

Human Resources for a Learning Society

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This paper focuses on the imperatives of the ongoing information and communication technology revolution for shaping current jobs and new skills and for creating a learning society and knowledge-based economy. The paper recognizes the need for proactive co-evolution of technologies, skills and jobs for sustainable growth and upward spiral of quality of life. It focuses on one powerful set of general-purpose technologies (that is, ICTs) as this focus illustrates more concretely the necessity of co-evolution of human resources in sync with emerging and future technologies.

While ICT provides efficient tools for building a modern, knowledge-based economy, it is the quality of the human capital that will ultimately determine success or failure in delivering on the promise of sustainable growth and high quality of life. Skilled human resources are a necessary condition for leveraging available ICTs and for re-inventing them to get closer to the diverse realities of all countries. The implications of the ongoing ICT revolution for education and learning are pervasive and profound, both in terms of the demand for new knowledge and skills, and the capacity and modes of supplying such knowledge and skills.

Consequences for human resources are not limited to ICT specialists and technology managers, or ICT production. Rather they span all specializations and all ICT user sectors. They cover all kinds of economic activities in which innovation, collaboration, competition, and learning are enabled or enhanced by ICT. And the development of information society-related skills has to pervade all channels of education, learning and knowledge sharing. Yet, surprisingly, e-skills tend to be the missing link in many national ICT strategies.

The emerging global economy and ICT-enabled development strategies will significantly increase the demand for e-skills. These skills will be needed in various ways in both the public and private sector. They must reach policy makers and corporate leaders as well as knowledge workers and grassroots innovators. They will be of central importance to worker mobility, employability and inclusion as well as growth, competitiveness and entrepreneurship. Among advanced economies, the gap is growing between the demands for e-skilled workers and ICT specialists, and the ability of educational institutions to supply them. Understanding the projected demand for e-skills, the current and potential channels of supply of such skills, the role of labor policies and markets, and the external factors likely to shape this demand-supply equation is critical to designing the human resource strategy for an increasingly competitive knowledge-based economy and inclusive information society.

A country e-strategy should address four broad human resources development challenges:

- i) *e-literacy*, that is, developing the capacity of the population at large to apply and use ICT in their roles as knowledge workers and consumers;
- ii) *e-leadership*, that is, raising the awareness and competencies of policy makers and business executives to set policies and governance mechanisms for ICT deployment in their organizations and the economy at large and to manage the consequent transformation towards networked organizations and economies;
- iii) *ICT education*, that is, strengthening specialized technology management education for ICT practitioners to plan, design, manage and support ICT systems; and
- iv) *ICT in education*, or e-education, that is, promoting the use of ICT to improve the quality of education and lifelong learning. This chapter takes each of these issues in sequence, while recognizing the interdependencies among them and the need to take a holistic view of human resources for ICT-enabled development.

E-literacy: Public Awareness and User Skills

E-literacy may be viewed in the context of building human capacity for development. This means considering basic e-literacy as a key component of human resources development for the masses and education for all.

Public awareness of ICT potential, and the widespread of e-literacy are critical to mobilizing the public's interest in reforming policies and institutions that would support ICT access, diffusion, and education. They help build demand for the country's ICT policies and ICT-enabled development strategies. Promotion and awareness campaigns should utilize a variety of channels such as television, radio, and road shows. Broad basic e-literacy is also essential to creating a critical mass of demand for public and private e-services. It determines the adoption rate and effective use of ICT and the Internet. On the supply side, ICT awareness should help mobilize financial resources and entrepreneurial talents to invest in ICT access, telecenters, ICT ventures, and local content.

This broad-based e-literacy was a core element of Singapore's national IT strategy: to create an "IT culture". A strong IT culture through heavy investment in e-literacy provided for dynamic investment in information infrastructure and advanced applications in government and business, moving the country towards the vision of an intelligent island.

The demand for e-literacy is enormous, particularly for latecomers and large countries. Should e-literacy campaigns focus first on the poor and rural areas where the private sector is unlikely to meet the demand without active policies and incentives? Should public efforts target or extend to the disabled and disadvantaged groups and those unlikely to be exposed to ICT through work or formal education? Should schools or telecenters be used as primary channels to promote e-literacy? Should broadband Internet access be subsidized to mobilize demand and build public awareness? Which popular

public services and information needs should be prioritized and delivered online so as to promote broad-based demand for online services? What role should the mass media play?

