

**An Issues Paper prepared for
the International Labour Organisation**

**A Survey of the Implications of
Information and Communication
Technologies (ICTs) on Youth Employment**

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Any errors or misinterpretation of fact remain the responsibility of the author.

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Executive Summary

Information and Communications Technologies (ICTs) have dramatically reshaped labour markets around the world. Social inequality within and between countries has increased and young men and women have tended to bear the brunt of this. The number of unskilled, semi-skilled and entry levels jobs in a wide variety of sectors have declined. Large organisations – in both the public and private sectors – have shed millions of positions. For young people this has resulted in stubbornly high unemployment levels, in most countries these are locked in at rates many times above national unemployment.

ICTs have been extremely important in generating two strongly diverging forces for the world's workers.

- They have contributed to the automation of processes making some workers redundant and closing off jobs many young people could have expected to begin their careers; and
- Changed the economics of many sectors reducing the importance of scale, so facilitating an upsurge in employment in Small, Medium and Micro-Enterprises (SMMEs).

Where young people, with the benefit of a good education and training foundation, could have once expected to have a job for life this is no longer the case. But if that education and training is in ICT-related skills, and if they demonstrate enterprise and resourcefulness there are vast opportunities.

For communities, encouraging and supporting their young people into these new sectors offers the twin advantages of generating employment and in building local economies' capacity to provide these increasingly important strategic services to other businesses and organisations. To achieve this will require continuing work by governments and multi-lateral agencies in meeting the various needs of young people (as outlined in table ES1) as well as newer, more innovative approaches in reconsidering the institutional approaches to providing support.

Table ES1: Support Needs for ICT-based Labour Market

	Developing	Transitional	Developed *
General Education	Improving from a low base	Good – excellent	Good – excellent with pockets of poor quality
Technology Skills	Chronic shortage and few training opportunities	Often extremely strong, in some cases a skills surplus ¹ exists	Shortages, where skilled workers do exist they often migrate to more affluent regions
Access to Computers	Shortages are widespread, take-up growing in some businesses and govt.	Generally in short supply	Access in schools, some public access programs, unemployed youth tend to have the lowest household PC ownership
Telecoms Infrastructure	Poor, very unreliable, often very expensive	Often unreliable and expensive.	Good – excellent. Access to lower cost & advanced services can vary
Enterprise	Contained to locally-focussed micro business	Nascent	Mixed, some examples of strong enterprise drive
Venture Capital/Finance	Limited access	Developing	Some government programs
Management	Limited experience available, often work in large firms or migrates	Growing skills base	Similar position as with Technology Skills, above.
Content	Little locally relevant material	Little locally relevant material	Large amounts of varying relevance

* Refers to the position, and the resources available, to those significantly marginalised or excluded from the wider, mainstream economy by their lack of employment.

Matching Capacity and Context

The issues summarised in this table are all important but they conceal the possibilities, and the extraordinary potential. This potential will be realised by creatively blending the features of these technologies – and the new world they are helping to create – with the capacity of millions of young men and women.

The world is currently making the transition from an Industrial to a Knowledge Economy. There are a number of fundamental shifts which have occurred with this change, they include:

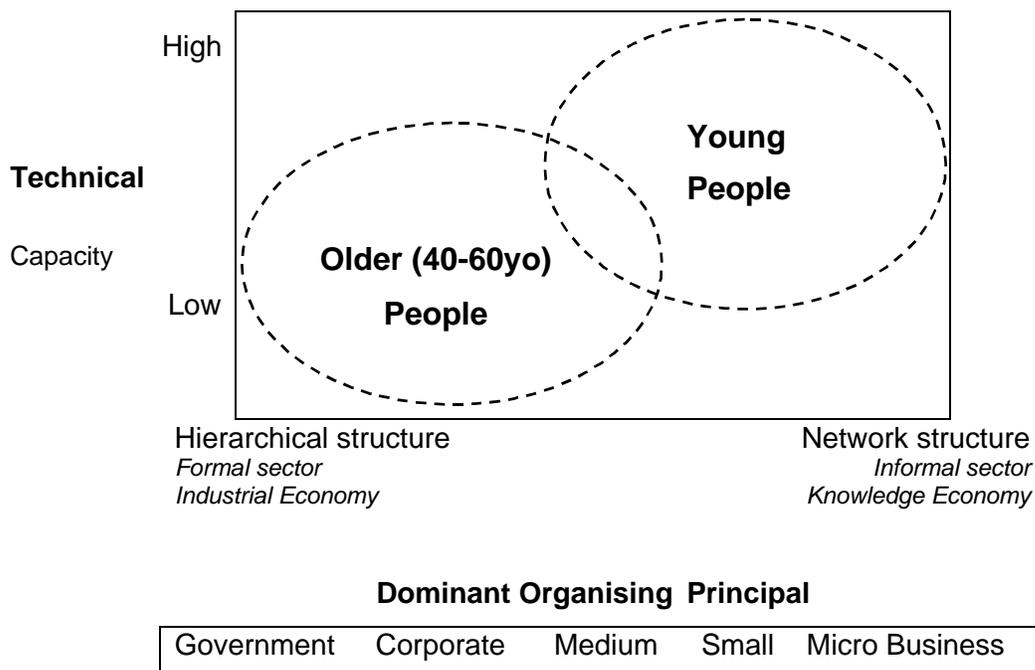
- a decline in the importance of labour, land and capital as the traditional inputs for economic development,
- a significant increase in the importance of knowledge generally

- a substantial increase in the importance of networks of people, both locally for SMMEs to collaborate, and internationally;
- the importance of technology generally and the capacity of ICTs in particular to significantly reduce organisational scale as a source of competitive advantage,
- the power of ICTs as organising, communications and transactions technologies.

These latter two points in particular are leading to greater use of (human) networks, rather than hierarchies, as an organising principle for large and small organisations in both the formal and informal sectors.

On the one hand young men and women have a *capacity* with ICTs – or the ability to develop that capacity – which far exceeds most of their elders and they are entering a global economic *context* in which smaller more flexible work environments, often working within networks are becoming increasingly important. In these two respects there are significant generational differences (see figure ES1). These differences highlight the problems in adopting a conventional approach, modelled on traditional hierarchical structures, to deliver remedial programs.

Figure ES1: Generational Differences to Technology & Organisational Structures



The most significant “missing link” is to provide the appropriately flexible framework, supported by the resources, to assist young men and women to realise this opportunity.

The Broader Environment, in summary

Social

Generational Issues

Young men and women's capacity to understand and adapt to ICTs – and the dynamics they generate – is significantly greater than for older people.

This capacity to use ICTs contrasts strongly with the unease and suspicion many older people have (figure ES2). In its extreme form this manifests itself in a view that ICTs, and the internet in particular, are a threat to be contained. This technology generation gap has the potential to lead to inter-generational tensions.

Figure ES2: Four Potential Scenarios for the Technology Generation Gap

Older generations' attitudes toward youth	Positive	Peaceful Coexistence	The Networked Society
	Hostility	Cold War	Generational Explosion
		Passive	Active
Network generations' use of new media			

Source: Tapscott 1998

Gender Issues

Girls and women tend to be later adopters of technology but where ICTs have clear application and functionality improve a closer gender balance quickly emerges. An important qualification to this is in those societies where more deeply based barriers exist against girl's and women's involvement in mainstream economic activity.

Skills

The demand for relevant, often high-level, skills is growing, there has been a decline in unskilled and semi-skilled entry-level positions.

As skilled workers are becoming increasingly in demand they are becoming more and more mobile.

Technology

Cost of Technology

The cost of information and communication technologies is continuing to plunge while their utility is increasing significantly.

Open Systems

There is a constant tension between open, non-proprietary systems² and those technologies which are based on tightly controlled intellectual property.

The Global Digital Divide

The world has fallen into three technology-economic groupings: Technological Innovators; Technological Adopters and the Technologically Excluded.

Economic

Shifting Paradigms

Knowledge is replacing labour, land and capital as the major determinate of economic development causing significant structural readjustment.

The Rise of Human Networks

The linking of high level technical skills, entrepreneurial attitude and high level industry networks is the feedstock for growth in this sector

Falling Transaction Costs

ICTs are greatly reducing transaction costs and improving market access, for SMMEs and Multi-National Corporations alike.

SMEs as Big Employers

Large organisations have shed workers for the past two decades, in particular unskilled, semi-skilled and entry-level positions. Employment growth has mainly come from SMEs and enterprise creation.

Political

Globalisation

Global market liberalisation has exposed national economies to global influences and reduced the capacity for national governments to intervene.

The Rise of Markets

Market, rather than public policy-driven, initiatives are seen as an appropriate approach in an increasing number of domains.

Distributing Work

ICTs have greatly enhanced organisations' and individuals' capacity to network, often very widely.

From Hierarchies to Networks

Organisations of all sizes are moving toward flatter structures, introducing more networked rather than hierarchical systems.

Recommendations, in summary

The background discussion to these recommendations is contained in chapter 4, detail on the recommendations themselves is in chapter 6.

Online NetWorkers

A project which captures the knowledge, enthusiasm, energy and idealism of millions of online young people around the world – in much the same way as an earlier generation's imagination was captured by the Peace Corps. – to assist their generation in other countries.

Prodigal Sons and Daughters

Develop strategies to target emigres knowledge workers and entice them to return.

Young Women

National governments must acknowledge the barriers girls and women face in engaging with ICTs and generate appropriate gender-specific policy responses.

SMME-centric Industry Development

Industry development and economic policies should be focussed on small to medium and micro-enterprises.

Local Online Economic/Employment Development

Local, geographically-focussed companies will increasingly find their markets being intruded upon by larger firms using e-commerce. Strategies need to be developed for SMMEs to act collaboratively to defend their markets initially and to assist those who wish to expand.

These approaches may include:

- Guaranteed Electronic Markets (GEMs);
- Electronic Produce/Product Exchanges (EP/PE); and
- Local e-markets

Finance and High Technology Start-ups

Develop hybrid financing/business incubators to create sufficient financing and management skills to optimise SMMEs chances of success in global technology markets.

Education and Training

Two aspects of this critical area require emphasising:

- the need for lifelong learning and
- the adoption of more flexible approaches to teaching and curriculum development.

Projects such as the African Virtual University and similar initiatives offer a cost effective means of delivery relevant training to a far larger number of people.

The Role of Other Actors

Many NGOs and an increasing number of corporations are involved in programs to provide employment to young men and women through ICT-based projects. The participation of these groups is extremely positive, not only as supporters of the work of governments and multi-national agencies but also because of the different modus operandi they can bring. Where governments and multi-national agencies are required to follow rigid processes, for political and public accountability reasons, this is not as important for these other groups.

Making this distinction is not intended to advocate a less rigorous process in distributing funds and support but that increasingly, far greater flexibility will be required to distribute assistance due to the changing nature of this environment.

Conclusions

ICTs have shown their capacity to dramatically alter societies and economies. They have already had a significant impact on the employment of young people: both positively and negatively.

ICTs do not offer a simple solution to solving the problem of youth employment. But what does make these technologies important in achieving this goal is that for young people ICTs are *their* technologies. They understand them and have the capacity to develop an empathy for them most adults cannot begin to understand.

With these initiatives there is the prospect of taking both an inter- and intra-generational approach to provide millions of unemployed young people – and their families and communities – with a path to a new economic future.

The Structure of this Paper

The first chapter of this paper is concerned with the wider environment: trends in technology and their impact on the workforce, changes that have already occurred in the reshaping of industries, the characteristics of some of these newer sectors and the employment and skills implications of these shifts.

In the following chapter some of the constraints in particular regions and facing particular groups are examined. These include shortcomings in technical infrastructure, changes in market conditions, the particular difficulties facing girls and women, issues in skills education and training, financial and management expertise, and regulations and policy settings. Within this section are a series of case studies which outline various policy and program approaches – many of them innovative – to address these issues.

Chapters 1 and 2 are mainly concerned with background information. For readers who are familiar with the discussion around the economic dynamics of ICTs and more general discussions on the knowledge economy these chapters are likely to be superfluous.

This is followed (chapter 3) by a brief examination of some of the over-arching issues for governments, the private sector and the wide range of other institutions involved.

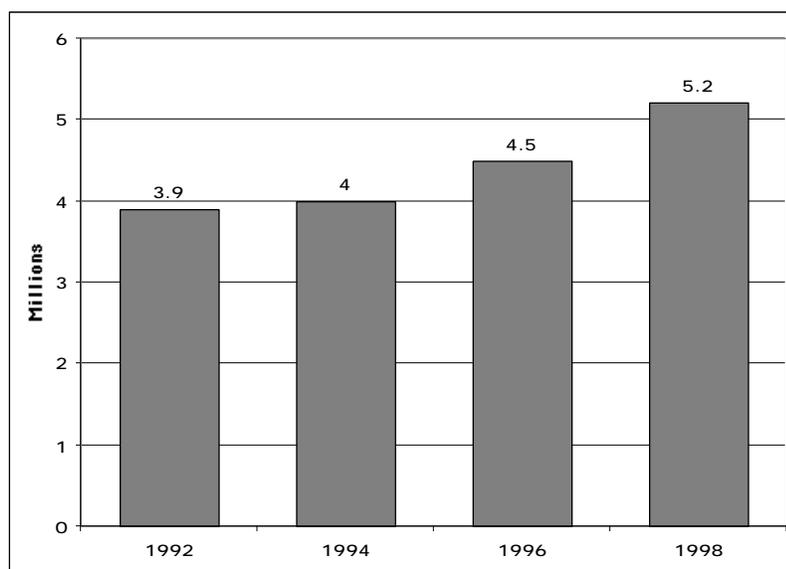
Chapter 4 examines some of the opportunities as well as some of the policies and strategies which have been used in building employment and enterprises to capitalise on these new conditions.

Introduction

The adoption of Information and Communication Technologies³ (ICTs) have produced both economic benefits and caused social dislocation over the past two decades. Every technological change brings with it this paradox but in ICTs we have, arguably, one of the most vivid examples. In parallel with the liberalisation of global markets these technologies have been responsible for the loss of thousands of jobs in industry after industry. At the same time they have been hailed as the provider of great wealth for some and exciting and rewarding work opportunities for many others. In the United States IT employment has grown at 6.5% a year since 1995. The number of employees in IT-producing forms in the US grew from 3.9 m. in 1992 to 5.2 m. in 1998 (DOC 2000).

The growing importance of ICTs have generally affected younger people more than older workers. On the one hand young people's lack of experience and access to resources can make them extremely vulnerable in the increasingly competitive job market arising from the globalised knowledge economy. On the other hand young men and women are the most adaptable and invariably the most technologically-able members of society. These capacities are most clearly seen in the stereotypical, youthful "New Economy" business men and women creating and working in organisations which have arisen in this new market.

Figure 1: Employment in US IT-Producing Industries



Source: US Bureau of Labour Statistics

While young people around the world are entering the workforce better trained than ever before, the proportion unable to find work has steadily risen in virtually every country – developed or developing (Ryan 1999). Social inequality both within and between countries has increased, invariably driven by changes in the labour market, and younger people have tended to bear the brunt of this.

At one level this pattern appears to be something of a paradox: a world economy demanding more and higher level skills while youth unemployment continues to rise. The reason appears to lie in the premium employers in traditional sectors have placed on both skills *and* experience, with most young people only meeting one of these criteria (Levy and Murnane 1992).

This paper will examine some of the factors driving these changes. It is concerned with both the direct and indirect impact of ICTs and the barriers and opportunities

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for young men and women in developed, transitional and developing economies. As could be expected, the different circumstances and conditions between each category of economy are profound. Table 1 is intended to provide an indication of these differences, it is not an attempt to be definitive. For much of the developing world the striking feature is the breadth of the challenges in all categories, in the transitional economies solid education and technical skills provide a good foundation. In the developed world the almost invisible weight of social exclusion for unemployed young men and women amongst so much advantage raises another set of difficulties.

Innovation and Information and Communication Technologies

The Austrian economist, Schumpeter, in his theories on innovation, made a distinction between product, process and managerial innovations⁵ (Schumpeter 1939). ICTs are having an impact on each of these levels simultaneously. As a product innovation ICTs are influencing *what* goods and services are provided and as a process innovation they are heavily influencing *how* they are provided. ICTs are enabling managerial innovation and changing the *way* organisations are structured and operate. These effects are influencing what job categories will survive and those that will disappear. They are also having substantial impacts on where jobs are located.

The increasing importance of knowledge to economic development and the greater capacity to codify information and knowledge is rapidly increasing the movement in services work to the locations with the cheapest or most capable workers around the world (OECD 1996, 1997, 1999 and Morris 2000).

