence of indigenous ICT entrepreneurs from within those communities.

This suggests a clear path to the development of indigenous ICT industries in sub-Saharan Africa. The people who understand these development needs are those from the local, disadvantaged communities, not those sitting in offices in MidRand, or Silicon Valley. The organisations that are best fit to address these needs are small, local companies (individuals or start-ups) – *i.e.* the SMME sector, not the multinational companies. There is a wide range of explicit and implicit development needs in most disadvantaged communities; hence there should be a substantial set of potential solutions and markets. But there is not much investment money available in these areas. And, there are few people in those communities who have the literacy, ICT skills and entrepreneurship capabilities, even though they well understand the needs.

It is unlikely that any proprietary ICT vendors (particularly multinationals) would seriously consider many, if any, of the innovative ideas from this underdeveloped, unattractive market. But by adopting OSS, the local entrepreneurs and champions are immediately empowered to pilot their ideas themselves, with very low start-up costs. They do not have to reinvent wheels, but can build on what is already freely available from the substantial global OSS community. The biggest remaining obstacle is the lack of broader literacy and appropriate OSS training and skills among the most disadvantaged communities. But that is a problem that sub-Saharan Africa can overcome, if approached strategically with innovative methods and with the co-ordinated support of the international development community.

Summary

Literacy is a multi-factorial issue with an ever-broadening definition. ICTs are disruptive, cross-cutting technologies that have the potential to impact on all aspects of human society. The growing combination of literacy provision and ICT, therefore, is generating an ever more complex matrix which is both full of exciting opportunities and also highly intimidating to a wide range of stakeholders. The vision is moving on from simply using ICTs to provide delivery and instructional tools associated with traditional notions of literacy, to one where *ICTs are an integral part of an information-literate society.* Personal participation in this technology-knowledge-innovation-economic development cycle begins with the ability not only to decode and comprehend text but also to access, analyse, evaluate, communicate, and use information to solve problems and create new knowledge. This broader vision of literacy better addresses the needs and realities of youth and adult literacy learners and users even in the poorest and most remote communities.

Throughout Africa, continued pervasive illiteracy, poverty and inequality are the major threats to prosperity, stability and peace at the beginning of the Information Age. It seems an aberration that, while extensive discourse continues around the "United Nations Literacy Decade: Education for All", and globalisation and ICT development initiatives encourage nations to become e-ready, there remain few signs of change and the gap between North and South is even wider today than it was in 1997.

Despite an impressive list of ICT-based African initiatives related to literacy and development, especially involving school connectivity (SchoolNets) and multi-purpose tele-centres (MPTCs), these projects have not yet had the positive impact on development originally hoped. Sadly, the national governments and the international development and donor organisations that have been primarily involved in establishing and funding these projects have usually done so in an uncoordinated, incoherent, *ad hoc* fashion, resulting in much wasteful duplication and little quality monitoring of the results.

SADC has recognised that their current education and training systems are rapidly becoming obsolescent, particularly because of developments in ICTs and globalisation. Indeed, the very foundations for an information society – basic literacy, numeracy and technology skills – are lacking in most SADC member countries. The need for appropriate, purpose-directed education and training, to quickly make people productive and competent, cannot be overemphasised, whether the learner is a subsistence farmer in a drought-stricken land or an information worker in a highly industrialised country. That is the case not only throughout SADC but in every African country, where a holistic national strategy is essential to address this special need. It is a problem that should no longer be left to the Ministry of Education to solve in isolation.

The sustainable development of poor and remote communities will not happen unless and until it is actively driven by individuals and groups from within them. Those wishing to promote sustainable development in Africa should seriously consider the successful ideas used in Finland's remarkable climb from poverty. In particular, their model of *"local information societies"* revealed that human effort and development are the primary foundation for societies and people improving their lives and projects. This has to be an attractive model for African development. Would it be possible to generate similar success stories, not just in a few isolated places in sub-Saharan Africa, but across the whole continent?

If we examine the wide range of needs of the broad spectrum of people in Africa, not just the elites, it becomes obvious that most imported software is of little use to the many millions of excluded people for reasons of

literacy, language and/or culture.[56] Instead of importing the dominantly text-based materials from the developed world, materials can be developed locally that specifically address the needs of the majority. Content can be produced where text is replaced by the much more natural voice, and in local languages. These materials can use visualisation techniques rather than text to more accurately describe places, people, and events. And they can use interactive animation and simulation to allow learners to actively investigate how things dynamically happen and work. Easily accessible digital multimedia tools exist to satisfy all these needs, many in the OSS stable. Providing the tools and developing the capability to support the local development and distribution of such relevant content could initiate a positive spiral of continuous development and use of new knowledge and innovation to benefit the African economy, society, and *all* its citizens.