These are difficult issues and must be addressed so as to prioritize and phase initiatives to build e-awareness and e-literacy quickly and effectively. Fortunately, most developing countries have a large percentage of young people who are quick to adopt ICT tools, to navigate the digital world, and be part of the Net generation. This target group can also be used to reach the more disadvantaged groups such as rural people, the aged, and women.

Often civil society organizations, grass-roots initiatives, business organizations and other non-government entities are the leaders in experimenting and introducing ICT into decentralized educational systems. These contributions are typically not on a mass scale. But they represent innovative approaches and at times best practices from which governments can draw on for scaling up. The mass media can also play a key role in disseminating best practices and mobilizing resources for scaling up.

While designing awareness-raising and strategic communication activities, it is vital to advertise not ICT per se (a very common mistake), but its ultimate *benefits*. The messages should be about the development ends, not the technological means. For example, in promoting the use of ICT for agro-business or rural enterprise, it is better to frame it not as an “e-Agriculture,” but as a means to promoting efficient market access for small farms, or to increasing income of entrepreneurs in rural areas by establishing local market information networks. The primary focus should always be on the target users’ problems and objectives. While e-literacy can be important in specific IT-enabled services, it is even more important to enhance employability, life long learning, and access to knowledge for all economic activities.

Enterprise-based training is increasingly needed for innovation, adaptation and effective adoption of ICT. Yet, developing country employers tend to underinvest in worker training, and in turn tend to be risk averse and reluctant to adopt new technologies that would demand new skills and practices. These problems are compounded for SMEs as these enterprises are often the lagers in technology adoption. For them, training is unaffordable and training supply not responsive to needs. Broad-based training for ICT diffusion should address these needs and provide adequate incentives and support to broaden the base of users, particularly among the SMEs (Chapter 13).

E-leadership: ICT Policy and Strategy Leadership

Developing countries need to bridge the gaps that often arise because of the change management issues related to introducing new technologies. First is the gap between ICT specialists and policy makers. Information systems developers understand technology but not the realities of governance whereas officials and politicians understand the realities of governance but not the technology. A basic level of awareness and e-literacy is therefore needed for policy makers, legislators, opinion makers, and other public and business leaders. Second, e-development brings massive changes in employment patterns. Thus, preventive measures are needed to ease adjustments and avoid resistance to change,

such as re-training and employment assistance. The more innovative and transformative are the uses of ICT, the more critical would be the need for e-leadership. Finally, most e-development programs have long implementation cycle and policy makers need to balance active promotion of ICT investments with absorptive capacity and re-training programs for managers and impacted workers.

One of the serious problems for e-development in many countries is low awareness of the potential role of ICT in development among public and business leaders. Increasing awareness among the business community is essential to let the private sector play the role of catalyst and accelerator of innovation. The need to increase awareness among political actors is exacerbated by the political nature of ICT interventions. Government authorities and policy makers in a given country are the *porte-parole* of e-development, and their support is crucial in fostering ICT initiatives.

New qualities are required from business and public leaders, in the context of globalization and innovation-driven economies. E-leaders should have deep understanding of the policy, political, organizational and social impact of ICT and of network-based competitiveness. They have to become adept at managing knowledge workers, learning organizations, local and global networks, intellectual assets, and open innovation systems. More collaborative style of leadership will be needed. Change and transformational leadership is in increasing demand.

As e-government and e-business applications continue to diffuse, managerial understanding of ICT potential and governance has to be deepened. Leaders and business executives can shape the enabling environment for ICT diffusion. They also invest in the requisites and complementary investments in skills and process changes are in place to turn ICT investments and innovations into productivity gains. Lack of broad managerial understanding of the potential and prerequisites of the new technologies has been the key reason for failed ICT investments in both public and private organizations. But the problem is particularly acute in the public sector and in developing countries. On the demand side, executives tend to isolate and delegate ICT leadership to technologists and ICT managers, and are not aware of the critical role they must play to integrate ICT into their business and development strategies. On the supply side, e-leadership training tend to focus on narrow technological and technical issues, to the neglect of ICT-enabled strategic and institutional change and human resources issues.