So, as well as being concerned with the direct employment and enterprise opportunities which might be generated directly by ICT sectors, the application of these technologies is also crucially important for this discussion. The way in which countries apply ICTs is rapidly becoming as important, possibly more important, than whether they have the capacity to manufacture super computers, integrated circuits or other high technologies.

The Context for this Paper

The evidence is now irrefutable that we are in a quite different economic environment than that which has dominated for the past century. The problem of unemployment for young people has coincided with the world's transition from an Industrial to a Knowledge Economy. This paper argues that this problem has been

viewed from an outdated Technology-Economy perspective. There are a number of fundamental shifts which have occurred with this change, they include:

- a decline in the importance of labour, land and capital as the traditional inputs for economic development,
- a significant increase in the importance of knowledge,
- the importance of technology generally and the capacity of ICTs in particular to significantly reduce organisational scale as a source of competitive advantage,
- the power of ICTs as organising, communications and transactions technologies.

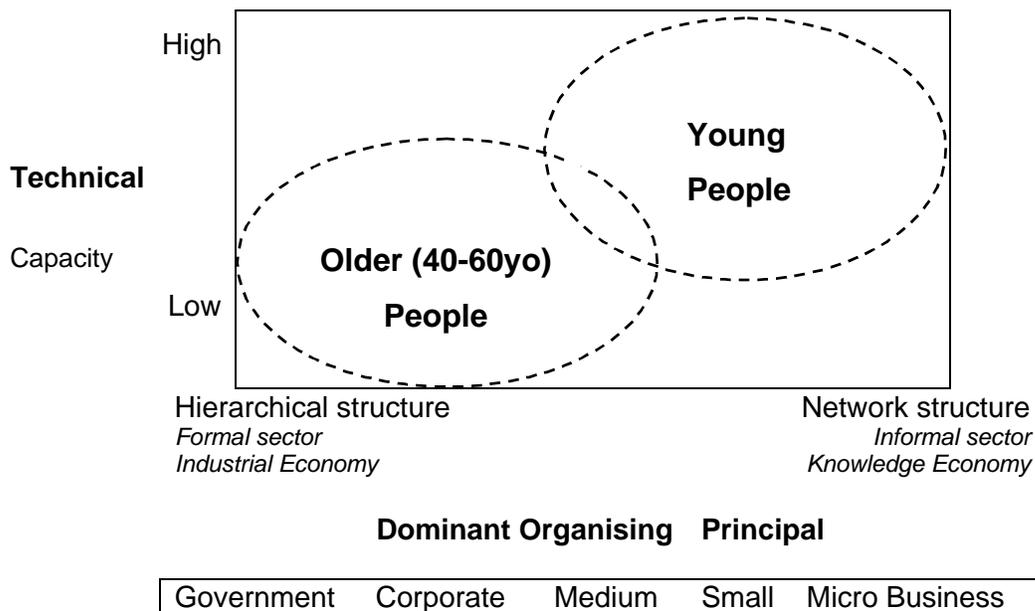
Underlying these changes is the ease, and the considerable capacity, the vast majority of young men and women who have come in contact with ICTs have with these technologies; in stark contrast to their elders. As has been said, “technology is not *technology* if it was created before you were born.” Young people see ICTs as being a natural part of their world and treat them accordingly. The technology writer Don Tapscott argues that these generational differences are creating tensions on a number of fronts:

- the older generation are uneasy about the new technology, which kids are embracing;
- older generations tend to be uneasy about new media, which are coming into the heart of youth culture;
- old media are uneasy about new media; and
- the digital revolution, unlike previous ones, is not controlled only by adults (Tapscott 1998).

From an Industrial Economy perspective, in which large hierarchical organisations (both public and private) are the dominant systems for managing, today’s youth employment problems can appear intractable. But questions have to be asked as to whether hierarchies are the organising principal best suited to today’s world and how well employment generating programs have taken account of the macro effects of technology. Certainly, in terms of the labour market large organisations have been shedding workers for many years. By far the most important generator of jobs have been Small to Medium and Micro-Enterprises (SMMEs). The size of these companies limits their capacity for vertical integration so they overcome this by working in networks. The human and organisational networks behind many SMMEs are greatly enhanced by ICT networks.

Networks, whether in business, government or technical structures, are increasingly important as organising mechanisms for economic activity. This clearly has major implications for labour markets generally and how we address employment for young men and women in particular. By looking at the relationship between different generations with regard to their preferred or most acceptable organising principle and their technical capacity a very clear difference can be seen (figure 2). Younger and older people are polarised on both of these criteria. The adaptability, technical capacity and natural capacity of young people to function comfortably and profitably in networks is ideally suited to this era. For government and multi-lateral agencies, the primary funding agencies for labour market enhancement programs, these changes pose some dilemmas, both in terms of designing programs in a rapidly changing environment and in finding appropriate and institutionally acceptable delivery methods.

Figure 2: Generational Differences to Technology and Organisational Structures



The Opportunity

This paper argues that by capitalising on these capacities of young people and by adjusting funding programs to a networked, non-hierarchical structure, better suited to this environment, an exciting opportunity exists. An appropriate set of responses which take account of these changed circumstances could make significant inroads into alleviating the difficulties many young men and women have experienced in finding stable and satisfying employment.

In this paper ICTs are viewed as tools, as a means to an end rather than an end in themselves. The paper is also concerned with both the business and employment opportunities which can be generated in the ICT sector and those which flow directly from them (direct and indirect employment opportunities). These technologies are, arguably, unique in the breadth of the impact they are having, and will continue to have, at every level of economies. They are being used to deliver tertiary education to physically isolated students in Africa and to socially isolated students in the United Kingdom, farmers in India are getting access to government and market information and artisans are able to keep overseas wholesalers informed as to how orders are progressing through their community centre's computer. Indian and Chinese ICT professionals are making an indelible mark in Silicon Valley – at the centre of the high technology industries – and increasingly choosing to bring their skills home to supplement their countries' existing strengths. Within this sweeping scope the emphasis is on how young men and women – the information and communication technology generation – can be assisted to capture these possibilities.

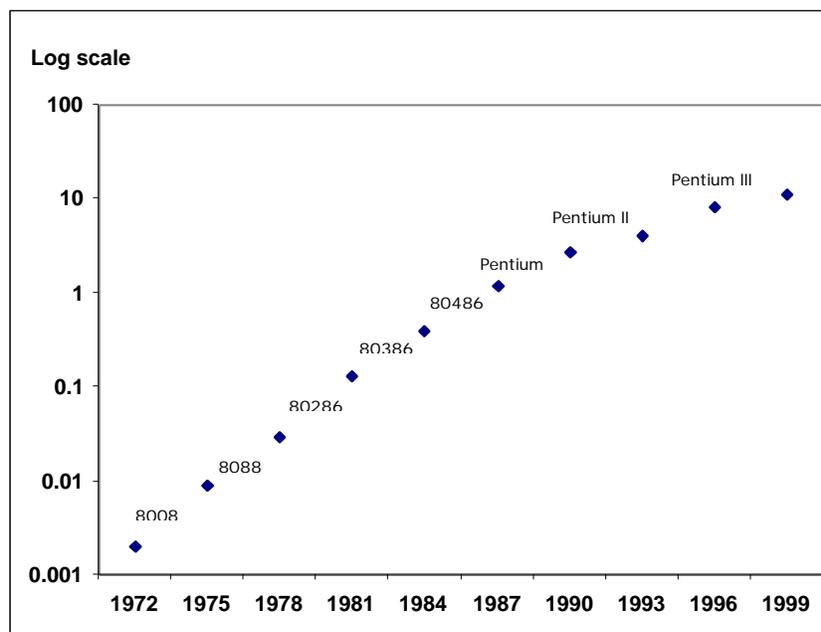
1. Trends in Technology and Youth Employment

Technology has been the enabler of great changes over the past two decades. This chapter provides an overview of some of these fundamental forces for the discussion which follows and addresses some of the labour market effects. It begins with that increasingly ubiquitous tool of our age, the personal computer, the critical importance of the technical and regulatory changes in telecommunications, and closes with some of the economic dynamics these developments have generated.

Personal Computers

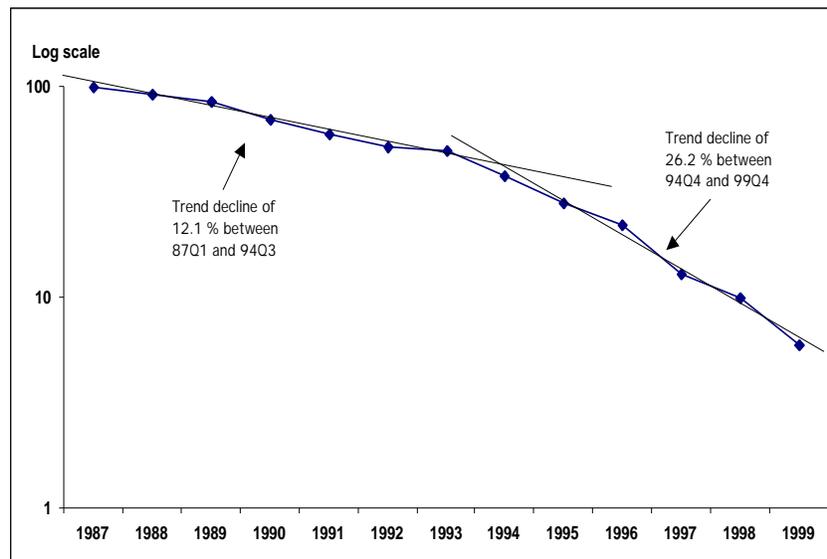
The computer revolution over the past 20 years has seen computers the size of an office building's air conditioning system replaced by desktop machines costing a fraction of the price and delivering many times the processing power. PCs, or personal computers, are now a ubiquitous part of offices and many homes in the developed world. The critical development has been the easy access to vast amounts of cheap processing power⁶.

Figure:3 Moore's Law (mill. transistors per Intel microprocessor)



Source: US Department of Commerce, *Digital Economy 2000*, 2000

Other related technologies have also shown dramatic improvements in performance and reductions in price. These patterns have resulted in an even sharper decline in the cost of PCs since 1995.

Figure 4: Price Declines in Computers Have Accelerated Since 1995

Source: US Department of Commerce, *Digital Economy 2000*, 2000

Labour Market Implications: While debate continues as to precisely what the economy-wide impact of the adoption of PCs has been, it is easier to take a number of specific examples. Banks in the developed economies have shed thousands of “back office” workers – mainly mid and low-level clerical staff – who were responsible for the labour intensive processing and reconciling of the numerous transactions completed each day. The loss of these semi-skilled and entry-level jobs in the banking sector and other information industries⁷ over the past two decades can be largely explained by the spread of computers.

An example of the employment generating effects of PCs are the numerous small publications and graphic design studios which have been established as desktop publishing software and cheaper computers have put the tools of the trade within the reach of many. Whereas these businesses and others in different sectors were once reliant on highly priced, highly specialised equipment the combination of a cheap and increasingly powerful PC with specialist software can do everything the last generation of machines did for a greatly reduced price.

In a whole range of sectors computers have enabled large companies (such as banks) to dramatically cut the number of workers they employ. The reverse of this has been that PCs have lessened the importance of size in allowing a small company to expand or the financial needs of a new company to establish itself. These dynamics have been reflected in numerous countries where large companies have generally reduced the size of their workforce. Any new jobs have tended to be created by small to medium and micro-sized enterprises (SMMFs).

This pattern of generic PCs combined with specialist software has transformed numerous information-based workplaces, from secretarial work to accounting. It is a pattern that is affecting more and more sectors beyond these “industry intensive” examples as computer processing power is being applied to an increasing range of applications, from grain harvesters and luggage tags to automobiles and toasters.

Telecommunications and Networking

While the history of remarkable advances in the cost and capacity of computer technology has become almost passé there have been equally profound changes in communications technologies. Improved computing power has contributed to this change also, as has the move to optic fibre – radically reducing transmission costs – improvements in wireless communication, compression technology and the development, and popularisation, of a whole range of technical protocols. While the internet sits atop these changes as the most talked about examples it is supported by a vast number of developments in telecommunications industries around the world.

It is also impossible to discount the effect of deregulation of the telecommunications sector. By 1997 69 members of the World Trade Organisation, representing more than 90% of the world’s telecommunications market, had agreed to liberalising their markets (World Bank 1999).

Labour Market Implications: The changes in the structure of the telecommunications industry have resulted in the shedding of thousands of jobs from the incumbent carriers as they have adopted new technologies and introduced new management practises to adapt to the liberalised market conditions. The industry-wide growth has meant that many of these retrenched workers have been in very high demand, either with new companies entering the market or as contractors, a very common employment relationship in this industry.

Box 1: Bangladeshi Infrastructure Initiatives

Bangladesh ranks as one of the poorest countries in the world and this is also reflected in its information infrastructure. In 1996 it had only three phone lines for every thousand people, compared with an average of 11 for other low income countries and more than 500 for high income nations (World Bank 1999). Since then the position has significantly improved through a combination of innovation, liberalisation, local enterprise and new technologies. Examples include:

individuals, all over the country, have set up kiosks converting their telephones into Public Call Offices (PCO). These kiosks provide computer-related services, fax, email etc. Private

entrepreneurs are providing PABX connections to willing subscribers, where the Bangladesh Telegraphs and Telephone Board (BTTB) is not able to provide lines at present.

more homes have cable TV connections than have telephones. These services are provided by private operators with satellite base stations. These cable connections can also provide high-speed data connections.

The BTTB provide direct in-dialling facility from urban areas to the operators of the rural manual exchanges. With this arrangement, all the telephone subscribers from home and abroad were able to dial directly to the rural manual telephone exchange operators who connect them to the local telephone subscribers.

Bangladesh franchised basic rural telecommunication services about a decade ago. This has been achieved through innovative revenue sharing arrangements between the incumbent dominant operator and the fledging private operators.

Private sector Telecom Operators of Bangladesh provide have developed an innovative approach to build a cellular mobile pay phone service on villages around the country. A village woman, chosen by the people living in the area, receives a loan from the Bank to finance the purchase of a mobile phone. She then uses it as a mobile pay phone and resells the service to the people of the village at a small premium. She clears the telephone bills and makes repayments to the Bank each week.

Bangladesh Railway has put a Fibre Optic Cable Network beside its railway tracks which cover an extensive area of Bangladesh. Grameen Phone Limited (GP), a licensed Cellular Operator, have taken this cable on lease and upgraded it. This has provided GP with a ready-made transmission network across Bangladesh.

Source: Information Technology in Developing Countries, Newsletter of the International Federation and Information Processing (IFIP) Working Group

<http://www.iimahd.ernet.in/~subhash/current.htm> (as at 1st August, 2000)

The trend for many telcos to move away from being a publicly-owned utility has resulted in far fewer entry-level training positions being offered in these organisations to young men and women. On the other hand the boom in the sector, with resulting skills shortages, has meant that few technically-able young people have had little difficulty finding employment or, in some cases creating their own businesses.

The internet has proven to be a particularly fertile ground for many of these young business operators. A number of factors have contributed to this:

the internet's "youth" means lack of a history for new start-ups is not such a disadvantage;

the slow response of the established carriers to address this new market;

the internet is comparatively inexpensive, in terms of technology investment, when compared with other sectors of the telecommunications industry;

the early realisation of many young people of the potential of the internet; and

many early users were young people.

Wireless Telecommunications

Developments in the last decade or two in wireless technologies have altered the economics of network construction and dramatically altered the way millions of people communicate. Cellular telephones have quickly moved from a business tool to an important alternative method for many countries to rapidly roll-out a phone service where conventional line services were too expensive and the delays too long.

Labour Market Implications: The links between wireless technologies and employment are less easy to define precisely. There is good anecdotal evidence to suggest that they have had a positive effect on enterprise creation. Cellular phones have been enthusiastically adopted by many micro and small businesses as a means of avoiding employing office staff to maintain contact. This has further reduced the number of these entry-level positions on one hand but on the other it has significantly lessened the operating costs of these businesses, particularly during their start-up phase.

Box 2: Plugging into the Internet

A South Asian initiative, run by volunteers from India and Bangladesh, is called bytesforall.org and is supporting and monitoring experiments being conducted across the sub-continent which are making computing and the internet "relevant to the needs of the millions".

"It is now possible to give 4.5 billion people the ability to leapfrog onto the Web, wherever there is electricity supply, even without a traditional phone line connection and without a personal computer," says Peter D. O'Neill from the University of Bradford.

His proposal is to deliver multimedia services on power lines to virtually any home, even if it only has a single light bulb dangling from the ceiling. Authorities in Bangladesh are toying with similar plans.