Notes

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Chapter 7

ICT in non-formal and adult education: Reflections on the Roundtable

Stephen McNair

The Roundtable

In the 1990s interest began to grow in the role of information and communication technologies (ICTs) in the education of adults, and in overcoming social exclusion. In 1996 (the International Year of Lifelong Learning), OECD/CERI and NCAL/ILI convened a joint event to explore the role of ICTs in addressing adult learning[1]. In 1999 a similar event was held to explore their role in addressing adult literacy and social exclusion[2]. In the late 1990s, the technologies were only tentatively beginning to be applied to this policy field and were promising much, but in many cases participants were reporting on experiments and aspirations rather than embedded practice.

When a similar group met in 2003, things had moved on. There was much more experience, and perhaps a more cautious view was being taken of what is possible – although some examples were quoted of large schemes, both to disseminate the technologies on a large scale and to reshape institutional structures in education. Beatriz Pont and Richard Sweet[3] pointed to the substantial growth of online learning in higher education in OECD countries, although in some countries this applies only to private institutions. Neil Selwyn emphasised the scale of some parts of the e-learning market, with millions of learners engaging in some form of commercial e-learning. From the European Policy Observatory, Claudio Dondi argued that e-learning is becoming part of the mainstream of education, rather than an eccentric innovation outside it. How far this is the case in relation to informal and non-formal learning, and work with the most excluded groups, is another matter.

The earlier discussions had been optimistic about the potential of the technologies to transform both education itself and the experience and opportunities open to the most disadvantaged. By contrast, this discussion was described by one delegate as "techno-realist". There was more emphasis on the use of ICTs in combination with other tools and technologies, and

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more concern about identifying what the technologies are *not* useful for. There was also a strong sense that governments are less willing than they were a decade ago to invest on the basis of visions of radical transformation. Most delegates agreed that the stage of initial implementation is now past. The hardware and infrastructure for ICT use in formal education is substantially in place, and there is now some solid, if uneven, experience of their uses in informal and non-formal contexts.

If the approach to technology was more cautious, the Roundtable was more ambitious on another front. With NCAL/ILI at the University of Pennsylvania celebrating its 20th anniversary, the Roundtable sought to extend its reach beyond OECD member countries, to ask how ICTs are being used to address the most excluded in the "developed" world, and what lessons might be shared between the OECD countries and the developing world, particularly southern Africa and India.

The programme presented a rich and complex range of research, experience and policy perspectives. Delegates came from 16 countries, and during the two days seven thematic papers and six country studies were presented and discussed. As always on such occasions there were complex questions about how far ideas and experience are transferable between countries and contexts, and issues about how far the cases examined are representative. Many examples were offered of work that enables excluded groups to overcome skills and knowledge gaps, but judging how far such work has really impacted on the problem is less straightforward. At times the sheer scale of the problems can mask what would be seen as major achievements by many more developed but smaller countries. Thus, although Mexico has 14 million people who have not completed lower secondary education, 300 000 of them were awarded certificates as a result of study with the National Institute for the Education of Adults in 2000. Similarly, South Africa has 10 000 schools still without electricity, but 14 000 schools now have computers and communication technology.

Division, diversity and equality

The digital divide

The notion of a "digital divide" emerged in social policy debate in OECD countries in the early 1990s[4]. The concern was that the introduction of ICTs might deepen existing social and economic divisions, as participation in economic and social processes increasingly involve digital communication. This could leave still further behind the already excluded, who lack both relevant skills and access to technology.

There was some debate about how much ICTs are distinct in this respect. Jarl Bengtsson pointed out that most new technologies are taken up first by the richest and most educated, only later permeating down through society. However, he recognised that ICTs may be a special case where technical development has led to ever-increasing capability – which can raise the initial learning barriers to entry, rather than lowering the price.

Who are the excluded?

The Roundtable's focus was on informal and non-formal education and training, and particularly on their role in overcoming social exclusion. However, countries varied widely in defining who is "excluded"; in breadth or narrowness of targets; in the role of formal and informal learning; and in patterns of participation in learning. Together these produce a very complex matrix of interacting forces, which makes the simple identification of "what works" difficult.

On the precision of targeting, one participant pointed out that it is relatively easy to appear to be addressing the problems by identifying the least marginalised proportion of the socially excluded, while still leaving the most disadvantaged outside. He proposed a more demanding focus on "the bottom half of the bottom half". Some were particularly concerned about those dropping out of schools; as Sweet pointed out, 11 OECD countries report more than 10% dropout in the final stages of compulsory education. By contrast, those from the developing world pointed out that these definitions were a long way away from exclusion as understood by those working with learners who have never seen a book, or the two-thirds of the world's population who have yet to make their first telephone call.