A special cadre of e-leaders is the Chief Information Officers (CIOs). These business technology leaders have been recognized in advanced countries as executives in their own right and increasingly on par with other business executives or CXOs. The roles, functions, and profiles of the CIO are becoming increasingly strategic and less technology-focused. The public sectors in some countries are catching up in recognizing and advancing the function and profile of these leaders. That is not the case in most developing countries, and particularly in the public sector.

In the business sector in developing countries, CIOs and IT managers are engineers with technical knowledge but without business management experience. They provide

technology solutions but are isolated from business or strategic decision making. In the public sector, they are placed further lower down in the decision making hierarchy, even when they are recognized as a cadre within the civil service. Attracting ICT leaders to the public sector will require both substantive change in the profile and compensation of this executive function as well as its image and career prospects.

E-leadership requires a blend of core competencies, One broad categorization of e-leadership roles and corresponding competencies is illustrated for the public sector, ranging from the strategic to the technical (box). This blend will vary, depending on the level of a leader's power and responsibility in the organization. The blend and content will also change in view of the rapidly changing ICT. For e-leadership to be forward looking, current, and flexible, formal education needs to be complemented with lifelong learning and just-in-time peer support.

Box : Core Competencies for public e-Leaders

As top executives and business strategists, e-leaders should be able to visualize the destination of information society, the results of an ICT-enabled development strategy and/or the possibilities opened by ICT for their agencies and countries. They should be able to build an inspiring vision of how ICT will improve mission performance and build organizational success. They should be able to interact with other executives and stakeholders to shape this ICT-enabled future and then communicate it to the rest of the organization or sector for which they are responsible. They should possess competencies in strategic thinking, strategic communications and foresight. They should have a broad appreciation and domain knowledge of the business they are in—beyond technology. They should understand the big picture.

Also as business leaders and strategists, e-leaders should define the broad directions for the ICT road map and provide managers and staff with the tools and governance to travel and learn on their way. They should be concerned with mobilizing demand for change and for realizing the developmental results of ICT investments. They should shape and inform expectations for ICT-enabled enterprise. They should also understand the needs of their clients. They should be capable of inventing frameworks and creating environments that bring forth ICT-enabled possibilities in line with business strategy, national aspirations and/or agency missions.¹ They should strive to bridge the digital divide and to build an inclusive information society.

As change leaders, the e-leaders are chief innovation officers of new business processes and new forms of organizations. They are also the chief relationship officers who enable the creating of new networks and work teams within organizations as well as new partnerships and supply chains across organizations. Working with other executives, they lead institutional change and inspire managerial innovation. They should have the competencies to facilitate the evolution of current hierarchies into agile, adaptive, networked, client-centered, and learning organizations. They should lead process

¹ For such leadership qualities, in general, see Zander and Zander 2000..

innovation and client-centered service integration and facilitate the corresponding changes in skills, attitudes and culture. They should be able to create sufficient trust to break silos, build partnerships, and engage process innovators, change agents and organizational development practitioners. They must have competencies in organizational development, process innovation, team building, network design and management, partnership and coalition building, and culture change management.

A user-focused e-government and seamless joined-up services can be very challenging and costly. Client-focus means changing organizational structures and processes and reallocating resources, and this requires change leadership. It also means changes in attitudes and behavior among civil servants. It can be a great challenge to achieve customer satisfaction while reducing the cost of services and making them affordable. It is up to e-leaders to strike the appropriate balance through process and service innovation and effective change leadership.

As *technology leaders*, CIOs are the suppliers and custodians of ICT resources. This remains an essential role of e-leaders and the traditional domain for Chief Information Officers and Chief Technology Officers. Public service constraints often limit access to technical talent with cutting-edge knowledge of new technologies, project management methodologies and new approaches to systems development such as rapid prototyping. Also in strong demand are skills to engage policy makers and business leaders in defining systems requirements and process transformation.