"There is a case for seriously examining this technology for local loop applications in countries like India, where over 70% of households have power line connections already.

Even a fraction of this conductor capacity made usable for additional communication purposes would make a huge difference," agreed electronics professors C. N. Krishnan and P. V. Ramakrishna of the Anna University's in Chennai.

Railway engineers from India's South-Central Railway, headquartered in Secunderabad, say that by using the copper and optical fibre of the Indian Railway network, internet and telecom services can be provided to about 4000 towns in approximately two years, at barely Rs. 15,000 (US\$350) per connection. India has a teledensity (phones per hundred) of barely two, as against fifty in the Western world. This strongly affects the competitiveness of the economy.

But the major problem is that current costs of around US\$1000 for each connection is not affordable. Once finance costs, operations, maintenance and obsolescence is taken into account, revenue of US\$300 per year is required from each phone line simply to break even. This is a price most in India cannot afford.

"In most developing countries, US\$300 per year for a telephone is accessible to less than five per cent of the population. How then can one hope for the development of telecom infrastructure and look for even some semblance of Universal internet access?" asks Dr. Jhunjhunwala, whose pioneering role in making telecom low-cost is widely recognised here.

Source: Information Technology in Developing Countries, Newsletter of the International Federation and Information Processing (IFIP) Working Group

<http://www.iimahd.ernet.in/~subhash/current.htm> (As at 1st August, 2000)

The Economics of Networks

The technology and social structures underpinning communication networks are critical factors in determining the shape and the efficiency of economies.

An important factor in these changed dynamics is that costs for buyers and sellers in completing a purchase or sale – their transaction costs – can be significantly reduced by improved networks. The growth in business-to-business (B2B) and business-to-consumer transactions on the WWW has been driven by these dramatically lower transaction costs⁸. Early in 2000 there were estimated to be 750 B2C and B2B online marketplaces operating around the world⁹. And as the take-up of these technologies has widened their value to all those connected has rapidly increased also.

The United States' Department of Commerce believes that this combination of growing computing power and increasing connectivity is responsible for a doubling of the growth of the US economy from 1.4% a year between 1973 and 1995 to 2.8% during the second half of the 1990s (DOC 2000).

Labour Market Implications: While many of the technological changes have worked in favour of smaller enterprises by providing access to more powerful technologies far more cheaply, some of the other features of these changes have not moved in their favour. As with the case of the telegraph this generation of communication technologies have enabled many multinational companies to efficiently increase their range of operations. This has often been at the expense of locally-owned, smaller companies. Scale has been used to implement sophisticated ICT strategies¹⁰ and it has become very important for managing product brands and in retaining access to the best market and product information.

While this new environment offers significant opportunities for smaller companies capturing these possibilities invariably requires superior management and strategic skills, particularly in a global market niche.

Organisations and individuals on the periphery (geographically, economically and socially) tend to do less well during times of great change. The evidence from the first stages of this change is that it does not differ greatly from those before, in broad terms. But the exceptions, for those who are adaptable and enterprising are very significant.

2. Constraints and Enablers

This chapter examines the impediments to taking up the opportunities offered by technologies and the new economic conditions they have facilitated. It also considers some of the approaches which have been followed to facilitate young men and women in capitalising on them. It begins with some of the “hard” technology issues, the impact of market liberalisation, the particular issues in relation to women and ICTs, social capability, a discussion of skills, education and training, and management and financial issues.

The Technology Gap

The chronic problem of access to ICTs by unemployed and underemployed young people around the world can seem an insurmountable barrier to building a path towards these opportunities. According to the ITU

...an inhabitant of a high income country is four times more likely to have access to a television set than an inhabitant of a low income country; 25 times more likely to have access to a telephone but almost 8,000 times more like to have access to an internet host computer. (ITU 1998).

There is no doubt that these shortcomings do present a significant challenge but it should be remembered that there are many ways of addressing these difficulties beyond copying western infrastructure models. At the national level some countries have “leap-frogged” several generations of technology and installed far cheaper, more modern systems than are in place in many developed countries. Communities in countries in varying stages of development have pooled their resources to build telecentres and other communal facilities to improve access to various ICTs.

Microbusinesses have been built by entrepreneurs with a mobile phone providing clients in their neighbourhood with a phone service. Several commentators have said that while the use of the internet in many African countries appears negligible - based on accounts per head of population - the usage patterns there tend not to follow western patterns. They say that as a result many more people than these figures suggest are actually using the internet, albeit from a very low base.

Adapting to local conditions, along with substantial organisational innovation, has enabled many people to build employment for themselves. They have very often done this on what appears to be - from a western perspective - very limited infrastructure.

Box 3: Connecting Latin America

Through grants from a non-profit organisation, the Canadian government and the local telephone company, an Ashaninka Indian village in central Peru recently received a computer, portable generator, a satellite dish and a big screen monitor for video conferencing for high school education. Six community leaders received eight weeks of computer training, enabling them to build their own Web site. E-commerce has boosted tribal revenue 10% as they have used the internet to sell organically grown oranges in Lima, 400 kilometres away.

Latin America is the fastest growing internet market in the world. Experts estimate that 13 million to 16 million Latin Americans are now online. Although representing only 3 to 4 %of the region's 500 million people, compared with more than 50 %in the United States, the user rate in Latin America is more than doubling each year. In the region's most prosperous countries, it is doubling every four to six months.

The average internet user in Latin America is still white, male, urban, university educated and rich or upper middle class. But over the past two years, a movement has gained significant momentum to put a dent in what has been called Latin America's "digital apartheid." In an effort to keep the internet from broadening the gap between Latin America's classes – already the widest in the world – progressive governments, activists and non-profit organisations have seized on the technology to reach out to the poor and the young.

In Argentina, the government launched a US\$1 billion program this year to offer personal computer loans to people who cannot afford conventional credit. In Chile, the government finished an ambitious plan to wire all 1,263 public high schools to the internet. Half of all grammar schools also have been wired, opening the internet to students of all economic levels. In Brazil, Latin America's most populous country and home to half its internet users, non-profit organisations have introduced computer courses and internet connections to hundreds of slums. At the same time, the advent of companies offering free internet access to Latin Americans has made it more accessible than ever.

Without question, massive barriers exist. Analysts worry that poor infrastructure, especially in rural areas, will derail attempts to fight poverty. Indeed, expensive, internet-ready computers were shipped to at least one rural school in Argentina last year that still lacked electricity. Also, many poor people without the reading and writing skills necessary to surf the internet seem doomed to fall between the cracks.

There are 0.2 personal computers per household in Latin America, compared with 1.6 in the United States. But increasingly, computers are available in schools or community centers, or they can be rented by the hour in cybercafes. In Brazil, where roughly 18 million cellular phones are in use, analysts predict that wireless internet services will become a cheaper alternative to computer-based use.

The struggle to wire the poor, while still far behind similar attempts in many developed countries, has gained ground as the cost of internet access has tumbled. In Brazil, furious market competition and the devaluation of Brazil's currency have brought internet rates down from US\$40 a month two years ago to roughly US\$10 today. In Chile, government regulations in 1999 forced rates down by 70 percent, with the average cost for 20 hours falling from US\$55 to US\$15.

In a region where high taxes, import duties and difficulty finding some goods produced abroad have made online shopping particularly attractive, e-commerce is booming as the internet changes everything from politics to tax filing. Brazilian consumers, who purchased \$198 million in goods via the internet two years ago, are expected to spend \$900 million through the Web this year.

Source: Faiola and Buckley

This is not to suggest that great inequalities do not exist. Table 2 sets out the huge disparities between different types of economy.

Table 2: ICT use by Economic Category

	Phone lines/1,000 people (1995)	PCs/1,000 people (1995)	Internet users/1,000 people (1996)
Low income economies	25.7	1.6	0.01
Low middle income economies	94.5	10.0	0.7
Upper middle income economies	130.1	24.2	3.5
Newly industrialised economies (NIEs)	448.4	114.8	12.9
High income economies ^a	546.1	199.3	111.0

(a: excluding NIEs)

Source: World Bank, *World Development Indicators*, 1998

The Digital Divide

Policy makers are acknowledging that allowing the gap between the information rich and the information poor to continue to widen is likely to lock those who are currently excluded – and possibly their children - into a permanent position of disadvantage. A number of developed countries have implemented major programs which seek to mitigate against the significant sections of their population being left behind due to shortcomings in education and training, access to ICTs, finance and management skills.

The other extreme of this continuum are the global nomads, elite knowledge workers who spend most of their working day either on planes or in hotel rooms and temporary offices online (Cogburn and Adeya 2000). As the “linkers” between so many global activities, these workers, and their employers, invariably have priority access to strategic information, a critically important asset.

Box 4: The Digital Divide in the United Kingdom and United States

United Kingdom

At the beginning of 2000, 6.5 million households (25%) could access the internet from a home computer. This figure rose dramatically from 9% of households throughout 1998 and 13% in the first quarter of 1999.

Regional differences - Levels of access vary greatly between different parts of the UK. In 1999-2000 the proportion was lowest in Northern Ireland, at 11%, and proportions were also low in Scotland and the North East, both 14%. Proportions were highest in London at 25%, the South East at 24% and the East of England, at 22%.

Income - Levels of access depend very strongly on income. (For this analysis households were divided into 10 equal groups (deciles) according to their gross income.) In 1999-2000 they were low in the four lowest decile income groups, at 3 to 6%. From the fifth group onwards PC ownership increased rapidly, to 48% of homes with the highest tenth of incomes.

Household structure - In 1999-2000 households with two adults and one or more children had much the highest levels of internet access, 31% if there was one child and 35 % if there were two or more. A high proportion of couples without children and below retirement age also had internet access, an estimated 26%. Much lower proportions of one parent households had Internet access, 7% if there was one child and 11% if there were two or more. Retired households were the least likely to have internet access, 5% of couples and 1% of one person retired households.

Source: National Statistics UK, *Internet Access*, 1st Quarter 2000, www.statistics.gov.uk

United States

The US *Digital Divide* report found that while the number of Americans accessing the internet has grown rapidly, the "digital divide" between information "haves" and "have nots" continues to widen. Some of the key findings were:

Income level is a strong determinant of a person or household's internet access. While a predictor of overall internet use, income level also influences where and how a person uses the internet. Persons with incomes of less than \$35,000 more often use the internet outside the home, while those making over \$75,000 predominantly use the internet at home. While persons in lower income brackets more often use community access centers, public resources available to date have not alleviated the significant internet use gap between rich and poor.

Race or ethnic origin is a likely factor in determining who has access to computers and the internet. Black and Hispanic households are twice as likely to own computers today as they were in 1994. Yet, when holding income constant, Black and Hispanic households are still far less likely to have internet access than White or Asian/Pacific households.

Americans living in rural areas are lagging behind the national average in computer and internet access, regardless of income level. At some income levels, those in urban areas are 50% more likely to have internet access than those earning the same income in rural areas.

The structure of a household also plays a significant role in predicting a household's connectivity level. Compared to two-parent households, single parent households have lower internet, computer, and telephone penetration rates. Holding race constant, family composition still plays a role in determining internet access. And for many demographic groups, family structure significantly impacts connectivity regardless of income.

Source: Department of Commerce US, *Falling Through the Net: Defining the Digital Divide*, www.ntia.doc.gov/ntiahome/digitaldivide/

Box 5: Working to Close the Digital Divide in North Carolina

The North Carolina Justice and Community Development Center's NCexChange project (www.ncexchange.org) has a mission to promote and support the effective use of electronic networking technologies by non-profit organizations and low-income communities throughout North Carolina. As part of that larger project, the Community NETworker Project (www.ncexchange.org/networker) is a national demonstration project which provides technology champions (or Community NETworkers) for nonprofits and small businesses in four North Carolina communities.

The Community NETworker project is driven by the needs of disadvantaged communities rather than the capabilities of technology. Special attention is given to community-based organizations which are often overlooked in the development of telecommunications strategies - community-based nonprofits, local governments, and small businesses. In addition, it also promotes collaborations with local institutions such as schools and libraries. The program has a particular focus on women and young people.

Community leaders in Greensboro, Rocky Mount, Swain County and Bertie, Beaufort, Martin, Tyrell and Washington Counties, where the project takes place, are developing strategies and tools to more effectively build their knowledge base, organisational capacity, and access to resources. Community NETworkers focus on "humanware" issues of training, support, facilitation, and dissemination rather than infrastructure.

Why did North Carolina think it needed Community NETworkers? Technology is still difficult to master. Despite technological advances in recent years, electronic networking remains a real challenge for many organizations who wish to actively use information technology.

Technology can still be daunting, and customised, hands-on training and ongoing technical support are rarely available. Busy practitioners face a steep learning curve. Getting connected is only the first step in enabling groups to make effective use of telecommunications opportunities. Most groups need extensive consultation, handholding, cheerleading, and troubleshooting before they learn how to truly integrate electronic networking into their operations. NETworkers help organizations significantly reduce the cost of learning to network.

Source: US Department of Commerce, www.digitaldivide.gov

Industry Liberalisation and Market Demand

An inevitable feature of deregulating telecommunications' industries is that market demand becomes the primary driver for carriers' decisions as to where investment in providing new services should be concentrated. Most countries have implemented policies Universal Service Obligations (USO) which set out minimum service levels required throughout the country. As USOs require some form of cross-subsidisation, or at least a lesser return on investment by the carriers, they are generally limited to basic level services. Just how "basic" can differ widely from country to country, as can be seen in table 3.

The threat for a region in a developed country, or a developing country, in this new environment where continuing investment in infrastructure is crucial for economic and social well-being is well illustrated by the viscous cycle on the right of figure 5

Below. For the regions with a well developed information infrastructure (on the left)

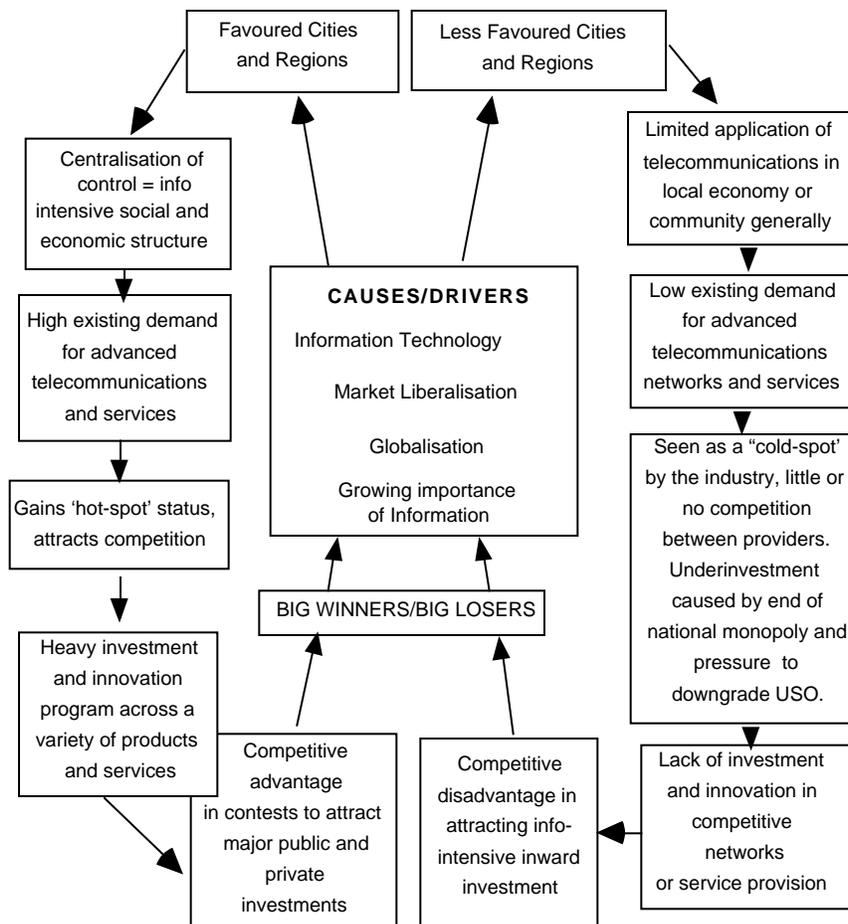
further growth is encouraged. This drives demand harder, which tends to set off a virtuous cycle of improving services at cheaper rates through competition. For less prosperous regions the reverse occurs.