On prioritising specific groups, countries had very different views. Among those mentioned were the urban and rural poor, women, the disabled and ethnic minorities, and more specific groups like refugees and migrants, victims of war and prisoners. In some countries, providing access to ICTs for large migrant communities is particularly a priority, given that such people are already disadvantaged by marginal status in the conventional workforce. In sub-Saharan Africa, where ICTs are available at all, they are sometimes under the control of particular groups (older men in the home, and unsupported traditional teachers in schools) who may be less likely to make effective use of them, and liable to exclude younger people and women from access.

Countries also differ in the scale of participation, and motivation to participate, in learning. Pont and Sweet drew on the invaluable and growing body of data emerging from OECD and on the European Labour Force Survey to confirm that those who do participate in adult learning are

disproportionately likely to be under 40, well educated, employed, urban high earners, and working in large firms with new workplace practices. In this world, education is all too often a process which further advantages the advantaged, while the excluded express little interest in participation. However, this is not a uniform pattern; in some of the EU accession countries, and others like Brazil, interest in computers was reported to be highest among the low achievers, despite their low confidence in using them.

The purposes of learning

Participants represented a wide range of views about the focus and purpose of informal and non-formal education. From India, Bhaskar Chattergee focused on its use for extending literacy, asking what ICTs can add by comparison with more primitive, but much cheaper, tools. From Norway on the other hand, Olav Vaagland saw the priority as finding how to develop literacy in the use of the technologies themselves, aiming to create a population with "digital fluency". From Australia, Richard Curtain was interested in how the technologies can enable people to develop the much wider range of skills, knowledge and attitudes required to be effective citizens (with some OECD countries already using ICTs for consultation on public policy issues and for voting). Finally, some participants focused on the use of ICTs as a tool for informal compensatory learning across the mainstream curriculum for those who have dropped out or been excluded.

Context and culture

A key theme underlying the discussions was the relationship between learning, context and culture. It was generally agreed that learning is more effective, especially for the most disadvantaged, when it is firmly rooted in the experience of everyday life in the community. However, the patterns of use, participation, access and ways of using ICTs clearly vary, according to both the cultures of individual countries and the degree of social and educational polarisation of the host society.

It was agreed that in general, the technologies are mirroring rather than leading the transformation of social and educational divisions in the wider society. Those countries with narrower social divisions are displaying a smaller "digital divide".

National differences

Sweet's presentation used data from IALS and PISA to show some of the dramatic differences between countries in the extent and nature of the divisions. His index of the digital divide demonstrated, for example, how

much more likely it is that those with low literacy levels in the United Kingdom will have access to computers than their peers in the United States. Employment status is also an issue: where the workplace is one of the principal points of access to ICTs and to learning, those excluded from work may be doubly disadvantaged.

Patterns of inclusion and exclusion, of discrimination and inequitable distribution of power are deeply rooted in national history. Bengtsson and Sweet both presented data suggesting a strong relationship between patterns of access and participation and degrees of economic polarisation on one hand, and democratic history on the other. They drew on CEDEFOP evidence regarding those who do not participate in learning and who express no interest in doing so, to show a pattern in which participation in learning directly mirrored national democratic history. At one end of the spectrum lies Iceland, with fewer than 5% defining themselves as "non-participants" in continuing education, and 800 years of democratic government. At the other end lies Portugal, with over 50% non-participation and barely 30 years of democracy. Against this background, improving access to learning is not, on its own, likely to radically alter patterns of exclusion and the distribution of opportunity.

Similar differences can be seen in patterns of learning, making cross-national comparison difficult and raising the possibility that different things are actually being described. Countries vary dramatically, for example, in the proportions of people reporting participation in education and training, but also in the intensity of study among adults. The proportion of training courses that are very short ranges from 60% in Norway to under 5% in France, Spain and Portugal. Similarly, as Sweet pointed out, the proportion of reported adult learning that takes place in different kinds of setting varies substantially, with 90% of all learning in Greece taking place in formal classrooms, compared to only 20% in Austria.

ICTs and national cultures

ICTs are not culturally neutral. They work better in some kinds of culture than others, and perhaps encourage a convergence of cultures rather than supporting diversity. Vivian Gadsden spoke of her own work at in Pennsylvania dealing with the effects of the technologies on patterns of family life. She pointed to the issues that arise for communities whose social structures are strongly built around respect for elders, when young people adopt technology with more enthusiasm and success. Concern was expressed about the implications of using technologies that may impose an individualist approach to knowledge on cultures that have traditionally placed a higher value on collective knowledge. One participant expressed concern that in some parts of Africa countries were being sold ICT systems

and software without considering how appropriate they were to the particular context. Another asked whether, and for how long, those colonised by the technology or the language of other cultures will accept this imposition.