Public CIOs are called upon to manage networks of ICT service providers and to engage in increasingly complex partnerships and contractual arrangements that demand current knowledge of the ICT industry and best practices. They should have competencies in outsourcing, portfolio management, project management, business case development, and information resources management. They should have broad understanding of the technological environment--the trends, the new wave of technologies, and the imperatives and the ways and means to secure open standards and avoid the risks of technological lock-ins.

ICT Professionals: Education and Training

A key component of e-strategies is the specialized ICT education and training necessary to build an ICT services industry, and to deploy the new technology for improving public services and private sector competitiveness. Skilled human capital is key factor in applying ICT to both public and private sectors, in maintaining and operating ICT infrastructures, and in exploiting the information that ICT makes available. Moreover, education and training in ICT and ICT-enabled services has proven to be a significant generator of employment and economic growth in countries like India, China, Korea, and the Philippines.

International experience shows that heavy investment in engineering, technology management, and ICT related education helps to create a positive spill-over effect on the whole economic system. For example, Ireland's success in reinventing itself to become Celtic Cyber-Tiger has rested heavily on intensive investment in people, and considerable emphasis on ICT education. Ireland has succeeded in creating centers of excellence in the domestic educational system that have attracted foreign investors to the ICT industry and supported growth and employment.

In many developing countries, the higher educational system is slow to respond to the ever-changing demands of the knowledge economy, especially in the fields of science, engineering and technology education. University-industry links and other types of public-private partnerships can be utilized to increase the quality and reach of technical education and training. Blending business management and engineering programs is particularly relevant to technology management and the commercialization of innovation, and to exploiting the potential of ICT as a tool for managerial innovation and institutional transformation.

Continuing education and training of ICT professionals is also essential to e-development. Singapore, for example, provided 70% subsidy against the cost of continuing education of software developers. Government could promote university-industry collaboration in delivering innovative educational programs to meet the special and fast changing needs of professionals. In Malaysia, the Knowledge-worker Development Initiative (KDI) monitors supply and demand of knowledge workers, and partners with the private sector to meet the gaps. KDI is involved in training and internships for undergraduates and existing works and in adapting university curricula to make them relevant to IT sector development. In the process, KDI forms partnerships with companies, academia, and government agencies.

Public-private Collaboration in Talent Development

Public-private collaboration for ICT skill development is on the rise, in part because of the relatively slow pace of reform of public sector education and training in response to the fast rise and dynamics of the ICT industry. The strategies and motivations of major vendors as suppliers of training should be taken into account in the ICT education component of the e-Development strategy. For example, Nokia has helped build ICT training institutes in China and South Africa. Cisco, in partnership with the UNDP is also active in promoting education as a means of narrowing the digital divide. Major software vendors such as Microsoft and Oracle are providing training around their products throughout the world. Microsoft has increased training output from 30,000 technical professionals a year five years ago to 1.2 million in 2008. The courses are conducted in commercial classrooms in 1900 independent companies around the world. There are clear advantages to these certified programs, as reflected by the explosion in demand. But if workers do not possess the foundation skills and knowledge, their specific technical skills will become outdated quickly.



Private ICT Education, India: A Franchise Model

The private sector is playing a major role in ICT education and training for all technical levels in India. The National Institute for Information Technology (NIIT) in India offers a broad range of ICT training for individuals and organizations from entry-level e-literacy to advanced courses on state-of-the-art technologies centers. It provides on-site, anytime anywhere, on-the-job or project-based training to clients in India through its extensive network of centers. It customizes its training to suit clients, public or private organizations. It has training programs for individuals, working professionals, colleges, schools and enterprises.

NIIT provides an interesting model for franchising large-scale, low-cost ICT training. It leverages the relatively low cost, high quality ICT education possibilities in India. It has an increasingly global coverage. It has become the “McDonald of ICT training” and Asia’s number 1 trainer in IT. It offers learning and knowledge transfer solutions to 5 million students across 32 countries. The IFC and Citibank have invested in NIIT’s student loan program. Using Citibank’s consumer lending standards, the program is based on student’s future earning capacity, thereby making loans affordable to lower income families. Using its established brand, NIIT has also partnered with global players, for example, with SAS to develop talent for emerging business intelligence technologies.