Table 3: The USO in selected Developed and Developing African Countries

Developed Countries	Developing Countries
<p>Australia</p> <p>“The USO is designed to ensure that every Australian citizen has access, on an equitable basis, to a standard telephone service, pay-phone and carriage services.”</p>	<p>Ghana</p> <p>“...defined as a telephone in every locality of more than 500 people.”</p>
<p>Canada</p> <p>“...to render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada...”</p>	<p>Burkina Faso</p> <p>“...defined as a telephone within every 20 kilometres”</p>
<p>France</p> <p>“Universal service for telecommunications is the supply to all of a quality telephone service on all the territory at an affordable price.”</p>	<p>South Africa</p> <p>“...defined as a telephone within a 30 minute travelling time...”</p>
<p>United States</p> <p>“...to make available, so far as possible, to all the people of the United States, without discrimination on the basis of race, colour, religion, national origin, or sex a rapid, efficient, nation-wide, and world-wide wire and radio communications service with adequate facilities at reasonable charges...”</p>	

Source: Cogburn and Adeya 2000

Figure 5: Virtuous & Viscous Cycles in Liberalised Telecommunications Markets



Source: adapted from Graham and Marvin

Box 6: Warwickshire Rural Enterprise Network (WREN)

The WREN Telecottage was set up in late 1991 in the United Kingdom as a means of addressing some of the problems of rural deprivation in Warwickshire. The rationale for setting up WREN as a resource centre offering information, business support and a workplace for rural businesses and people included a need to overcome skills shortages in computer literacy and 'skilled non-manual' occupations and a desire to make the rural economy more diverse and dynamic.

Ways in which WREN is contributing to the local community and economy include:

- Offering people a seamless transition from IT 'gateway' training through formal qualification and on to employment and small business creation
- Access to ICT resources and services
- Providing business information and support services

- Promoting the interests of teleworkers and telecottages (teleworking is seen as a means of opening up new opportunities for rural workers)
- Helping rural women set up businesses.

WREN has begun to make a quantitative impact on local employment. One example is the Rural Women Back to Business course, aimed at rural women out of the labour market for a year or more, it covers business start-up, management skills, basic ICT and personal development.

The results have been impressive. Over the period 1992 to 1994, 44 women took the program. The results:

- 18 new businesses
- 13 becoming employed
- 4 gone on to further education and training
- 9 involved in voluntary and family farm work

A fundamental element underpinning WREN's success has been its links with the local community, its ability to respond to what people in the community need, its personal touch and its integrated holistic approach to training and business development in the rural context.

Source: Shearman 1999

Social Capability

But even more critical than the physical structure that a country or region has access to are the capabilities of its population. In its 1998-99 report the World Bank chose as its theme "Knowledge for Development". The Bank's President, James Wolfensohn emphasised that a society's human capacity does not stop at the amount of knowledge accumulated by its members but must also include how they use and adapt it. While this may be obvious it is well worth highlighting, given the speed with which it can be taken for granted and overlooked.

In relation to this issue a recent article¹¹ Jeffrey Sachs of Harvard University's Centre for International Development provided a useful perspective on where issues of technical and human infrastructure converge. He classified the world into three categories (importantly he emphasised that not all regions of a particular country fit into a single category as regional differences are common). The categories are:

- Technological Innovators (those generating ten patents or more per million population);
- Technological Adopters (high tech exports of at least 2% of GDP); and
- Technologically Excluded.

Technological Innovators account for 15% of the world's population and for virtually all technology development. The second group, which comprises about half the global population, has the capacity to adopt these technologies and integrate them into production. Technologically excluded countries and regions make up a third of the world's population and are technologically "disconnected", without the capacity to either innovate or to integrate. This clearly has significant implications for both the number and quality of jobs a country can hope to generate and in the future.

Although Sachs' analysis emphasises apparently narrow aspects of a knowledge economy (IP and high tech exports) he has proposed an index which graphically illustrates the underlying point. Information and Communication Technology alone, without the human capacity to properly use it, is virtually useless (see also Wade 1990 and Mansell 1998). In addition to access to networks and equipment, countries and regions require a holistic approach to building their information industry capacity. Relevant factors include:

- an education system which has integrated ICTs into learning and provides technical training;
- an awareness of the dynamics of ICTs and the opportunities they present;
- government and business that use ICTs to interact with the public and each other; and
- the degree to which the policy environment promotes or hinders ICT adoption and use. (CID)

Skills, Education and Training

At the centre of the move from an Industrial to an Information or Knowledge Economy is lesser importance capital, labour and land have compared to knowledge, technology and innovativeness. The divergence which is occurring between nations and between socio-demographic groups within economies is as much to do with differences in the knowledge and skills base as with available technology. In fact, many would argue human capacity is more important. Whatever the case there is no dispute that investment in education and training is a crucial element.

An important factor with regard to much of the structural unemployment in developed countries has been the mismatch between skills and newly created jobs (Jones 1995). Perhaps the key issue is that ICT-based work tends to require lower levels of traditional skills and greater abstract and synthetic reasoning skills. (Mansell 1998).

For young men and women in all three above mentioned categories of economies low levels of education and literacy severely limit their capacity to find work in any sector. This disadvantage is compounded in the Information or Knowledge Economy.

For most people in developing and transitional economies the internet's strong bias to English is another impediment, although the dominance of English is lessening. While limited education opportunities are a problem for many young people in developing countries, this is also the major factor blocking young men and women in the developed economies who are unemployed, see box 6 below.

Box 6: Education level and Employability in Selected Developed Countries

"In Canada, Ireland and the United States, unemployment is twice as high for young people with low literacy skills as it is for their high-literate peers. In the Netherlands and the UK the differences are even larger. Although young people with poor skills may be working, their jobs will not necessarily be stable, rewarding or well-paid.

For workers with low literacy skills, the prospect of holding better-paid jobs varies among countries. In the US, they are 3.5 times as likely to be among the worst-paid workers. But in Canada, Ireland and the UK, the chances are about even for young adults with low literacy skills to have low or high income, although there is a clear earnings advantage for their high-literate peers. These young adults with high skills have employment rates with medium or high income 2.2 times (the US) to 1.2 times (the Netherlands) higher than those with low skills.

The Conference Board of Canada has calculated the financial and economic cost of school drop-outs for 1992 as being:

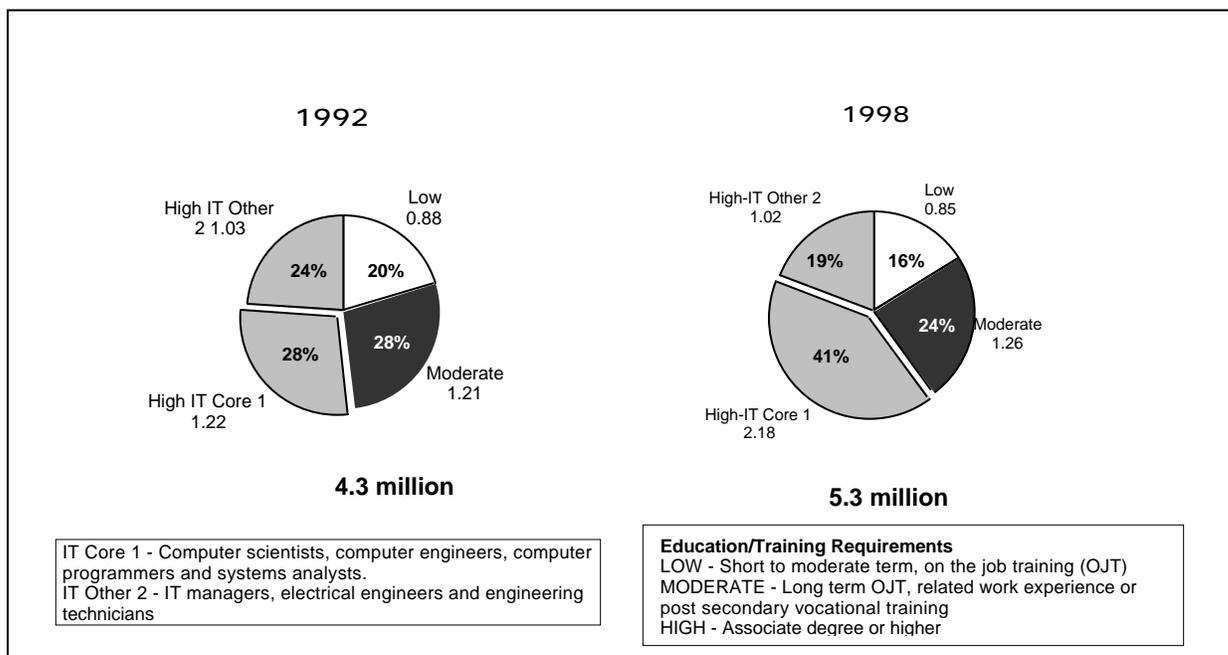
- the loss of more than \$4 bn in present-value terms over the working lives of nearly 137,000 youths, who dropped out of secondary school before 1989.
- Each individual male drop-out will lose on average nearly \$129,000, in 1992 dollars – over his working lifetime, while the female drop-out forfeits \$107,000.
- As an investment vehicle, education has a higher rate of return than almost any alternative investment project. The rate of return to society of investing in secondary school education is 19 per cent for males and 18 per cent for females.
- Canada could save \$26 billion if the drop-out rate were reduced from 34 per cent to 10 per cent by the year 2000."

Source: *Overcoming Failure at School*, OECD, Paris 1998

The education and training needs for workers in the information industries are significant. Literacy skills are a foundation on which technical, information gathering and manipulation, and managerial skills can be built.

The challenge for many governments, but particularly those in developing countries, is that the substantial investments made in providing their students with sufficiently high level skills to compete internationally also makes them attractive in the global jobs market. “Brain drains” are a constant problem for these countries and as the competition for skills grows the outflow is likely to worsen. For instance, it is estimated that more than 30,000 Africans holding Phds live and work outside the continent¹² and Chinese and Indian computer scientists and engineers account for 25% of Silicon Valley high tech workers (see chapter 4). Furthermore, this trend is unlikely to slow. The US Department of Commerce reports that virtually all of the employment growth in IT occupations between 1992 and 1998 was for the highest skilled workers: computer scientists, engineers, programmers and systems analysts (figure 6). The other employee segments, measured by education and training levels, recorded only marginal growth.

Figure 6: Employment in IT by level of Education and Training Requirements (mill.)



Source: US Economics and Statistics Administration based on Bureau of Economic Analysis, quoted in DOC 2000

On-going Skills Development

The nature of the information industries is such that retraining and upgrading workers' skills is an essential part of keeping pace with changes and developments. Keeping pace is partly a function of attending formal, in-service training programs, but having the opportunity to reinforce formal learning with practical experience is also vital.

In this regard the role of the public sector can be critical in setting purchasing policies to facilitate these opportunities for their trained citizens. They often favour (consciously or unconsciously) Multi-National Corporations, (MNCs) which not only denies skilled local workers experience but could, ultimately, encourage a brain drain. Where the local skills base is inadequate, public sector purchasing could be used as a means to encourage skilled émigrés back, if only temporarily. (Mansell)

It is outside the scope of this paper to discuss in detail the issues with regard to skills in the knowledge economy. Its importance generally is now well accepted in both developing and developed economies (World Bank 1999). As outlined in table 1 the nature of the educational needs of young people seeking to enter the labour market differ significantly between different economies. Many secondary schools in the developing world, for instance, suffer both from lack of access to ICT equipment and the limited experience and knowledge of their teaching staff.

Vocational training is often dominated by equipment vendors conducting courses on their products. They also tend to offer a technologically determinist perspective without taking account of the cultural and management issues central to successful implementation of ICTs.

South African reports suggest that while training in ICT issues is offered as part of courses at many universities in the region, difficulties in finding appropriate course material (much of which has been imported from the US or Europe which means that graduates are better trained for conditions in those countries than their own). Many of the institutions also have difficulties in gaining access to suitable equipment to train students. (Mansell) African countries have moved to address this issue with the adoption of a certification system for non-academic training providers (Mundy and Nyirenda 1995).

Box 7: Economies in Transition, The case of Romania

The legacy of Romania's Communist-era isolationism has been mixed. It did lead to some build-up of ICT-related technological capabilities but these were weakened by poor indigenous R&D and poor management of R&D funds, centralised government control of all major industries, a lack of domestic supporting industries, undemanding internal markets, and strict government export controls.

The period of transition and gradual policy liberalisation since 1989 has seen much of the country's hardware capability lost or confined to specialised niches.

Liberalisation has also caused a loss of software technological capabilities through both external and internal brain drains, through the conversion of some software developers into software traders, and through the conversion of some custom software developers into system integrators. Nevertheless, greater retention of software skills has been possible than was the case with hardware skills.

Liberalisation has also led to a significant expansion in local IT consumption. This has drawn in the multinationals but it has also encouraged a large number of new local entrants into the IT industry. Within these local entrants, there has been widespread creation of at least low-level technological capabilities in areas such as IT consultancy, IT installation, IT maintenance, IT training, and software customisation.

The future for Romania's hardware industry seems limited, at least in terms of mainstream computer production. The future in software seems brighter and offers greater opportunities for the country. Compared to hardware, Romania has built up and retained a greater depth and volume of software production capabilities. Development of new capabilities is also easier since software has much lower entry barriers than hardware production because it is less capital-intensive, more labour-intensive, with a lower rate of obsolescence, and (at least for certain types of software) it has far fewer economies of scale. All of these factors work in Romania's favour given its particular macroeconomic circumstances.

Employment issues

Limitations on IT skills and IT training represent a key constraint to Romania's vision of a more IT-intensive future. IT companies in Romania are either one of a few, large state-owned organisations or one of very many, small private-owned companies which typically employ only one or two people. Turnover for these firms has been relatively modest.

Reported wage levels in the Romanian IT industry are a little above the national average. Registered employment in IT makes up just over 0.2% of total Romanian employment, of which work in software firms constitutes roughly 13%.

Salary costs for Romanian IT staff are around one-tenth of Western costs. This makes Romania, at least potentially, an attractive site for offshore software development.

The majority of the IT workforce is between 23 and 38 years old. Most have a higher education computer qualification, and most have an expertise in at least one foreign language (typically French, German, English or Russian). This all helps to make it easy for Romanians to communicate whilst working on export contracts, to receive technical training overseas (or from foreigners coming to Romania), and to keep up with IT developments via the international media.

Source: Grundy and Heeks 1998

Online Delivery of Education and Training

The education and training sector has traditionally been a heavy user of communication technologies for delivering courses. Australia's School of the Air serving children in isolated regions and the UK's Open University are two long-running examples. The African Virtual University is another, more recent example (see box 8 below).

The advent of widely available, interactive, internet-based learning systems has sparked another surge of interest in distance learning. While delivering course material to physically isolated students is clearly important, the capacity to provide education and training far more cost effectively will become more important as demands on the sector continue to grow.

The nature of the learning must also change significantly from that which has been provided. Table 4 outlines some of the broader issues and the implications which flow from them.

Box 8: The African Virtual University

Many African Universities lack top-quality professors, up-to-date materials, adequate facilities for teaching and research, and modern curricula, particularly in science and technology. And even these meager resources are accessible only to a privileged few – despite keen demand throughout Africa for qualified scientists, engineers and business leaders.

The African Virtual University was launched in 1995 to remedy this shortfall by offering high quality university education at a distance. Its mandate is to increase university enrolments and to improve the quality and relevance of instruction in

country a local institution is competitively selected to oversee operations. It registers students, supervises study programs, and offers a structured study environment. It also helps with technology problems, provides hardware and software for interactive courses, and awards local credit for courses taken.

The African Virtual University's headquarters in Nairobi provides tutoring for students and training for professors and teaching assistants in the use of electronic teaching media. It installs and services all the required hardware and software, standardizes teaching practices and monitors quality control, sets price structures and conducts marketing campaigns. And it purchases the best available distance education curricula and instructional media from around the world and adapts them to local needs.

The university hopes to offer relevant short courses in high-demand subject areas at affordable prices. So far it has installed 27 satellite receiver terminals, with 12 each in English-speaking and French-speaking countries and three in Portuguese-speaking countries. And to compensate for the dearth of scientific journals in African universities, it has developed a digital library.