Roger Diaz de Cossio pointed out that in multilingual societies, the choice of language for accessing the technology not only can affect simple levels of comprehension, but also can carry complex overtones about status and values that can convey important messages to excluded individuals, as in the case of Mexican migrants in the United States. They retain Spanish as the language of personal relationships into the second generation, while using English as the language of business, the Internet and perhaps literacy.

There was particular interest in the Finnish experience, of transforming a poor, remote and rural country into a leader in the knowledge economy in little more than a generation. Bob Day argued that this model might translate into the similar context of rural Southern Africa. Tim Unwin supported this, arguing that ICTs could enable countries with low levels of formal education to jump a stage of development, bypassing dependence on textbooks (which are expensive, not durable and in developing countries, often out of date), to move directly to a world of access to vast quantities of constantly updated information. However, it was pointed out that most developing countries have very much larger social and income divisions than Finland, and that this may have a major impact on the transferability of ideas and approaches.

The role of employment

Having paid employment, as Pont and Sweet pointed out, is a major determinant of access both to ICTs and to training, at least in OECD countries where 45% of identifiable learning is continuing work-related training. Anthony Wilhelm argued, drawing on German experience, that one of the most effective ways of overcoming exclusion is to get young people into paid employment, and keep them there long enough for them to develop affiliations to work and the workplace.

This poses several problems for evaluation. Much of such learning is deeply embedded in the workplace and difficult to isolate for study, and the proportion of people having this access will vary with the economic cycle, with those most in need of education and training the most vulnerable to exclusion during economic downturns.

Nature and purposes of learning

Transmissive and transformative learning

One of the distinctive features of informal and non-formal education is complexity of purpose. These types of education deal with autonomous adults, whose choices of how and what to learn are not dictated by the state or by formal institutions – the activity may not even be recognised as "learning". The planned and actual outcomes can therefore be more complex. Much learning of this kind is necessarily embedded in the problems and contexts of everyday life, directed at changing the lives of individuals and communities as much as at achieving formal qualifications. This means that the learning is more likely to be transformative than transmissive: designed to enable individuals and groups to recreate their communities and lives, rather than conveying bodies of established knowledge in traditional forms. The Chinese example of the Yellow Sheep River project, where the teaching of literacy was intertwined with the economic development of a rural community, was one of several examples quoted. There was general agreement that ICTs can support such approaches, but some doubt about the extent to which such approaches were currently widespread.

The benefits of ICTs

There was some agreement that the potential benefits identified for learning with ICTs at the previous Roundtable, and since established as key components of effective strategies for the most disadvantaged, are still real, though not always widespread. ICTs do have the power to motivate and to tailor learning to individual need, circumstances and preferences. They also have the capacity to provide active engagement, a focus on individual learner skills, structure and support (teacher or peer), frequent assessment and feedback, a supportive community, and connections with wider communities (providing both relevance and resources). More ambitiously, they also allow for group engagement, and for building on learners' existing language and experience.

All these are very relevant to the needs of excluded groups and individuals, but there was some scepticism about how far the benefits had actually been realised. Selwyn argued that in practice the use of ICTs may have led not to the promised widening of the curriculum but to a narrowing of it, pointing out that much new e-learning provision in the corporate sector has concentrated on a very narrow spectrum of occupational learning directly ICT-related, perhaps diverting resources from other, important fields.

Several participants saw mixed mode learning as important. They recognised that some of the more enthusiastic visions of "pure" ICT-driven learning expounded in the past have now given way to a more measured view, where ICTs sit alongside more conventional approaches. Several papers also pointed to the need for ICT based learning to be seen in a social context, in terms both of teacher support and peer-group support.

There was agreement that the role of ICTs in facilitating more effective and relevant assessment had been neglected. The generally recognised advantages of ICT-based assessment in allowing privacy and repeated attempts without stigma must be at least as important to excluded young people and adults (whose experience of assessment in formal education is likely to have been negative) as to mainstream students. However, no examples were quoted, and the general view was that this is an area in need of much more exploration.

What works? The state of research and evaluation

The notion of examining "what works" as a basis for policy making is attractive to policy makers and international agencies. However, in the context of informal and non-formal learning it can be a difficult one. Because such learning is, by definition, deeply embedded in the culture and institutions of a particular country and culture, practices are likely to differ more here than in formal schooling, which usually operates with relatively defined objectives (common to most countries) against which to measure "working".