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Instruments for Talent Development

Human resource development interventions in ICT education and training should be guided by competitive analysis of the IT sector and its most promising segments. Of particular importance to many developing countries is the IT/ITES offshoring, covering IT/software services, BPO, and knowledge process outsourcing (KPO), and engineering and research and development services (Chapter 8). Interventions should be targeted at the right segments and right groups. For example, if the opportunity is in developing IT services, including R&D, then interventions should target engineers and technical specialists. If the opportunities lie in basic ITES, such as call centers, and if there is large pool of generalist graduates, then training in languages of export markets and in other industry-specific skills would be opportunistic.

Countries can select and deploy many policy instruments to increase the size and quality of talent pool for offshoring. Expansion of higher education could include specialized IT/ITES institutions, using public-private partnerships. This may be augmented by incentives for international universities to establish local campuses. In the case of Singapore, the Industrial Development Board established training advisory committees involving industry participation and industry-based training schemes. Singapore’s InfoComm Development Authority has also promoted global partnerships to develop and upgrade IT skills.

² NIIT (<http://www.niit.com>)

Incentives may be targeted to augment demand for ICT education through government-subsidized student loans. Governments may consider special incentives to encourage investment from local and international ICT training vendors. The talent pool may be augmented by tapping talent in specific areas via simplified visa regulations, as in the case of Malaysia and Singapore. Large countries like India may tap unconventional sources like unemployed graduates or junior college cadres and create bridge schools to provide short programs using targeted curricula for the sector.

Scaling up and expanding the pool over time may require some longer term measures. University curricula could be adapted and augmented by including IT-related and BPO-related skills, and complemented by investments in IT facilities. IT bridge programs would be targeted at the appropriate skill level—for graduates without technical training, it may include final year IT training and internship at software houses. For those with engineering training, a bridge course would improve understanding of software packages and Internet applications and other relevant skills to support consultative selling. Distance learning may leverage available trainable resources. Several states in India have taken some innovative measures, such as Andhra Pradesh's Institute of IT Enabled Services Training. AP has also partnered with GE so as GE would provide content and train-the-trainer support, as well as screening and placement of students, while AP would provide trainers and infrastructure.

The private sector should partner with government in devising and delivering these initiatives, and in setting globally-benchmarked standards. For example, ICT sector associations should engage their members in defining the skills gaps and communicate these requirements to the government and educational and training organizations. They may fund country-level skill assessment studies. They may also partner with government to fund or facilitate investments in relevant programs in the education sector. In the Philippines, universities partnered with leading standards organizations to maintain quality and align skills with industry requirements.

Targeted interventions can also support research and training to make them better tailored to the needs of local SMEs as users of ICT (chapter 13). SMEs face special challenges in adopting and mastering ICT and academic training and research institutions typically neglect these special needs. Many developing countries and their IT enterprises have been attracted to the offshoring opportunities, but neglected the potential of local enterprises, particularly their SMEs. An ICT-enabled development strategy cannot afford to neglect the special Human resource needs of SMEs to tap the potential of ICT. Several developing countries have been experimenting with programs to link universities to SMEs and develop the human resources necessary to meet these special needs. Malaysia provides one example (box).

Linking Universities and SMEs for Human Development, Malaysia

Malaysian SMEs experienced difficulties in their research and training activities due to a lack of ICT skilled labor in the country. The Teaching Company Scheme (TCS), a concept introduced in the UK, was employed to tackle the issue. The program creates partnerships in which academics and students join with companies to contribute to the implementation of their strategies on technical or management side. The TCS supplements the SMEs' financial and human capital and allows students to get valuable hands-on experience. It also improves the links between public and private sector in the country—targeted to the needs of SMEs.

Talent development should extend beyond ICT skills to also include middle management talent development, through targeted programs to address ICT-related issues in human resource management, quality assurance, finance, and marketing. On the ground training and internships programs may be also promoted. Such practical training and on the ground observation are even more critical at middle management level. Country ICT associations may organize educational visits leading companies within country, and in leading nations which adhere to standards like Six Sigma.