Source: World Development Report: Knowledge for Development, 1998/99

Table 4: Knowledge and Skills Themes for the Knowledge-based Economy

THEME	COMMENTS AND IMPLICATIONS
Knowledge & Skills are key	<p>Investments in the modern economy & community investment pays off for individuals, enterprises, nations and regions</p> <p>Strong underpinning for social cohesion and equity</p> <p>Governments, enterprises & individuals need to review the level & priority of their investments in knowledge & skill formation</p> <p>Governments should examine whether economically and socially optimal levels of investment are taking place</p>
There is a requirement for world class learning infrastructure, content and performance to underpin knowledge & skill investment	<p>Learning infrastructure, content and performance should be measured and compared against the world's best</p> <p>High standards of performance will increasingly be expected from individuals, enterprises and nations and regions</p> <p>There is a need to confront and remedy poor performance ("failure") within education and training systems</p>
Knowledge & skill intensive industries, enterprises and jobs are growing	<p>Lower skill jobs are relatively declining</p> <p>Knowledge and skill are embodied in both new industries and enterprises, and in many older industries and enterprises as they embrace new processes</p>

Workplace change requires greater emphasis on worker adaptability, knowledge and personal responsibility	<p>There has been a growth in “non–standard” employment</p> <p>People need foundation knowledge for ongoing, flexible learning</p> <p>Knowledge and adaptability will be required for people to manage a career of many jobs and self–employment</p> <p>Rapid responses to particular learning needs will be required from learners and providers</p>
A widespread commitment to lifelong learning is needed	<p>People need foundations for lifelong learning</p> <p>Learning takes place in many settings—workplaces, home, the community, and education and training institutions</p> <p>Funds derive from multiple sources — investments will be made by governments, enterprises and individuals</p> <p>Individuals must take responsibility for managing their own lifetime of learning</p> <p>Adult learning, especially among adults who have not attained foundations, should be given more priority</p>
Learning will cater for a diversity of client groups, take place in a variety of locations and utilise a variety of content, learning styles and delivery methods	<p>Learners will “bundle” education and training experiences in a variety of ways</p> <p>Provision and regulatory arrangements must enable diversity and “bundling”, especially beyond basic learning in compulsory schooling</p> <p>New information and communication technologies will be key enablers of more flexible delivery and wider access to learning</p>

Source: compiled from various OECD reports, Curtain 1995 and Neef 1997

Finance and Management Expertise

Over the past several decades the ICT sector has created employment for thousands of people. One of the defining features of the ICT sector are the numerous dot com entrepreneurs it has spawned. This link between the industry and entrepreneurship is almost inseparable for most people.

One important reason for this is that the capital costs of establishing many types of ICT-based enterprise – in particular software and internet content businesses – are not great. Economies of scale, the holy grail for any company in the Industrial Economy, do not have the same importance in the knowledge economy. As most ICT companies are providing a service (or produce a product which will assist in the delivery of a service) their work can be applied to a whole range of activities. This provides significant opportunities to exploit economies of scope¹³.

The nature of ICT sector work, along with the liberalisation of workplace regulations in many countries, has also made creating an ICT start-up easier. Most of this work is “digitised”¹⁴, making it extremely portable and easier to break down into project

sized tasks. This makes sub contracting far more simple which, in turn, provides start-up owners with far greater flexibility in managing their employment costs – by far the largest cost for the majority of new ICT companies.

For many government agencies, dealing with and developing policies to support small, medium and micro enterprises (SMMEs) has been unfamiliar, and not always comfortable, territory. A number of non-government organisations (NGOs) have invested considerable energy and resources in encouraging enterprise development driven by the realisation that neither large companies nor the public sector are generating sufficient new jobs to meet demand. There are important and challenging issues for governments here (some of which are listed in table 4). It is generally accepted that financing new enterprises from public funds is inappropriate. Grants and other programs operate in some countries but the compliance costs of meeting public accountability safeguards can often be onerous and unproductive for fledgling companies.

For private investors financing start-ups in developing or transitional economies has little appeal. In most cases they will be based a long way from the investee companies and so will be unable to closely monitor and advise on progress. To invest in smaller enterprises, particularly micro-businesses, the transaction costs of providing the small amounts of credit or equity they generally require are too great to justify the investment. A number of government programs and organisations have been established to bridge this gap. Several governments in developed countries (eg Canada, the United Kingdom and France) have established loan guarantee schemes which underwrite commercial lenders against losses on small business loans.

In the developing world a minor movement has been created around a number of successful micro-credit schemes, of which the best known is the Grameen Bank in Bangladesh. This model has been used by the Bank Rakyat in Indonesia and by Accion International and FINCA throughout Latin America. It has also been taken up by a number of groups in developed countries targeting the needs of particular groups: the *Women's Initiatives for Self-Employment* in San Francisco and *East Community Investments* in Indianapolis in the US are two examples. In addition to providing the funds their clients need, these organisations tend to also offer significant business advice services (OECD 1998).

Table 5: Company Regulatory Issues for SMMEs

Policy Area	Issues
Company registration	Options for company structures affect registration costs (time and money) for entrepreneur ¹⁵ . Their transparency and level of protection can be critical for both entrepreneur and investors' confidence.
Administrative or compliance costs	The costs in meeting taxation and other regulatory requirements can be onerous for SMMEs
Competition policy	Restrictions against "predatory pricing" by dominant firms. Exclusive dealing arrangements. Restrictions against mergers which create dominant companies or monopolies.
Bankruptcy legislation	Managed, equitable and open processes in the event of failure. Offering appropriate legal protection to companies which are experiencing temporary difficulties, allowing them to restructure and reorganise, can avoid unnecessary failures.
Tax	High taxes which reduce the returns for risk and entrepreneurship can restrict firm creation or expansion.
Intellectual Property Rights	Non-existent or poorly structured or policed IP regulations can be a major disincentive to investment, particularly in R&D.

Source: compiled from OECD 1998

Young Women and ICT

The ICT industry, as with most technology-based industries, is heavily dominated by men. This gender bias flows on to the increasing number of other sectors of the economy in which ICTs are becoming important. Casual observation and a myriad of reports¹⁶ make it clear that ICTs are not gender neutral. Unchecked this pattern has worrying implications for young women as they find themselves being marginalised from this dynamic industry, a problem that will have ever increasing implications as ICTs become even more ubiquitous.

Direct ICT Employment

Even those who are attracted to the sector often make alternative work choices because they see the industry as being hostile to them. This could be described as an internal factor. There is strong evidence to suggest that this is a common pattern around the world. A related issue is that ICT industry work environments can also be obsessive and single minded in their concerns with the technologies. This lack of balance with regard to other life concerns can be very unappealing to many women. A US survey by the American Association of University Women has found that the number of women graduating from computer science courses has plummeted in the last 15 years from 37 to 28%¹⁷. Only 9% of engineering graduates are women meaning only 20% of the ICT industry workforce are women. The survey also found that girls and young women are dissuaded from careers in high-tech by violent electronic games, dull programming classes and the public image of the IT industry as a "nerdy", antisocial world.

Another US survey of university undergraduates found women are more attracted to work which offers good benefits, stable business environments, and team-oriented workplaces. The men who were surveyed were found to be far more attracted to high paying jobs. The survey suggests there are also clear differences between men and women with regard to the type of companies they would like to work in. Almost 55 percent of males prefer to work in new start-ups and high-risk ventures, while only 35 percent of women feel the same.¹⁸

A cycle can quickly develop where these internal factors begin to promote a more widely held attitude where any activities which make more than superficial use of ICTs are considered "mens' work".

As has been briefly mentioned, these barriers and disincentives to greater involvement by women in the ICT industry – directly and indirectly – are of concern for two reasons. The dynamism and vigour of the sector means that millions of women are being "locked out" of access to the world's most vibrant job market today. The fact that this is occurring is contributing to the chronic shortages of skilled ICT professionals has economy-wide implications.

But there are other indicators which provide a different, and more optimistic, picture. During the first quarter of 2000 girls and women accounted for more than half (50.4%) of all internet users (Media Metrix). Of particular interest was a rapid growth in the number of teenage girls (12-17 yo) using the internet. Usage amongst this group increased 125% in the past year.

Whilst men continue to make up the largest proportion of internet users in other countries the online population is rapidly moving toward a balance which more closely reflects the gender balance in society. The proportion of internet users in Sweden is 44%, in the UK 36%, France 33% and Germany 33%. The survey company predicts that by 2005 the ratio of men and women online in the US will reflect the population generally.

Barriers to Women's Involvement with ICTs in the Developing World

In its examination of the position of women in sub-Saharan Africa (SSA) the World Bank (1997) identified four interconnected priority issues which needed to be addressed. The strategic issues raised are not specifically concerned with ICTs but highlight the broad issues. In all cases ICTs are increasingly becoming a factor, either directly or indirectly, or as an issue on either the supply or demand side.

- Women's central economic role, especially in agriculture and the informal sector;
- Gender bias in access to education, health, and other basic social services;
- Time poverty — a critical gender dimension of poverty in Africa - and
- Raising women's participation.

The barriers identified in the first dot point in relation to women's critical economic role in SSA societies, particularly in the informal sector, whilst being denied access to basic technologies clearly have a major implications for any ICT-based development.

The impediments to women gaining education and training, particularly "at the higher levels", as raised in the second dot point above, is another significant constraint. The greater demands placed on women, characterised as "time poverty" 3rd point, mean making the adjustments to new modes of working especially difficult.

The final point closes the circle, in a sense, with the 1st issue of women's central economic role. The four closely inter-related issues point to a social structure well designed to maintain the status quo and, as with any closely linked system, to ensure that making changes will be difficult.

ICTs and Women in the Developed Economies

Difficulties for women in gaining access to technology are not as severe in developed economies, notwithstanding the barriers faced by economically and socially excluded men and women, but many of the social constraints remain. Women working in "traditional female" jobs, such as secretarial positions, have worked with computers

for decades. The close links between graphic design and the production of World Wide Web sites, for instance, have made this a relatively easy transition to working in an ICT-intensive environment. But an interesting pattern has been the regularity with which women working in web design companies, for instance, have not as often made the transition to database integration and programming enhancements as the industry has extended into other technology areas.

Computer science and engineering courses tend to be heavily dominated by men in terms of both teaching and student enrolments. There is also a quite high drop-out rate – or, more often transferring to other courses – amongst women in these courses. A number of programs have been established to address these issues and to encourage girls and women with an interest in technology to pursue education and work in the ICT sectors. These programs most commonly take the form of providing mentoring by women working in the relevant sectors, mutual support groups, producing and publicising case studies, and even the establishment of venture capital funds specifically targeting women innovators and start-up companies run by women¹⁹.

Exacerbating the position of women is the fact that these problems are rarely at the centre of policy discussions about ICT, or even general economic development. However, as the importance of ICTs in an increasing number of areas becomes more clear, implementing appropriate programs is being given greater priority. At present most initiatives are being undertaken by women already in the industry. Nonetheless, maintaining attention on encouraging girls and women into these sectors is slowly being recognised more widely as being critical for economic development, in the broadest sense, for communities, as well as for the opportunities that changed attitudes could offer individual women.

3. Current Government Policy Approaches

Government Policy Approaches

The approaches to economic and employment development by various national governments, summarised below (table 6), highlights the range of different positions of each economy. There is general unanimity amongst the more developed countries that government should take a hands-off role and concentrate more on creating an environment which is conducive to the market. The US and Canada exemplify this approach, the European Community takes a slightly more interventionist view funding “catalytic projects” while working toward a “lighter touch” approach.

In Egypt and South Africa the governments are playing a central role as a lead user seeking to build expertise and a critical mass of users and providers. For other countries (Ghana, Mozambique, Tanzania etc.) the government’s role is more all-encompassing as a range of needs are addressed.

The Role of Other Actors

Many NGOs and an increasing number of corporations are involved in programs to provide employment to young men and women through ICT-based projects. The participation of these groups is critical, not only as supporters of the work of governments and multi-national agencies but also because of the different modus operandi they can bring. Where governments and multi-national agencies are required to follow rigid processes, for political and public accountability reasons, this is not as important for these other groups.

Making this distinction is not intended to advocate a less rigorous process in distributing funds and support but that increasingly, far greater flexibility will be required to distribute assistance due to the changing nature of this environment.

Table 6: Information Economy Priorities for Selected Countries

Country	Emphasis of Information Economy plans and policies
Canada	Jobs creation, innovation, culture and sovereignty, network of networks, public/private sector development, competition, privacy, security
Egypt	Tourism networks, health networks, government networks, government online, libraries network, community centres
European Community	Liberalisation, standardisation, intellectual property right, media ownership, catalytic projects in ICT applications
Ghana	Mass Computer Literacy Warfare, ICT use in public administration, health information system (electronic health card), semiconductor design centres, public information clearing house, E-Commerce for non-traditional exports, electronic financial clearing house, E-governance, folk music database, district telecentres
Japan	Ageing population, infrastructure, creativity, standardisation, co-operation
Mauritius	Infrastructure (telecommunications, broadcasting, computerisation), People (literacy, highly motivated workforce), Information workers and information economy
Mozambique	National telecommunications policy, applications, telecenters, content development
Senegal	Telecenters, electronic commerce, access to research institutions, job creation, governance, infrastructure development, applications and enabling environment
Singapore	IT manpower, IT culture, ICT infrastructure and use, IT applications, IT industry, climate for creativity and entrepreneurship -to nurture indigenous IT development, co-ordination and collaboration
South Africa	Government network, universal services, public and private partnerships, equitable access, community networks
Tanzania	IT based economy, improved social amenities, good governance, high ICT awareness and use, high mobility infrastructure, sustainable agriculture, stable economic growth, improved education, enhanced R&D and a coherent ICT framework
Uganda	Multipurpose community ICT centers, e-commerce for women entrepreneurs, environmental content, content for fringe communities, online agricultural information, school nets and ICT applications in health
United States	Promotion of private investment, competition, access, universal service

Source: *Information Technology in Developing Countries*

Table 7: Generic Youth Employment Policy Options

	Developing	Transitional	Developed *
General Education	<-----	Virtual University and Technical Training	---->
Technology Skills	<-----	Virtual University and Technical Training, Online NetWorkers	---->
Access to Computers and Telecoms Infrastructure	<-----	Telecentres Appropriate ICTs	---->
Enterprise	<-----	EP/PE Comm/CommNet GEMS	---->
Venture Capital/Finance	<-----	Hybrid VCs and Business Incubators Business Planning Comp	---->
Management	Prodigal Sons and Daughters	---->	
Content	<-----	Comm/CommNet GEMS	---->

4. Possibilities in a Global Knowledge Economy

The labour market for young people has changed significantly over the past decade under the combined impacts of globalisation, market liberalisation and the increasing adoption of information and communication technologies (ICTs) into more and more work places. This chapter examines a number of approaches to these new conditions and proposes some others. They are based on a number of general trends, that:

- the demand for increasing skills amongst workers is growing,
- inexperienced workers are in relatively low demand due to significant reductions in entry-level positions,
- structural readjustment is endemic, forcing the reconstitution of industries and having a major impact on many regions around the world,
- e-commerce is playing a particularly important role in this and appears likely to have a major impact on many traditional businesses, particularly retailers in specific, vulnerable sectors,
- large organisations are either reducing or, at best, freezing the size of their workforce,
- the entrepreneurial capacity of individuals and regions is rapidly becoming critically important to their economic well-being.

More positive trends include:

- the establishment and growth of millions of small and micro businesses; this trend is particularly apparent in the services and “new economy” industries,
- a disproportionately high number of young people play a critical role in many of these start-up companies in these new sectors, sometimes as the innovator, more often as the skilled staff,
- an enterprise culture which appears to be far more prevalent amongst young people than older generations (many more appear to be focussed on getting work rather than a job²⁰)
- growing indications of an ICT-based “new economy miracle” taking shape in the world’s two most populous countries, India and China (PRC),

Projects and Opportunities

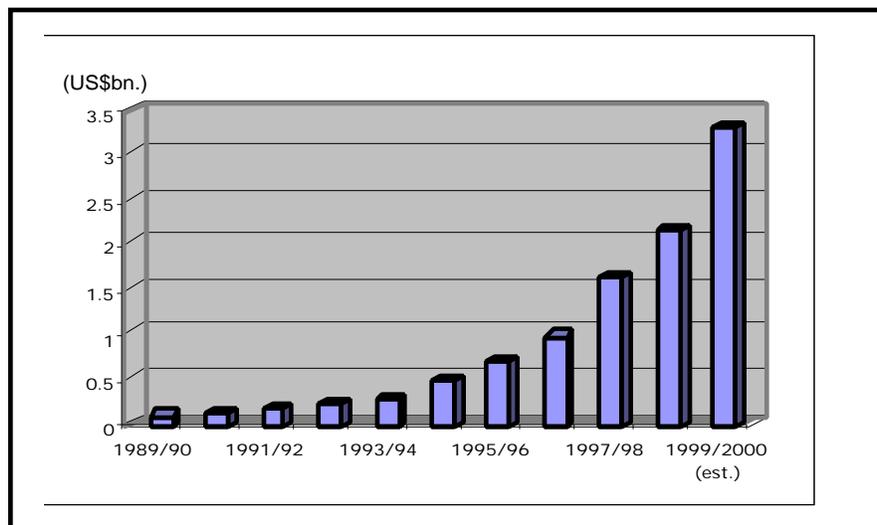
The opportunities for ICTs to contribute to the employment and business development prospects of young people have been categorised here under direct and indirect possibilities. Direct refers to opportunities arising from the development of ICTs or services directly related to the technologies (eg software and hardware development, the provision of telecommunications services etc). Indirect covers the application of ICTs across a whole range of traditional, and new, sectors within economies (e-commerce is an excellent example).