Nevertheless, there was general recognition that the growing concern of government and other funders with evidence of "value for money" in the use of ICTs is legitimate. Chatterjee pointed out that while for many OECD countries the costs of ICTs can seem trivial, in a developing country the price of a single PC can pay for the simpler and cheaper tools for literacy teaching for hundreds of basic classes.

There was a lively discussion about the need for and nature of research into the use of ICTs to overcome social exclusion and in informal learning, and widespread concern at the focus of research activity, from two points of view.

First was a concern that, in a field where both the technologies and the social contexts are volatile, too much resource is devoted to theoretical forms of academic research that are slow to inform practice or policy. It was generally agreed that more action-based and formative modes of research are required. There was particular concern that the reluctance of some funders of work in developing countries to pay for the evaluation of their programmes and activities was leading to the repetition of mistakes and

embedding of poor practice. There was agreement that, although it may be difficult to define "what works", development and project work over the last decade has at least provided some answers to the question of what does not, and that more systematic study of these lessons would be valuable.

The second concern was that too much evaluation research focused on project management and performance rather than outcomes, so that we learn how an initiative was implemented but not whether people learned. Vaagland argued for the development of more systematic and agreed indicators of development and effectiveness. Dondi described the work of the European Union Policy Observatory on Lifelong Learning and Employment, funded by the EU to systematically study development in the field, to set that development in theoretical and practical contexts and to map the emerging issues and opportunities.

A major function of informal and non-formal learning is the development of social capital, as Curtain pointed out. Such forms of learning can be critical to creating and maintaining social networks, and to building the capacity of communities. However, measuring the development of these and relating it to both learning and the use of ICTs represents a significant challenge to evaluation and research methodology.

Even at the more straightforward level of measuring individual achievement, the absence of agreed indicators of performance remains an issue. Wilhelm described the US approach, where the Department of Education, the National Education Association and key ICT companies have developed a framework of skills required for young people to function successfully in an information society, with two distinct measures of equity, based on resource parity and educational adequacy.

Data for evaluation are also very patchy and unreliable. Although some countries have substantial data, there is no agreed measure for ICT literacy to match those available for traditional literacy and numeracy, and measures of penetration of the technologies themselves are especially unreliable in developing countries. The South African participants suggested that much of the numerical data on sub-Saharan Africa should be treated with scepticism, since collection methods are difficult and unreliable, and political motives may lead to distortions (as they may in OECD countries). Moreover, measurement often concentrates on the quantity of hardware and software in existence, neglecting the fact that it may be located or controlled in ways that prevent or limit its use in practice by particular excluded groups, including in some contexts women and young people.

Where are we now in the change process?

From hardware to achievement

In most OECD countries, policies on the use of ICTs in education for the last decade have concentrated on the necessary, but not sufficient, provision of hardware and networks. It appears that most have now reached the point where the infrastructure is in place to provide access across the formal sector, and that a reasonable infrastructure also exists to support informal and non-formal learning – even if plans have not always sufficiently recognised the implications of technological obsolescence and replacement.

Now, participants agreed, the major problems for out-of-school learners are motivational and content related, although it was recognised that "content" is too simplistic a notion and that relevant software and teacher skills in this field may, and should, take many forms to meet a wide diversity of needs.

The Roundtable was also reminded that success in installing ICTs is not the same as success in combating either exclusion or illiteracy, and that the review of the UNESCO CONFINTEA process shows little progress towards the e-learning goals set for UN Literacy Decade.

Participants felt that, in terms of Rogers' five stages of technology adoption[5], OECD countries are now at the stage of transition from "early majority" to "late majority" adoption, which implies that the next stage of development will involve overcoming some fairly entrenched resistances. This calls for a different level of commitment, and it is not entirely clear how this is to be led nor who is to pay, since policy makers are liable to feel that they have now made the investment in ICTs and are looking for payback, not demands for more investment.

Old institutions or new?

Previous Roundtables asked to what extent existing institutions are appropriate for supporting education for excluded groups and individuals, and this remains an ongoing debate. Formal schools and colleges can offer a stability and security badly needed in the precarious world of informal learning, whereas fragile organisations often depend on volatile funding sources. Wilhelm pointed to the German Web Punkte programme as a good example of using school facilities successfully for excluded groups, although others suggested that the resistance to "going back to school" among the disaffected is too strong for such an approach to be effective.

However, the very stability that makes schools useful also tends to make them conservative, concerned as much to maintain established values and functions as to innovate and experiment. In some countries (both OECD and developing countries) it is clear that schoolteachers act as a conservative force, resisting the more creative uses of the technologies to improver the quality of learning as well as to increase access for non-traditional learners. Furthermore, really effective use of ICTs for informal and non-formal learning can be very difficult to embed in the institutional structures of traditional schools.