Measures to secure continuous improvement of the talent pool may include clarifying qualifications, tracking adherence to quality by schools, and providing certification and tracking of ICT and ITES workers. ICT associations may take the lead in promoting common assessment tests for various ICT specialties, such as for ITES-BPO, and for accrediting specialized training institutions. For example, NASSCOM developed a common assessment of competence test for ITES-BPO for India. In the short run, this provides for a common standard for recruitment. In the longer term, it would lead to an alignment between education and employability, help trigger downstream educational and training initiatives to help increase the talent pool, and provide a marketing tool for countries to showcase their skill standards³.

Similarly, promoting credible and transparent accreditation mechanisms for ICT and ITES training institutions at the country, regional or international levels can ensure that training offered is of a minimum accepted standard. The accreditation framework should include assessment of quality of faculty, current curriculum, pedagogy, infrastructure and industry linkages. Given the dynamism of this industry, such assessments and accreditation frameworks should be kept up-to-date.

For higher value niches of ITES, such as Knowledge Process Outsourcing (KPO) services, globally-benchmarked skills in the knowledge domain are also critical. For example, the Philippines has become an attractive choice for KPO for U.S. financial

³India's reputation in the software services was similarly helped, among others, by having many of its software houses meet the highest level of CMM quality standards.

institutions in part because the Universities of the Philippines offer courses in finance and accounting modeled on the U.S. General Accounting Principles. Similarly, Sri Lanka has become an attractive destination for KPO because of its large pool management accountants certified by Chartered Institute of Management Accountants.

Leveraging the Diaspora

An important issue for ICT strategies is the brain drain and the increasing global competition for software engineers. The brain drain makes it more difficult to retain the very people critical for coping with the ICT revolution. Developing countries must find ways to stem this brain drain, and even reverse the process into “brain gain” by mobilizing the Diaspora for broader national development.

Diasporas can enhance the reputation of the home country and augment or complement the local pool of ICT professionals. In the case of India, Indian ICT professionals in Silicon Valley helped create a sort of branding of Indian software, and facilitated various partnerships and outsourcing opportunities. Firms are establishing operations in both the United States- the front office- and India- the manufacturing facility. The worldwide network of Indian ICT professionals has also invested in skill development and has mobilized venture capital for ICT startups at home. The diaspora has had a significant impact as mentors, catalysts for policy change, direct source of returning talent, as well as investors and venture capitalists.

Similarly, the US-based Diaspora from Ireland and Israel have been also fundamental to their country’s external networking and software export success. Korea and Taiwan had long standing programs that helped reverse the brain drain and mobilized their Diaspora to develop markets and exploit global knowledge. Others like Singapore and Malaysia are aggressively recruiting ICT talent to build innovation-driven economies.

The promising role of the diaspora is particularly pronounced in the case of IT-enabled and outsourced business services for several reasons. First, unlike manufacturing, business services do not require large capital investments in machinery and infrastructure. Much of the investment needed is in the human resources. Second, as a relatively new industry in developing countries, business services face neither entrenched domestic monopolies nor trade unions. India’s success is particularly relevant here since the fast export growth in software services began in this sector prior to, and as a spur for the broad liberalization of trade and investment in other sectors of the Indian economy.

Governments can play a catalytic role by strengthening the diaspora network infrastructure capturing synergies, and leveraging the diaspora talent. (Kuznetsov, 2006). Activities include establishing a formal diaspora network, building on existing groups to aggregate this population’s talent and capital, promoting partnerships and joint ventures with local SMEs, establishing an innovation fund to promote joint research projects, facilitating short visits and seminars, and involving the diaspora in reviews and reforms of innovation strategies, programs and institutions. The effectiveness of such diaspora

initiatives however depends on having the right incentives and an environment of political stability and sound economic management.

E-education: Leveraging ICT in Education and Learning

There are several rationales for leveraging and mainstreaming ICT in general education and training (APDIP, 2004). The most important is the pedagogical rationale. Information technology offers enormous potential for enhancing access and quality of education and training systems, and tapping this potential for education should be a critical element of any national ICT strategy or education sector strategy. The use of ICT for education can shift the focus from teaching to learning, from teacher-centered education to learner-centered and learner-paced systems. There is also a social or equity rationale, as ICT is becoming increasingly pervasive in everyday life, and integrating ICT in basic education would level the playing field, familiarize young students early on with ICT tools and digital networks and initiate them on a life long journey of learning and discovery. The employment and vocational rationale is also important: ICT-based employment skills such as networking skills, IT-enabled services, desktop publishing, etc. Finally, there is the catalytic rationale, as ICT can accelerate reforms in teaching methods as well as in educational management institutions.