Direct Application of ICTs

Émigré Drivers: A New Economy Miracle?

The growth of the Indian software and Taiwanese hardware industries during the 1990s has been one of the most often quoted examples of globalisation and the shifting dynamics of the world information economy. India's huge number of technical graduates – the second highest in the world – have been crucial in building the industry very rapidly over the past decade. Taiwan is now universally regarded as a major centre for the production of computer hardware.

Figure 7: Indian Software Industry Revenue (1989–2000)



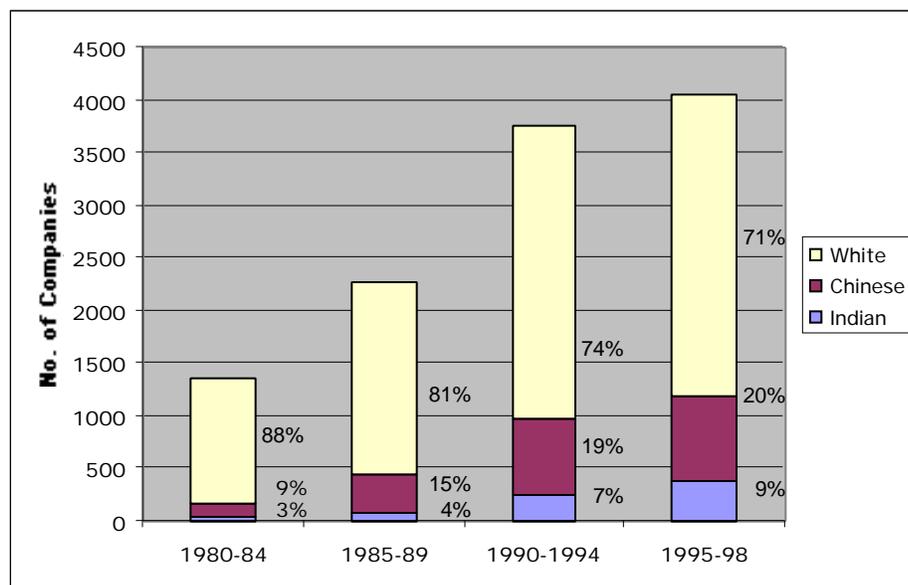
Source: Indian Software Site – <http://www.man.ac.uk/idpm/isixpt.htm>

A parallel, and complementary, development has been the growing importance of the expatriate Indian and Chinese communities at the geographic and economic centre of the industry, Silicon Valley. Most often these workers have come to the United States to further their university studies in science or engineering and stayed

on to work in one of the numerous companies in the region. In 1990 20% of the scientists and engineers in the Silicon Valley workforce were born in Asia. Further investigation of statistics of PhD graduates indicates that this trend has escalated significantly and another group are quickly gaining significance. Between 1990 and 1996 the number of doctorates from Bay area²¹ universities awarded to Indian scientists and engineers more than doubled, the number awarded to Taiwanese remained stable, but those earned by students from mainland China tripled. These three immigrant groups accounted for more than 60% of the doctorates awarded to foreign students between 1985-1995. The proportion of Asian engineering students graduating from Californian universities is even higher, running at twice the national average.

While these statistics are unlikely to surprise any observers of the industry few would realise the pivotal role Indians and Chinese have had in establishing and managing Silicon Valley start-up companies. In every five year period between 1980-1998 the proportion of start-ups founded or run by Indians or Chinese has grown (figure 8). Between 1995-1998 these entrepreneurs established more than 1,000 companies and in 1998 almost a quarter (24%) of Silicon Valley high tech companies had Indian or Chinese CEOs. These companies generated US\$16.8 trillion in revenues and employed 58,000 people. (Saxenian 1999)

Figure 8: Chinese & Indian-run High Tech Start-ups in Silicon Valley, 1980-1998



Source: Saxenian 1999

These statistics reveal a three step process: a wave of graduate students into US universities to study for their PhDs; take up a position in a Silicon Valley high

technology firm and then return to work or invest in their home industry. Taiwan is the first country to have successfully completed all three phases, India is between the second and third stages. Computer scientists and engineers from mainland China are the latest group to follow this path.

The potential combined impact of these changes on India and mainland China raises the prospect of an enormously powerful dynamic developing in the world's two most populous nations, based around ICTs. While the direct employment and revenue earning potential for these two countries from a strong ICT industry would be significant the likely flow-on effects are probably even more important.

Employment by Mobilising the Internet Generation

The internet is a young person's medium. The largest numbers of early adopters and the most enthusiastic users in every country are young people. Many of these young men and women have an ease and a conceptual grasp of the potential of the internet which goes well beyond the vast majority of older people.

A by-product of this youthful capacity is that many of these young people have a passionate belief in the power of the internet generally, and in its capacity to rectify many of the ills they perceive in the world. Probably the most impressive, and most positive example, of this ethos is the open source software movement. The advocates of open source software advocate that progress can be made far more quickly, and a better result can be achieved, if programmers openly share their work with each other²². Not surprisingly they argue strongly against intellectual property constraints on software and, as a group tend to have a strong dislike for "suits" (the more commercially focussed members of the industry).

What might appear to be a recipe for chaos has in fact resulted in the production of a number of extremely advanced and well accepted programs. Probably the best known of these are the Unix and Linux operating systems, and Apache server software. All of these programs are entirely in the public domain²³ and can be downloaded and used free by anyone. The vision which drives the hundreds of participants involved is primarily a passion for the internet²⁴.

The achievements of the open source software movement are an intriguing and insightful demonstration of the power of networking technologies and networked organisational structures. Unlike the traditional hierarchical structures refined in the 19th century and favoured by government and corporations the networking approach exploits the tremendous communicative power of the internet to move and enhance

information around the world at the speed of light to create radically new organisational systems. It has often been observed that these systems tend to be more biological rather than the linear or mechanistic industrial age structures. Their significance here is that with the internet young people are proving their mastery of this approach.

The Economics of Co-operation

The successful completion of these complex projects would not be possible without the internet. It has massively lowered the transaction costs for dispersed groups around the world to move information. In this example the internet has dramatically changed the economics of co-operation, particularly the potential for co-operation over great distances and between countries.

This development is due to a combination of factors:

- greatly lowered transaction costs;
- the knowledge, understanding and enthusiasm of millions of young people in the internet; and
- their faith in its potential to be a catalyst for change.

Harnessing this youthful enthusiasm and these talents, combined with an appropriate structure opens up the prospect of building the type of links which have supported and sustained these open source projects.

An opportunity exists to create a structure which supports the translation of this energy to projects in regions where youth unemployment is high. The goal would be to provide part of the framework required for unemployed young people around the world to generate work for themselves. This could take a number of different forms from linking them in with distant work possibilities (eg WWWork, box 12) to providing support for them to provide services locally (eg GEMs). This latter option has the double advantage of delivering into the young people's communities the human and technical capacity to exploit many of the opportunities offered by ICTs, both direct and indirect.

Indirect application of ICTs

Electronic Markets

The impact of ICTs in altering the way in which transactions take place has already been significant. Business-to-business (B2B) e-commerce has grown particularly rapidly. Their growth can deflect attention from the structural changes occurring

within the sectors moving across to electronic forms of trade. Many of the traditional players in these sectors are having to contend with aggressive new entrants which are making optimal use of ICTs to operate their companies, invariably with many fewer staff than the existing enterprises.

Just as in the example of the banking sector a decade ago, e-commerce is stripping many jobs, particularly entry-level unskilled and semi-skilled positions, from existing industries. As business-to-consumer e-commerce extends its influence into other sectors, thousands of jobs will be shed from the traditional retailing sector, in particular. Some of these positions will be replaced by the continuing demand for workers with technology skills, and transport and freight companies are likely to expand their workforce. Overall, this change is another which is likely to significantly disadvantage the prospects of young men and women. The most vulnerable jobs to these changes are those in which many would have expected to begin their working lives.

Box 9: Global trade for local artisans

PEOPLink is a non-profit organisation helping producers in remote communities all over the world market their products on the internet. The organisation is built around a global network of Trading Partners (TPs) that, in turn, provide services to several community-based artisan producer groups.

The Trading Partners are local development organizations that provide a range of services to several artisan communities, such as to "Fair Trade" markets in the industrialized countries. Many TPs are members of the International Federation for Alternative Trade (IFAT) which is comprised of members from 90 countries seeking to maximise the benefits of global trade for grassroots artisans.

PEOPLink equips the TPs with digital cameras and trains them to capture images and edit them in a compressed format suitable for transmission via the internet. Images of the crafts are placed on the PEOPLink Web page and then promoted to retail and wholesale buyers in the industrialized countries. The Web page also contains ample educational materials, sourced from the TPs, about the work and lives of the artisans.

In this way, PEOPLink also aims to go beyond just selling crafts, by empowering people in developing countries with the equipment and skills needed to participate in the new world of electronic commerce. For example, PEOPLink helps them build and maintain their own Web catalogues and provide on-line training and product development support.

Source: www.peoplink.org

But, as with some of the sectors mentioned earlier, there are also market opportunities created by the wider availability of ICTs and these associated new industry structures. For young men and women most of these jobs are likely to be enterprise development, rather than employment, opportunities. In the following section the role of a number of geographically-based networks are discussed as types of virtual infrastructure which can enable the creation of new enterprises as well as the defence of existing SMMEs. They are: localised electronic markets, guaranteed electronic markets, and electronic produce or products exchanges.

Localised Electronic Markets

Two characteristics of global electronic markets pose an extraordinary threat to the millions of small and medium sized businesses around the world. These are the capacity of large companies with sufficient resources to expand their reach dramatically and the additional weight e-commerce gives to dominant brands. In particular sectors (books, computer software and games, CDs etc.) traditional businesses in developed economies are beginning to feel the impact of multinational e-commerce providers of these products and services.

If electronic commerce were a drug, the marketing blurb would say electronic commerce speeds things up, makes things clearer, brings things nearer. But a closer look at the health warning on the back would say, "detrimental to those without an effective information infrastructure, without an active and aware private sector, without an environment conducive to private sector development and without skilled human resources".

Source: Cogburn and Adeya

Recent analysis by a Wall Street investment house²⁵ has suggested that within the next three years more than a quarter of the sales of some products will occur over the internet.

Table 8: Estimated Impact of E-commerce on Selected Sectors

(US\$bn.)	1999 sales - shops	1999 sales online	2003 est. - shops	2003 est. online	Online share 1999 (%)	Online share est. 2003 (%)
Books	21	2	23	7	7.5	30
Music (CDs)	13	0.7	7.5	26	1	28
Video games	20	0.2	26	7	1	28
Computer hardware	39	2.9	59	18	7.5	31
Computer software	18	2	26	10	12	40
Sports goods	33	0.7	39	3	2	8
Toys	24	0.2	27	2	1	4
Supermarkets	353	2	382	13	1	4

Source: Salomon Smith Barney

These estimates highlight the potential scale and the speed with which changes in a number of sectors are occurring. Compounding these effects is the impact e-commerce is already having in driving down profit margins for many traditional businesses. For many young men and women the dramatic alterations to the way in which the retail and wholesale operations are organised will have serious implications for their employment prospects. The retail sector, which has traditionally been an employer of many young people, is and will continue to modify its operations aggressively to take account of these new threats. Much of that attention is likely to be focussed on opportunities to reduce their workforce. The flow-on effects, caused by the loss of these jobs, are also likely to be significant.

Many of these retail SMMEs, which have operated for decades servicing a geographically defined market, are ill-equipped to challenge these forces. While there are occasional examples of successful micro e-commerce businesses, which have identified and filled a global niche market, these are exceptions rather than the rule. Few conventional SMMEs have the resources to establish an online presence, build a brand name globally, and sustain the losses while their “e-market” grows. And all the time watching their customers make fewer visits to their (physical) shop as they move their purchases to one of the online vendors. (Different dynamics, but

delivering a similar result, will increasingly face locally-focussed SMMEs providing services to other businesses as B2B e-commerce gains momentum even faster.)

A strategy for communities is to develop their own online, geographically linked WWW site which blends local news and relevant information with commercial activity to create a centre that acts as an alternative to the multinational e-commerce sites. Not only does this offer the potential to slow the “virtual migration” of local customers elsewhere but it also provides local businesses with a relatively easy entry into e-commerce. Local economic regeneration is also possible through the development of regional B2B markets.

Few relevant examples exist. The United States and some European countries have a large number of what might be referred to as “public interest” networks which have been established by community activists and/or online advocates working to facilitate the take-up of the technology in their town or suburb²⁶. There are also a growing number of examples of local government authorities establishing sites to impart information about the organisations’ activities and services and sometimes, about their community.

Nonetheless there is little doubt that some form of collective organisation will be needed by most communities to mitigate against the corrosive effects of an increasing amount of business moving to e-commerce transactions. The following sections discuss two specific examples which address aspects of these issues.

Guaranteed Electronic Markets

A feature of almost every e-commerce initiative currently being developed is that their proponents plan to colonise and control at least one component of the market segment they have targeted. There are very few examples of open electronic markets that have been established by disinterested individuals or organisations. Guaranteed Electronic Markets (GEMs)²⁷ have been conceived as entirely open e-markets modelled on public utilities. The critical component of a GEM is the guarantee which is underwritten by a central authority, in much the same way governments underwrite the value of their paper currencies.

The GEM itself consists of a series of databases which contain information about products or services available for hire or sale. A potential user can scan through the various providers and determine their location, cost and the number of satisfactory transactions they have been involved in with other GEMs users. When the two parties have agreed on the timing and terms, the purchaser pays the agreed price to

the GEMs. Once the task has been completed, and assuming there is no dispute about the quality of the service from the purchaser within a set period, the service provider is paid by the GEM, minus a service fee.

The guiding principles under which GEMs operate are that:

- each transaction is thoroughly enforced;
- market conditions are structured around the needs of buyers, rather than favouring particular sellers;
- the system is committed to simplicity of operation for users and keeping overheads low;
- the GEM stands alone, divorced other vested interests;
- the system has no purpose other than provision of electronic markets; and
- the system has automatic protection built in for users.

The GEM concept addresses the potential for SMMEs to take advantage of e-commerce to expand new businesses and to expand those businesses already operating. In common with the Localised Electronic Markets mentioned above, GEMs provide an open mechanism which will enable smaller companies and individuals, which are otherwise largely constrained in developing a viable online presence, with an avenue to establish themselves. For young men and women especially co-operative and accessible initiatives such as these offer great potential to provide a framework in which micro-businesses can be encouraged to generate employment in the online economy.

Electronic Produce/Product Exchanges

Whereas Localised Electronic Markets and Guaranteed Electronic Markets are primarily internally focussed in addressing some of the issues raised by global e-commerce, Electronic Produce/Product Exchanges (EP/PE) concentrate on using these technologies to tap into distant markets. Just as in the past producers and small manufacturers have attempted to reduce their costs and to gain greater control over markets through pooling their resources to operate packing sheds or trucking operations, ICTs can offer the same opportunity today. An EP/PE would provide information on:

- supply side inputs, such as the availability of sources of finance, labour and expertise, raw materials and technology;
- demand side inputs, market opportunities, prices, size of markets, quality; and
- environmental conditions, competitors/market intelligence, legislation.

In this example (figure 9) the EP/PE is trading in agricultural produce but the concept could be applied to a wide range of products. The EP/PE has two main elements: the technology and the management and marketing infrastructure specific to the product or industry.

Box 10: India's Magic Box

An information revolution is sweeping through the backwaters of Madhya Pradesh, in central India, spearheaded by what the villagers simply refer to as the "magic box". This "magic box" tells them what the price of potatoes is in the "big town" nearby and even provides them with copies of their land records, revenue maps and other documents they may require to get bank loans for the new harvest season.

Dehrisaria is just one of 600 villages in Dhar district that is now wired to a computer network. The network has 21 computer centres manned by local youngsters trained to work as operators. The centres, funded by local village councils, are expected to eventually subsist on user charges. Villagers have to pay a small fee of Rs. 5 (about US\$0.12) for daily market rates of locally produced food grains and vegetable crops available at the nearby wholesale markets as well as markets in big cities like Delhi, Chennai, Mumbai and Hyderabad.