Partnerships

There was a general consensus that the next phase of development will depend on partnerships between government, education and training agencies, ICT firms, and a range of community agencies whose own agendas call for a more literate population and a population with better ICT skills. The proper roles for each partner will clearly vary between countries and contexts, and there is a need to better understand how to form and facilitate partnerships to ensure that each brings the most relevant expertise to the table. Bates has pointed out the range of roles government currently plays: from the direct provider or funder of ICT-based learning, to broker of partnerships, protector of customers, and strategic investor on behalf of the underserved[6].

An example of the dilemmas of partnership was offered by Michael Feller of JP Morgan Chase Bank. Here, a public-private partnership between the bank and a severely disadvantaged school appeared to be achieving a major transformation in a single school and its community. However, the scale of the investment in a single institution is clearly not replicable to large numbers of schools or communities, especially in countries lacking the history of private philanthropy that is so strong in the United States. Wilhelm offered a cautionary example from Germany, where the ambitious "Germany 21" initiative sought to develop a public-private partnership approach on a large scale, but only a very small fraction of the targeted 20 000 long-term industrial sponsorships of schools ever materialised.

Sustainability and the quality of the technology

Sustainability is becoming an increasingly important issue, as Myung-sook Jeannie Pang from Korea pointed out. In most innovations the first waves of investment are easier to justify than the ongoing updating, but if activity is to continue, funding flows need embedding in the mainstream of institutional budgeting. In the case of ICTs hardware needs regular

replacement as it deteriorates with use, but also as the technologies themselves develop. New software constantly offers new opportunities, but often calls for upgrading the computers, in an industry where technical advance is reflected not in falling price but increasing capacity (often well beyond the foreseeable needs of the user). Embedding informal and non-formal uses of ICTs in existing institutions can help with such sustainability and ensure maintenance and support, but in many countries those most excluded are the least likely to return to school. The same is true of many of the agencies that work with such groups, which are often dependent on short-term project funding – which makes long-term investment strategies especially difficult.

Curtain pointed out that the technologies remain clumsy and often ill-adapted to inspire confidence in teachers or learners. Even the most well established software is still alarmingly prone to malfunction, especially under the rigorous conditions of some community and domestic environments. The needs of the most excluded learners (in OECD and developing countries) might be better served by cheaper and simpler but more robust hardware and software.

Some conclusions

ICTs on their own are not a solution to addressing the needs of disadvantaged learners. If anything, the most disadvantaged learners are the least likely to benefit from unmediated ICT access, since for them the social context of learning and personal support are especially important in creating motivation and engagement.

Nor will acquiring ICT skills in itself overcome exclusion. Rather, ICT needs to be seen as part of an overall strategy to address failure (of education systems and of individuals), one that will embrace face-to-face as well as distance/online learning, and embed ICT use in the life of the individual and the community.

In his presentation, Sweet proposed a framework for reviewing progress on four fronts: infrastructure, access, skills and content.

On infrastructure. The first stage of infrastructure creation is now largely over in most OECD countries. Although the levels of provision vary and there are clearly areas where provision is still inadequate, the main issue is no longer getting sufficient hardware and software into the field, although the issue of renewing obsolete equipment is important. The issue is now maintenance and sustainability.

On access. The Roundtable heard about a range of interesting initiatives, and it is clear that in some places ICTs have been used creatively to extend

access. However, there was less confidence about the overall impact, and about the available measures of outcome.

On skills. There are continuing concerns in some countries about the skills and willingness of teachers to use the technologies, although some countries have made determined attempts to address this. However, Finland appears to be one of the very few countries that has spent more in recent years on the development of the human resource than on the hardware, although this approach was widely endorsed.

On content. This appears clearly as the weakest area. Much of the use of ICTs is still limited to teaching the use of the generic software. Although there are again interesting examples of imaginative uses of ICTs for teaching, for self-directed learning, and to make learning relevant to the circumstances of particular communities and learners, there is still little content aimed at the needs of the most excluded learners, in either transmission or transformational mode.

There was general agreement on the need for clearly defined and well resourced leadership of for ICTs in education and development, as the next stage of development will call for overcoming more deeply entrenched resistance from learners and teachers in a climate where resources are perhaps likely to reduce rather than expand. It was also clear that the creation of durable long-term funding streams for informal and non-formal learning is a priority if such approaches are to play a significant role in overcoming exclusion.

In addition, a number of questions for further study emerged from the discussions. They included:

1. What does *not* work in the use of ICTs for informal and non-formal learning with disadvantaged groups: where, and why not?