The knowledge revolution places further demands on educational institutions, to modernize the curriculum at all levels, to integrate computer and Internet tools into learning and professional development, and to prepare young people for life-long learning. East Asia has shown that technology orientation and content are as important as resources in improving educational outcomes. ICT tools and skills must be mainstreamed into all levels of education, including professional schools and management education. Industry leaders, business and public managers, and policy makers should understand the organizational and learning requirements to lead this technological transformation. This understanding is essential to educational reforms to integrate ICT tools into learning processes, curricula and teacher training as well as the management of educational programs and institutions.

Universal primary education and literacy remain a fundamental condition for participating in dynamic and information-intensive economies. Literacy cannot be leapfrogged. Increasingly, this now includes digital literacy. Pilot approaches should be encouraged; comprehensive reforms should be built on what worked.

Countries are experimenting with promising approaches. In Brazil, an NGO is helping communities to develop sustainable “information technology and citizenship schools”. Communities who apply and meet sustainability criteria are provided with technical assistance and training for instructors as well as help to procure and install initial donation of hardware. As a result of the NGO work with community associations, more than 35,000 school children in over 200 schools and 30 cities have been trained in basic computer literacy. In Chile, 5000 basic and secondary schools received computers, training, education software and ongoing support from a technical assistance network of 35 universities organized by the ministry of education. In South Africa, School Net

provides Internet services to local schools, including connectivity and technical support. The challenges of scaling up the impact of such pilots are substantial, but a national ICT strategy must build on such experiences and help increase their coverage and effectiveness.

Interest in and use of ICT in education is growing and substantial resources are being invested in this technological transformation. Yet, a growing body of experience in developing countries points to an apparent disconnect between the rationales most often presented to advance the use of ICT and their actual use (Turcano, 2005). The formal rationales are to introduce learning and teaching practices and to foster 21st Century thinking and learning skills. Much of the rhetoric is about changing the teaching-learning paradigm: this represents the potential of ICT for transforming educational systems (see Chapter 2). But actual programs of ICT in education are predominantly for use of ICT in computer literacy and dissemination of digital learning materials. In practice, ICT is used to support existing teaching and learning practices (with new and often expensive tools). A key challenge is to bridge this disconnect.

An e-education strategy must be guided by a holistic vision of the priority needs and reforms of the education sector to meet the demands of a competitive knowledge economy and inclusive information society. It is not enough that ICT in education is aligned with the national ICT strategy. It should be also driven by a coherent education sector strategy. It should be driven by clear pedagogical philosophies. Currently, there is tension between traditional and new pedagogies: ICT can serve both traditional, transmission-type pedagogies (more effective in preparation for standardized testing) as well as more learner-centered, constructivist pedagogies and measures of progress may be linked accordingly.

An ICT-enabled transformation of the education sector demands a holistic and coherent e-education strategy. It calls for a variety of enabling factors and raises important equity issues. Therefore, a holistic approach to educational reforms should be considered where ICT could make a fundamental difference or impact: teacher training, curriculum development, local content, reaching rural and remote areas, lifelong learning, as well as funding, decentralization and accountability.

But a holistic approach to e-education is challenged by the fact that different parts of government are responsible for ICT in education policies in developing countries, with no effective mechanisms for consultation and coordination. In some countries, ICT in education is the purview of the Ministry of Education, while in others it is handled by the ministry of Science and Technology, Ministry of Communication and information Technology, etc. Regardless of the locus, problems of coordination among the many stakeholders abound. Yet, successful ICT-enabled transformation of the education sector demands the inputs of many players: Ministries of education, labor, ICT, science and technology, Finance, and rural development, as well as academics institutions, NGOs, civil society, media, and the private sector.