The computer centres also provide villagers with important documents for Rs. 15. Banks in the region have agreed to accept the documents issued through these centres which are now also authorised to notarise them if required. Local officials say the computer network, inspired by an experiment carried out successfully in the neighbouring state of Maharashtra a year ago, will ensure that the villagers will not have to run around local government offices needlessly, like they have in the past. "They can now send applications for income, caste and domicile certificates as well as requests for land demarcation and landholders' loan passbooks on-line. These will be prepared within 10 days and the applicants informed online," says an official in Dhar district.

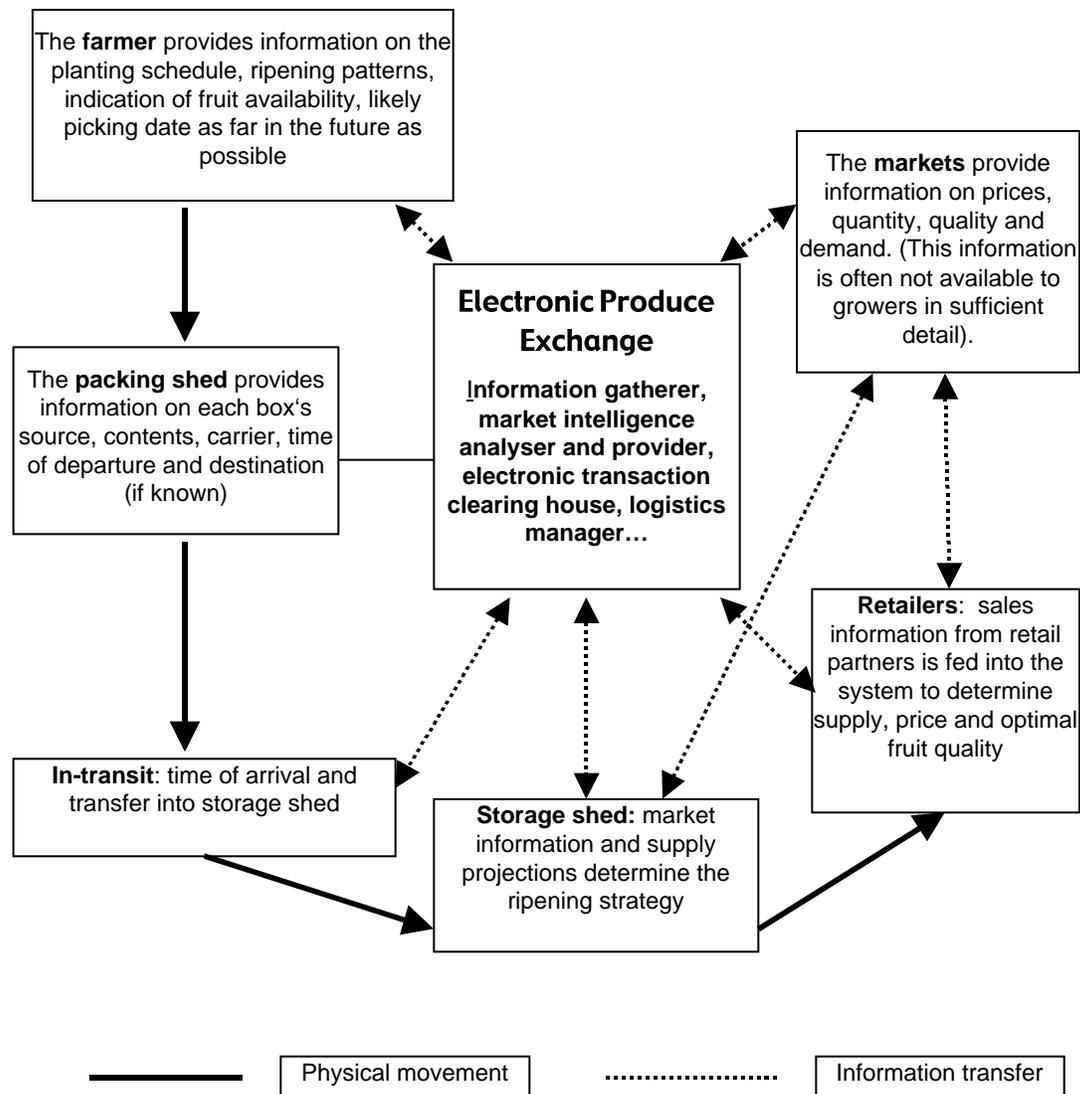
The network has also connected a hospital in the city of Indore, 60 kms away, with the Dhar district hospital and three primary health centres to make specialist medical advice and referral services available to villagers. A dozen patients in remote areas were referred to Indore in the first fortnight of the network's trial run itself.

The computer centres also act as communication links between the government and the villagers, allowing complaints about non-delivery of services under government schemes, absent teachers, and non-functioning pump sets, among other things.

Source: Information Technology in Developing Countries, Newsletter of the International Federation and Information Processing (IFIP) Working Group
<http://www.iimahd.ernet.in/~subhash/current.htm> (as at 1st August, 2000)

By strategically gathering and processing information, which is readily available to a grower group but not always accessible, farmers can have better information and so have greater influence over the distribution chain which will in turn enable them to reap greater benefits.

Figure 9: An Electronic Produce Exchange



The crucial issue in regard to the period we are entering is that ICTs are causing the value chains in a whole range of industries to be re-structured. As happens in any restructuring of this scale, the balance of power in the various business relationships can be expected to change.

Broader applications to other industries

A system such as this is well suited to SMMEs which are efficient producers but confined to local markets or operating at a great distance from market, and have had to rely heavily on an agent or broker to perform the function of aggregation to interface with the market. An EP/PE is distant-independent, it could be used equally well to supply domestic markets or those overseas. An important limitation however, is the quality of the transport and other logistical infrastructure.

Enterprise Development

Changes in labour markets around the world have forced policy makers to reconsider long accepted strategies to ensure that the supply of jobs kept pace with the growing demands for work by young people entering the job market as well as older workers left unemployed by structural readjustment. The most important of these changes has been the massive shedding of jobs by larger employers over the last two decades in particular. (As we have seen much of this has come through the adoption of new technology, particularly ICTs.) The vast majority of new positions created through this period have been through the establishment of new businesses or the expansion of SMMEs. In both cases a policy framework which encourages entrepreneurship is a critical component.

The following section is not concerned with the generic issues concerning enterprise development but with some of the specific issues related to encouraging and building enterprises directly and indirectly with ICTs. A feature of each of these approaches is that they are designed to address and accommodate the considerable uncertainty attached to establishing and operating a business in an ICT, or an ICT-enabled, sector. This includes the volatility and dynamism of the technologies themselves, the rapidity of change, and the fact that invariably the product or service will be attempting to survive in a global market.

Business Incubators, Finance and Management

Programs to establish business incubators have been used widely in many countries as a means of encouraging the establishment of small and micro firms and assisting them through their first few years of operation (the most likely time for failure) by providing various business and mentoring services.

A variation of this approach, which has been used most often for the incubation of technology businesses, sees aspects of the traditional incubator combined with a

heightened seed or venture capitalist role. Whereas in most incubators each tenant, or business, is a stand-alone business, in this model the centre management is also an investor in the start-up. As a result the management/investor group will tend to play a very active part in the day-to-day management of the company, particularly in relation to the non-technical aspects of its operation.

In many ways the relationship is similar to that which exists between an R&D team in a company where the technologists' exclusive concern is the technology they are working on. In some cases the technology group's administration, finance, marketing etc are all managed by the central management team. In this scenario, the similarities end with the distribution of equity. While a technologist employed in a company generally has no legal claims over the intellectual property and any profits which may flow from his/her innovation, in these hybrid incubator/VC arrangements the technologists are shareholders. The best known application of this approach has been in Israel as a response to the arrival of many highly skilled migrants from eastern Europe following the collapse of the Berlin Wall. This hybrid approach offered an opportunity to capitalise on the technical skills of these new arrivals but acknowledged the lack of business skills amongst them, particularly technology management skills.

The Australian government has also used a variation on this model in its Building on IT Strengths (BITS) program. The government has funded a number of consortia, whose membership has been drawn from technology, investment and education sectors, to operate incubators and investment funds specifically targeting ICT-based initiatives in the earliest stages of development. An important feature of the BITS program is that it is a hybrid public/private sector model, each of the consortia are required to invest their own funds in the company and in any start-ups they decide to support. (http://www.dcita.gov.au/nsapi-text/?MIval=dca_dispdoc&ID=4020)

An entirely private sector example of this approach is the US-based company IdeaLab (<http://www.idealab.com>). It also differs from the examples above in being very closely tied to its founder, Bill Gross, who has also generated many of the ideas which have become start-up companies. In these situations Mr Gross through IdeaLab bring together a development and management team to implement the idea. (<http://www.business2.com/content/magazine/indepth/2000/10/16/21185>)

Business Planning Competitions

Another approach is increasingly being adopted as a means of quickly teaching young people, particularly those with a strong technology background, business

skills are based around competitions. These competitions could well be described as “action learning” programs in which the entrants go through courses on developing business plans based on their own concepts. These plans are judged – most often by venture capitalists – at various stages of development and awarded prizes. The prize in the final round often comes with a some form of commitment from a venture capitalist or a business incubator for support.

Box 1 1: Building Innovation in Germany

Despite Germany’s well-educated workforce and a rich history in technological innovation and commercialisation it has performed relatively poorly in high-tech sectors. Compared with Silicon Valley, where 73 percent of all companies that have annual sales of more than US\$50m. were established after 1985, the share of these companies in Munich and Stuttgart is only 17%and 20%, respectively. Except for the software producer SAP, no company founded in Germany since the early 1970s has become a global leader in a new technology.

Germany still faces considerable challenges in closing the entrepreneurial gap. The source of the problem is not a shortage of capital available for new enterprises, as many people assume, but rather a shortage of knowledge and experience in managing start-up companies.

Business plan competitions, initiated in 1996 in cooperation with the universities of Munich and Berlin, have become established as forums where entrepreneurs can exchange ideas and make contacts. These contests have attracted many imitators. After training and coaching, would-be entrepreneurs submit comprehensive business plans, which are judged on their potential for generating the interest of venture capitalists. These competitions have so far nurtured something like 1,000 new businesses, mainly in high-tech industries, and have created thousands of new jobs. Governments have also become more active; most regional governments have set up generously endowed development programs for young companies.

Competitions have also been used as a vehicle for extracting business ideas from staff in existing companies. The competitions give staff members the opportunity not only to present proposals but also to get support and experienced guidance to realize them.

Summarised from: “The German Road to Innovation”, *McKinsey Quarterly*

An important feature of these competitions is that their generally young participants have an opportunity to test and develop their ideas and the form in which they present them in a safe environment. The traditional approach leads to an exceptionally high failure rate, largely through the inexperience of the proponents.

Distributed Work

The ease with which information can be moved about has led to a surge in the movement of work, particularly services work. The Indian software industry has been built on this structure as programmers in the sub-continent have been employed or contracted by companies in the developed world.

Just as US and European manufacturers have moved their production facilities to factories which employ lower wage workers a similar pattern is developing in the information industries. Swissair has relocated its revenue accounting processes to Mumbai Airport in India (Forge, quoted in Mansell 1999). Many other large organisations have moved their “back office” functions to low wage locations, capitalising on the ease of communication and the mobility of this type of work through ICTs. Much of the processing work for Wall Street’s financial services firms is completed in the Caribbean, for instance (ibid). The growing importance of the call centre industry has been another significant boost to ICT-driven employment in peripheral regions of developed countries and in developing economies.

But while ICTs, combined with companies’ preparedness to consider new ways of structuring their work, should offer significant opportunities the reality has been that they have tended to focus on particular countries and ignore others. Africa, for instance, has few examples of this type of investment (ibid). Sometimes proximity to clients and sharing the same or similar time zone (eg. the Caribbean in relation to New York) becomes a crucial feature. In other cases particular locations can develop a momentum through already having a number of these operations. Companies seeking a site for a call centre or transaction processing centre are attracted to locations where similar operations exist. Much of the infrastructure is already in place and there is already a pool of experienced labour.

Box 12: World Wide Work – Mobile work to Singapore

When you can’t get the workers to come to the job then get the work to them.

It’s been a mantra for distributed work for years. For Singapore Press Holdings, publishers of the *Singapore Straits Times*, it has been the answer to a long-running shortage of skilled workers to produce its stable of papers.

After years of recruiting journalists off-shore at great expense to come to Singapore and then watch them return home within a couple of years in 1994 the company decided to open a sub-editing bureau in Sydney.

There is nothing unusual in major newspapers having bureaus in the world's main news centres but an office handling sub-editing – the “pointy end” of producing a daily paper – was and is out of the ordinary.

Teng Guan Khoo opened the office and has managed it, and its 12 full-time staff, since. But the project had a difficult start, “we had to overcome a mental gap between Sydney and Singapore,” Mr Khoo says. “Some of our people went there and some of them came here to see how each office ran. Now it is like we are working on a different floor in the same building.”

It also helps that a third of the staff are originally Singaporean, one third Malaysian and the remaining third European Australians.

A permanent leased line between Singapore and Sydney links the offices. The sub-editors in Sydney have access to the same information and features on their screens as their 300 colleagues at head office. The full time sub-editors, plus four part-timers run in shifts from 8am to 2am seven days a week editing copy for three papers in the Press Holdings group: the international section of the *Times*, the afternoon tabloid, *The New Paper* and *The Business Times*.

Most of the work done in Sydney is copy editing but it is an indication of the company's faith in the system – and its staff in the office – that the leader section editor for its financial paper, *The Financial Times*, works there.

And with no end in sight to the shortage of journalists in Singapore (in fact expansion and new players entering the market will significantly expand demand) Mr Khoo and his colleagues have been working on expansion plans. Constrained by space in their Sydney office three more sub-editors will soon begin working from their homes in suburban Sydney, Melbourne and Perth.

Demand is not just increasing from Singapore. Mr Khoo says he has been approached by a Korean paper wanting English-speaking sub-editors to produce an English supplement to its paper.

Extract from “World Wide Work: Globally distributed expert business services”

Managed prudently these trends encouraging the mobility of work offer developing economies and depressed regions the opportunity to capture some of the benefits of this new environment to provide employment opportunities where few prospects may have existed. But the prospect of serious exploitation is also very real. In fact, mobile international capital and MNCs are, arguably, in a stronger position today to

negotiate aggressively with national and regional governments and with workers for various incentives and subsidies. The ease with which their operations can be moved, the high level of competition amongst countries and regions concerned about unemployment and the relatively few competitive advantages many regions, particularly the most depressed can offer, all point to a significant negotiating imbalance.

Infrastructure

The trends in the development of technology outlined at the beginning of this paper are, on the whole, working in favour of wider and easier access to information and communication technologies.

Policy-makers in virtually every country have accepted that improving access to communication services is a critical priority for social and economic development. There is also general acceptance that a loosening of central control over their telecommunications systems will encourage a drop in prices and (generally) wider availability of more advanced services. (The potential negative effects outlined in figure 5 should be remembered.)

Appropriate Information and Communication Technology

A significant impediment for many in the developing world to access to what might be described as Appropriate ICTs (AICT) is that hardware and software manufacturers in the developed countries (where virtually all manufacturing is located) use much of the technology improvements to add what are often largely superfluous features. From the perspective of the developing world, and disadvantaged regions in the developed world, much of these spectacular technology gains have been squandered.

Initiatives such as the UN's Industry Development Organisation's IT Services for Industry have worked to redress some of these issues. It seems likely that developments in PDAs (Personal Digital Assistants), small hand-held and battery-powered micro-computers, may soon develop to the point where they can be regarded as useful AICT. The current generation of PDAs cost about US\$400 and the top of the range models are now internet and wireless enabled. Most PDAs already offer a range of functions including a basic word processor (controlled either via a detachable keyboard or writing on a keypad), a calculator and a database. Wireless and internet access enables e-mail to be sent and received and specifically formatted WWW pages can also be downloaded.

The telecentre model of a community centre equipped with a range of different ICTs which are made for public use, and which often also run training courses, have proven a popular solution in many areas. From the rural regions of Africa to isolated townships in Western Australia telecentres have been used as a cost-effective means of providing access to ICTs for people, businesses or to households²⁸.

The Freeplay clockwork radios are another example of AICT, designed with the conditions of isolated living in mind (<http://www.windupradio.com>). The application of cellular mobile phones in Bangladesh (see box 1 demonstrates an appropriate social and economic approach for that society for a western technology.

5. The Role of Government, the Private Sector and other Institutions

The scale of the task and the very different dynamics of this international environment underline the need for a different approach to addressing youth employment issues. The most critical differences are:

- the importance of knowledge in economic development;
- the speed and volatility we are facing;
- the capacity of traditional public sector structures to respond to speed and volatility and to make the transition from hierarchy to network organisational structures;
- the increasing importance of networks rather than hierarchies in structuring organisations and projects; and
- the adaptability of young people.