2. What kinds of research and outcome-based evaluation can best meet the needs of policy makers and managers and reflect the needs of both excluded individuals and excluded communities?[7]

3. In what circumstances are formal schools suitable for carrying out educational work with excluded groups?

4. Can ICTs enable severely excluded communities to leap straight from pre-literate to ICT-literate worlds?

5. Is it possible to develop a culturally neutral measure of ICT literacy?

6. What makes partnerships work in education for excluded groups, and what should the role of government be in this?

7. What role can ICTs play in educational assessment, especially in relation to excluded groups?

These form a very preliminary agenda for researchers and funders of research in this field, and might contribute to an agenda for a future event that will focus on the next stage of work on the role of technology for the education of low-skilled adults and out-of-school youth.

Notes

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4 OECD, 1996, ibid.

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6 Bates A.W. (2001), "The Continuing Evolution of ICT Capacity: Implications for Education" in G. Farrell (ed.), *The Changing Faces of Virtual Education,* Commonwealth of Learning. Available online at www.col.org/virtualed/virtual2pdfs/V2_chapter3.pdf

7 In this domain, a new publication on *Monitoring and Evaluation of Technology for Education and International Development* is just being completed with support of InfoDev/World Bank, by D.A. Wagner, B. Day, T. James, R. Kozma, J. Miller, and T. Unwin, for the U.N. World Summit on Information Societies in Tunis (November 2005).

Annex 1: Brief case studies

Brief case study 1: Korea[1]

Korea has national policies to ensure that all of its citizens, including the information have-nots, will have the ICT skills both for work and for purposes such as e-commerce, home shopping and home banking. Supporting these are policies to ensure that all citizens will be able to access various online data services, and on- and offline education and training programmes. Some 14 ministries are involved, with the lead being taken by the Ministry of Education and Human Resource Development and the Ministry of Information and Communication. A number of mechanisms exist to co-ordinate implementation by these various ministries. Ministries allocate most of the funds to local government, sometimes with a system of matching funds. All expenditures are audited on the basis of outcomes.

Those targeted include adults, farmers and fishermen, residents of remote areas, housewives, senior citizens, the disabled, youngsters in juvenile reformatory, overseas Koreans, and refugees. Both non-certificated programmes and certificated programmes at high school and tertiary level are offered. Central and local governments support the provision of ICT in facilities such as post offices, welfare centres and private agencies. They subsidise tuition fees, especially for the disadvantaged.

Several sites and portals to promote career preparation and job placement have been developed since the mid 1990s. These include Careernet (www.careernet.re.kr), Work-net (www.work.go.kr), HRD-Net (www.hrd.go.kr), Women-net (www.womennet.net), and the online youth counselling centre (www.youconet.or.kr).

Some significant outcomes of these policies are:

- As of June 2000, 30% of citizens had been provided with basic ICT training, and by the end of 2004 a total of 40% of citizens were to have been provided with it.

- In 2000, 500 000 students from economically disadvantaged households were provided with ICT skill training fees. Ten per cent

of these students were to be supported with PC lease and the Internet access fees until 2005.

- ICT skills standards for all citizens, teachers and students were developed during 2001-02 and recommended to be adopted in ICT skills training programmes.

- Since 1999 a high school-level Information Literacy Test (http://ilt.edunet4u.net) has been run.

- In 1996 the Cyber Air and Correspondence High School (http://www2.cyber.hs.kr/) was launched to provide an online curriculum. Internet TV is added to the online curriculum.

- In 1998 Education (Credit) Bank (http://edubank.kedi.re.kr) was open to provide lifelong learners a credit account that can be retrieved during their lifetime.

- In 1998 KOSNET (www.kosnet.go.kr) was open to provide Korean language learning materials for overseas Koreans and other nationalities in Korean, English, Japanese and Chinese.

- In 2000 a lifelong learning system (http://www.lll.or.kr/)was open to provide online educational information, a cyber educational system, statistics, and real-time data collected from local sites nationwide. In 2001 the Qualifications Network Q-Net (www.qnet.go.kr) was established to provide certificates information on both domestic and overseas qualifications.

- The *Cyber Air and Correspondence High School* started providing an online curriculum in 1996. The aims were to offer better access to teaching-learning materials than radio programmes that can be broadcast at only one time, and to lead adult learners to become self-directed lifelong learners. Currently maths and English are provided via Internet TV; gradually all subjects will be. In the near future e-administration will be adopted for individual learners' schedules, for lecturers to develop their own online teaching materials and to deliver their lectures in real time, and for system managers to oversee the whole curriculum and data on student registration and learners' progress. A co-operative learning environment is encouraged through bulletin boards, e-mail, and teaching-learning databases.