These factors make the development of highly specific funding programs largely unworkable and instead place a premium on enterprise. Reconciling the need for greater certainty and accountability on the part of funding bodies with this changed global environment presents challenges for public policy makers.

A feature of the new economy – and the ICT sector sits at the heart of this – is that there can be big winners and big losers. Economists say these new structures encourage a situation where the strong get stronger and the weak get weaker which leads to extreme outcomes (Shapiro and Varian). These demands are not well suited to publicly funded programs requiring applicants to respond to specific criteria which have often been developed at a distance, both from the marketplace and from the time of implementation. Auditing demands which often require reporting and acquittal against the program criteria and the original application do little to enable the type of flexibility any small and/or young enterprise needs to give it the best opportunity for survival. Involving more established and larger private sector organisations and NGOs in overcoming these barriers is clearly important.

The recommendations which follow are preceded by a summary of the overarching issues which are especially pertinent to youth employment and ICTs.

Social

Young men and women's capacity to understand and adapt to ICTs – and the dynamics they generate – is significantly greater than for older people.

This capacity to use ICTs contrasts strongly with the unease and suspicion many older people have. In its extreme form this manifests itself in a view that ICTs, and the internet in particular, are a threat to be contained. In its most extreme form this can encourage a technology generation gap.

Figure 10: Four Potential Scenarios for the Technology Generation Gap

Older generations attitudes toward youth	Positive	Peaceful Coexistence	The Networked Society
	Hostility	Cold War	Generational Explosion
		Passive	Active
		Network generations use of new media	

Source: Tapscott 1998

Girls and women tend to be later adopters of technology but once ICTs usability and functionality improve a closer gender balance emerges. In some cultures significantly wider gender differences place barriers before girl's and women's ability to take up some of these opportunities.

The demand for relevant skills is growing, there has been a decline in unskilled and semi-skilled entry-level positions.

Skilled workers are becoming increasingly in demand and increasingly mobile.

Technology

The cost of information and communication technologies is continuing to plunge while their utility is increasing significantly.

There is a constant tension between open, non-proprietary systems and those technologies which are based on tightly controlled intellectual property.

The world has fallen into three technology-economic groupings: Technological Innovators; Technological Adopters and the Technologically Excluded.

Economic

Knowledge is replacing labour, land and capital as the major determinate of economic development causing significant structural readjustment.

The linking of high level technical skills, entrepreneurial attitude and high level industry networks is the feedstock for growth in this sector

ICTs are greatly reducing transaction costs and improving market access, for SMMEs and MNCs alike.

Large organisations have shed workers for the past two decades, in particular unskilled, semi-skilled and entry-level positions. Employment growth has come from SMEs and enterprise creation

Political

Global market liberalisation has exposed national economies to global influences and reduced the capacity for national governments to intervene.

Market, rather than public policy-driven, initiatives are seen as an appropriate approach in an increasing number of domains.

ICTs have greatly enhanced organisations' and individuals' capacity to network, often very widely.

Organisations of all sizes are moving toward flatter structures, introducing more networked rather than hierarchical systems.

Government Policy Approaches

The approaches to economic and employment development by various national governments, summarised below (table 9), highlights the range of different positions of various economies. There is general unanimity amongst the more developed countries that government should take a hands-off role and concentrate more on creating an environment which is conducive to the market. The US and Canada exemplify this approach, the European Community takes a slightly more interventionist view funding "catalytic projects" while working toward a "lighter touch" approach.

In Egypt and South Africa the governments are playing a central role as a lead user seeking to build expertise and a critical mass of users and providers. For other countries (Ghana, Mozambique, Tanzania etc.) the government's role is more all-encompassing as a range of needs are addressed.

Table 9: Information Economy Priorities for Selected Countries

Country	Emphasis of Information Economy plans and policies
Canada	Jobs creation, innovation, culture and sovereignty, network of networks, public/private sector development, competition, privacy, security
Egypt	Tourism networks, health networks, government networks, government online, libraries network, community centres
European Community	Liberalisation, standardisation, intellectual property right, media ownership, catalytic projects in ICT applications
Ghana	Mass Computer Literacy Warfare, ICT use in public administration, health information system (electronic health card), semiconductor design centres, public information clearing house, E-Commerce for non-traditional exports, E-governance, folk music database, district telecentres
Japan	Ageing population, infrastructure, creativity, standardisation, co-operation
Mauritius	Infrastructure (telecommunications, broadcasting, computerisation), People (literacy, highly motivated workforce)
Mozambique	National telecommunications policy, applications, telecenters, content development
Senegal	Telecenters, electronic commerce, access to research institutions, job creation, governance, infrastructure development, applications and enabling environment
Singapore	IT manpower, IT culture, ICT infrastructure and use, IT applications, IT industry, climate for creativity and entrepreneurship -to nurture indigenous IT development, co-ordination and collaboration
South Africa	Government network, universal services, public and private partnerships, equitable access, community networks
Tanzania	Improved social amenities, good governance, high ICT awareness and use, high mobility infrastructure, sustainable agriculture, stable economic growth, improved education, enhanced R&D and a coherent ICT framework
Uganda	Multipurpose community ICT centers, e-commerce for women entrepreneurs, environmental content, content for fringe communities, online agricultural information, school nets and ICT applications in health
United States	Promotion of private investment, competition, access, universal service

Source: *Information Technology in Developing Countries*

6. Recommendations and Concluding Remarks

The recommendations which follow are broad without being specific to any one country or group of countries. They flow from the global issues outlined above and attempt to address some of the generic problems facing particular types of economies, as outlined in table 1. (Greater detail on many of these recommendations is contained above in the body of the document, particularly in chapter 4.) Specific programs are identified in table 7.

Online NetWorkers

There is an opportunity to capture the knowledge, enthusiasm, energy and idealism of millions of online young people around the world, in much the same way as an earlier generation's imagination was captured by the Peace Corps., to assist their generation in other countries. Harnessing this potential offers the possibility of radically altering the employment prospects of numerous young men and women. This project could also provide massive leverage more generally by building ICT capacity for their community as a whole.

Prodigal Sons and Daughters

The mobility of knowledge workers has increased significantly in recent years as their skills become more highly prized. This has placed many developing countries and depressed regions in an invidious position as they invest scarce resources in educating these individuals only to see them leave to seek more attractive opportunities elsewhere.

Taiwan has been extremely proactive in attracting expatriates and, more recently, India in attracting some of its skilled expatriates back. The contributions these individuals can make to their country is even greater because of the professional networks their overseas experience has provided them with. Governments should maintain contact and seek to attract them back at the appropriate time.

Young Women

National governments must acknowledge the barriers girls and women face in engaging with ICTs. These barriers can revolve around differences in the way many males and females relate to these technologies. In other situations they can be determined by socially determined practices which effectively preclude girls' and women's involvement. In most cases effectively dealing with these barriers will require positive discrimination, in others sensitively developed programs which, as far as possible, circumvent social constraints.

Without adopting a more proactive stance many millions of girls and women will suffer from ICT illiteracy, and given the profound economic impact of these technologies that could be as disadvantaging as the inability to read or write.

SMME-centric Industry Development

Industry development and economic policies generally need to be focussed far more heavily on small to medium and micro-enterprises. These are the organisations which have been most successful in generating new positions as larger organisations have systematically reduced their workforces over the past two decades.

Local Online Economic/Employment Development

While much has been said about the borderless nature of electronic commerce and the opportunities this presents for many small companies and for individuals examples are more the exception than the rule. Local, geographically-focussed companies will increasingly find their markets being intruded upon by larger firms which have the resources to use ICTs to expand their market reach.

There are a range of strategies which can be adopted by communities to mitigate against the potential negative effects of e-commerce and to capitalise on the opportunities it presents. These include:

- Guaranteed Electronic Markets (GEMs);
- Electronic Produce/Product Exchanges (EP/PE); and
- Local e-markets

Finance and High Technology Start-ups

The skills demanded of investors and managers of high technology start-up companies are great. The volatility and the scope of these markets make them extremely complex environments in which to operate. Up to date market intelligence and a wide range of technology management experience are invaluable advantages the established “ICT capitals” have. For investors and companies establishing themselves in countries without these advantages their chances of success are lessened.

By creating a hybrid financing/business incubator organisation it has been possible to create sufficient critical mass to attract these skills. This is very difficult for a stand-alone SMME to achieve.

Education and Training

It is almost superfluous to mention the need for education and training in a knowledge economy. But two aspects of this issue are worth emphasising: the need for lifelong learning and the adoption of more flexible approaches to teaching and curriculum development and teaching which take account of the changing workplace students will enter.

Projects such as the African Virtual University and similar initiatives offer a cost effective means of delivery relevant training to a far larger number of people.

Concluding Remarks

The task the United Nations is addressing in seeking greater employment options for young men and women is challenging and important. Information and communications technologies have already had a dramatic impact on the way millions of people live and work – both positive and negative - and they are likely to continue to change these relationships for the foreseeable future.

ICTs do not offer a simple solution to solving this important problem. But what does make these technologies crucial in finding an answer is that for young people ICTs are *their* technologies. They understand them and have an empathy for them most adults cannot begin to understand. The comfort many young people have with ICTs is not just a function of them having “grown up” with these technologies. The open, networking manner in which young people instinctively conduct themselves is well suited to ICTs. But this style of operation is the antithesis of the way in which traditional institutions operate.

It is entirely possible that the new ICTs are so profound in their impact that they will reshape institutions and related social relations. In this case, the young, with their acceptance of change and lack of investment in the old ways, may find themselves better off than the rest of us.

This report has identified the key trends in relation to relevant technology and social change, and presented some possible, perhaps probable, outcomes. What actually does occur, of course, will be determined as much by political, and even personal decisions as by any inherent technical logic. The problems regarding youth unemployment are rooted in various socio-economic conditions, such as standard of education and basic standard of living, and even with the best technological systems in place, problems in these areas will continue to severely constrain beneficial change.

Nonetheless, this report is broadly optimistic about the possibilities for utilising new ICT to promote youth employment. In many important ways the dynamism and inclusiveness of networked systems in particular and the socio-economic relations, such as GEMs, that can emerge from them match well with the inhering qualities of young people. Given the requisite amount of support, political and financial, appropriate information and communication technologies and that the energy and enthusiasm of young people can be effectively combined the potential exists to generate significant social benefits. There is the prospect of taking both an inter- and intra-generational approach to provide millions of unemployed young people – and their families and communities – with a path to a new economic future.

In many cases the potential of these hopes being realised is likely to pivot heavily on the preparedness and generosity of those currently in power; at the community, national and internal levels. They must be willing to alter traditional institutional arrangements so the potential of young people and these technologies can be realised for the benefit of many.

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Notes

- ¹ Skills surpluses refer to a situation where the skills level of the workforce is higher than the higher than the needs of local employers.
- ² Non-proprietary, or open systems, most often refer to software which has been developed and released into the public domain without any of the usual restrictions of intellectual property law.
- ³ This term refers to computers, software and telecommunications, including the internet. The purpose in referring to these technologies collectively is to underline the trend towards, and the growing importance of them as communications technologies. The internet is the most important and the best recognised manifestation of this change.
- ⁴ See skills surpluses above.
- ⁵ The distinctions between these three categories of innovation are the invention - product innovation - its technical refinement - process - and finally improvement in the systems for its production - managerial.
- ⁶ The frequently quoted indicator of this trend is Moore's Law, named after one of the co-founders of the leading microchip manufacturer Intel, Gordon Moore. It says that every 18 months the processing power of chips will double and their price will fall by half. Moore's Law has proven to be true for over a decade.
- ⁷ In this paper Information Industries is used broadly to include not only the manufacture, marketing and support of ICTs but also those sectors which make heavy use of these technologies. As ICTs, and derivatives of it such as the internet, are more widely used this can become all-encompassing. Our interest here are in companies or individuals producing or marketing online products (online publications, music, tele-services etc.) or those for whom ICTs have become a critical part of their work (e-business applications to distribute tangible products, for instance).
- ⁸ Industry analysts, The Gartner Group say B2C in the US will be worth almost US\$29 billion in 2000, a 75% increase on 1999. Jupiter Communications say that B2B e-commerce in the United States is currently worth US\$336 billion and will be worth more than US\$6 trillion by 2005. If Jupiter's projections prove accurate this will mean 42% of B2B transactions will be online. (Source: Nua Internet Surveys, <http://www.nua.ie/surveys/>). This is at the upper range of industry projections. An examination of the various analyst's forecasts by *The Industry Standard* reported estimates of B2B's value in 2003 ranging from US\$634 billion to US\$2.8 trillion. NB Whilst these companies are experienced industry analysts actual and projected figures for e-commerce activity have proven to be notoriously difficult to measure and forecast, as *The Industry Standard's* survey makes clear. They are mentioned here, and should be regarded, more for indicative purposes.
- ⁹ "Seller Beware", *The Economist*, March 4, 2000, p. 61-2
- ¹⁰ A leading example of this is the US-owned Wal-Mart discount retail chain. For many years the company has been extremely innovative in its use of ICTs to gain efficiencies, particularly in managing its inventories. By building its own networks and closely monitoring stock levels it has altered the economics of discount retailing so that it can now operate a viable store in far smaller locations than had been possible, and increase the profitability of its existing outlets (Parker 1995). Having refined this further over the past

three years the company has increased turnover 47% with only a seven per cent increase in inventory (US Dept. of Commerce 2000).

¹¹ Sachs 2000

¹² Reported from a UNECA Conference of African finance and economic development ministers on “The Challenges of Financing Africa”, Addis Ababa, May 1998

¹³ The benefits arising from carrying out related activities. These are similar to economies of scale but whereas with under economies of scale flow from carrying out the same activity (most often using machinery for mass production) with economies of scope savings come from a systemic understanding which gives the firm advantages in carrying out related activities.

¹⁴ Software development, for instance, is done on a PC and produces a digital product which can be moved over a network from one machine to another in a split second. The mobility of paper-based work on the other hand is comparatively severely constrained.

¹⁵ The time taken to register a company in different countries can vary dramatically. In Germany it can be done in one day, in Spain it can take between 19 and 28 weeks. (OECD 1998)

¹⁶ for instance the report of the ITU’s Task Force on Gender Issues in ITU 1998a and 1999.

¹⁷ <http://www.aauw.org/2000/techsavvy.html>

¹⁸ http://www.nua.ie/surveys/index.cgi?f=VS&art_id=905355946&rel=true

¹⁹ See www.siliconsalley.com, and also “Salleyforth”, *Business 2.0*, June 27, 2000

²⁰ This distinction has been made by various writers but most succinctly by Charles Handy, author of *Beyond Certainty: The Changing Worlds of Organizations, The Age of Paradox and Age of Unreason*, amongst others.

²¹ The Bay area refers to the San Francisco conurbation; San Jose, Oakland and Berkeley.

²² Another important element of their thinking is a basic feature of information “products”, as opposed to industrial products. The major point is that an infinite number of copies can be made for virtually no cost (until the product comes out for the digital domain and is transferred to a disk or some other physical medium) without causing any degradation to the original.

²³ Versions of some open source programs have been used as the basis of a commercial product. This most commonly involves using the program, possibly adding some features, preparing a manual and packaging and marketing the resulting product. Within reason this does not tend to run counter to the attitudes of the open source movement.

²⁴ Probably the best discussion of the attitudes and philosophies behind open source is “The Cathedral and the Bazaar” by Eric Raymond, <http://www.tuxedo.org/~esr/writings>

²⁵ Research by Salomon Smith Barney, quoted in “Sopping on the menu”, by Robert Gottlieb, *The Weekend Australian*, 15-16 July, 2000

²⁶ A good deal of information about these networks can be found in Schuler 1996. The Blacksburg Electronic Village (in Blacksburg, Virginia, US - <http://www.blacksburg.va.us/>) is a long-running local site containing community information but has little news and only business directories. Other examples are focussed

primarily on getting users on the internet (eg Charlotte's Web, Charlotte, North Carolina, USA - <http://www.charweb.org/> and The Echo, New York City, USA - <http://www.echonyc.com/>).

²⁷ The name, Guaranteed Electronic Markets, and the concept are the brainchild of Wingham Rowan and have been spelt out in more detail in two books, Rowan 1997 and Rowan 1999.

²⁸ More information on Telecentres is available at <http://www.telecentres.com/> (rural Europe), <http://www.idrc.ca/pan/telecentres.html> (Telecentres across the developing world), <http://www.itu.int/ITU-D-UniversalAccess/seminar/tunis/tunis-program.htm> (ITU project on the Middle East), <http://www.telecentres.wa.gov.au> (Western Australian Telecentre Network)