- The *ICT Skills Programme for Parents* helps to increase parents' participation in the school community by providing basic ICT skills. It is particularly targeted at the disadvantaged, and is delivered at local schools by teachers assisted by students who have good ICT skills. Each course consists of at least 15 hours of basic PC handling, instruction in using school homepages and educational software, e-mail, and information ethics.

Brief case study 2: China[2]

Internet use has skyrocketed in China in recent years.[3] In 1997, there were 299 000 computer hosts and 620 000 computer users. In 2003, there were 26 million computer hosts and 68 million computer users, and in 2005 the estimate is 124 million users, or about 13% of users worldwide.[4] Yet, a significant digital divide persists: 55% of Internet users surveyed in 2003 had a college-level education, compared to just 3% of the general population (the total per cent users in China in 2005 is estimated to be 9.3%. By available indicators, China's poorer interior regions are significantly lagging behind in information technology growth.

Nonetheless, numerous initiatives are under way to bridge the digital divide, and to experiment with using ICT to address problems of isolation and poor access to information, both within and outside the formal education system. These initiatives include the Ministry of Education's recent commitment to invest the equivalent of USD 43 million in developing distance education to improve educational opportunities in economically disadvantaged western regions, as well as initiatives such as the "Connecting Every School" Project and collaborative efforts with international agencies to use ICT for distance teacher education.

A technical assistance project, supported by the Asian Development Bank (ADB) places particular emphasis on "soft" components – that is, educational content and materials, training of teachers to use new ICT tools for innovative teaching, peer support networks, and monitoring and evaluation – to add value to existing ICT facilities and capacity. Professional development and capacity building has been built into the project design. One example is providing ICT-based support to local teachers of English and Science in grades 7-8 with skills and tools to adopt new pedagogies of student-centred instruction, particularly inquiry-based and collaborative learning. The ADB project also supports the building of better networking mechanisms, including teacher peer networks (e.g., for sharing of lesson plans, and more broadly acting as "communities of practice" to spur grassroots-level innovation), support from head teachers and local

educational officials, and an enhanced role of township-level host schools in supporting village-level primary schools.

Other more decentralised initiatives are also emerging in China, such as individual schools pooling money from teachers to open computer labs; local governments creating education management information system sites for information sharing; and local governments working to create programmes that respond to local economic development needs.

Notes

1 Adapted from presentation by Myung-sook Jeannie Pang, Korea Education and Research Information Service (KERIS), Seoul, Korea.

2 Adapted from presentation by Emily Hannum and Xuehui An, University of Pennsylvania, with additional inputs on the ADB project from personal correspondence from Meng Hongwei, CNIER, Beijing, China. See URL: www.adb.org/Documents/TARs/PRC/tar_prc36518.pdf.

3 Figures on computer hosts, computer users, and Internet users come from survey reports published by the China Internet Network Information Center, www.cnnic.cn/en/index/0O/02/index.htm. Most recent 2005 data is from http://www.internetworldstats.com/stats7.htm.

4 China Education and Research Network (CERNET), 2001, "China to Promote Distance Education in Western Regions", *People's Daily,* 13 June 2000, electronic reproduction: www.cernet.edu.cn/english/education/distance/intro/dis_01.php from CERNET section on distance education: www.edu.cn/HomePage/english/education/disedu/index.shtml

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Education and Training Policy

ICT and Learning

SUPPORTING OUT-OF-SCHOOL YOUTH AND ADULTS

Across both the industrialised and the developing worlds, educators have high hopes for information and communications technology (ICT). ICT has been seen as a potentially powerful tool for raising educational performance and increasing access to learning by the disadvantaged. Can it live up to these hopes? And does it have particular relevance to the needs of out-of-school youth and adults with inadequate educational qualifications and low literacy skills?

This volume contains important lessons for educators and policy makers. First, raising motivation is a key factor in encouraging disenchanted and under-confident learners, whether out-of-school youth or adults, to re-engage in structured learning. Second, ICT is not a panacea. It is not an alternative to good teachers, interesting and relevant curricula, and accessible and learner-friendly places for learning. ICT can, however, be a useful complement to each of these.

This publication reveals a number of interesting examples of innovative programmes using ICT that can increase access to learning by the disadvantaged. The papers show that ICT can be one way – but by no means the only way – to improve pathways to learning. It can do this by tailoring learning to the needs and preferred learning styles of the disadvantaged, and it can make learning more interesting by providing immediate feedback. A third message is that just as adult learning itself has been the under-funded and under-appreciated Cinderella of the formal learning spectrum, so the application of ICT within adult learning has tended to lag behind much of the rest of the education system. The present volume provides some cautionary remarks on the recent past and opens up some significant opportunities for the future.

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