Best practices and lessons learned are emerging, but with a few exceptions, they have not been widely disseminated nor packaged into formats easily accessible for policy makers in developing countries. Little documentation exists about scaling up of pilots and innovative uses of ICT in education. There are many pitfalls involved in e-education strategy implementation. An enduring problem is putting technology before education. A typical bias is towards hardware and connectivity issues, and little attention to relevant content and teacher training. Lessons and best practices are emerging, and should be systematically sought (Box).

Box : Integrating ICT into General Education: Lessons Learned

Lessons of experience and best practices are emerging, suggesting the following guidelines:

- Promote a comprehensive approach. Access alone is not enough to create a cultural shift towards ICT use. All the elements - hardware, software, internet access, teacher incentives and training, improved pedagogy, high quality online content and educational software - have to come together, in the same school at the same time, to be effective.
- Build a critical mass of trained teachers to develop sustainable changes in attitude towards ICT. The challenge of teacher training and support cannot be underestimated. ICT can enable teachers to transform their practices, given a set of enabling conditions. Providing incentives to teachers and administrations are necessary to integrate ICT into learning systems. In Chile, it was found at least 60% of the teachers in the same school have to receive training at the same time to create a cultural shift in the school towards ICT use. Training one teacher per school all over the country as was done in some other countries was a waste of money.
- Train teachers to move to new pedagogical practices and to create more learner-centric pedagogical environment, enabled by ICT. Teacher technical mastery of ICT skills is a necessary but not a sufficient condition for successful integration of ICT into teaching. The development of appropriate pedagogical practices is more important than technical mastery of ICT.
- Expose teachers (on an ongoing basis) to ICT and fast emerging educational applications to be able to remain current and select the most appropriate resources. Experience indicates that even in the advanced OECD countries, few teachers typically have a comprehensive knowledge of the wide range of ICT tools and resources that are applicable to education.
- Create an unavoidable ICT environment. ICT has to be used in administration functions such that teachers and principal cannot avoid learning the new tools. ICT literacy should be linked to future promotion for teachers.
- Seek cost effective and sustainable solutions for the deployment of ICT. Long term maintenance, operational support and constant upgrading of ICT in the classroom and educational institutions can be costly. Even in developed countries, educational institutions seek private sector funding and in-kind

contributions. However, public-private partnerships should be researched and evaluated to enhance their effectiveness and sustainability. Alternatives such as Free and Open Source Software (FOSS) may greatly reduce the cost of software procurement.

- Seek innovative approaches to content development. Digitizing and adapting digital content for access via ICT is a lengthy and expensive process. This is especially true for educational television and video production. This may have equity implications for using minority languages to disseminate content via the Internet. Despite the growing educational resources available on the Internet, experience shows that there is dearth of such resources in a format that is easily accessible and relevant to most teachers and learners in developing countries. Lack of digital educational resources that are directly related to curriculum and assessment of educational outcomes can be an important barrier to ICT use in education
- Build partnerships with the private sector and academia. Private sector engagement allows for development of effective educational software packages, relevant content and training programs that are well-tailored to the local needs. University-schools partnerships help to improve teachers education and develop network of teacher trainers. Private sector and academia can also promote accountability of government programs to promote ICT use in education by administering an independent Information Literacy Test for teachers.

Source: Turcano. 2005

E-learning and Lifelong Learning

There are three major formats of e-learning: self-directed, collaboration within a group, and guidance by an instructor. The last format can be further divided into direct e-learning, where computer-assisted networks are used to disseminate knowledge from an instructor to the students, and indirect schemes where computer-assisted networks are used to disseminate knowledge between instructors.

First type of e-learning currently has somewhat limited potential in many of the developing countries because of limited connectivity. Indirect schemes, however, may be applied more easily, and have a bigger impact and cost effectiveness. It can address two interconnected problems that face developing countries. First is a “human capital gap” – shortage of certain skills among the population necessary to build the knowledge economy. Most often developing countries need knowledge transfer in business-related issues - marketing, finance, management, etc. Second problem is that local educational system is often unprepared to fill this gap. There are simply not enough good instructors who can professionally teach these subjects. Indirect e-learning schemes help to quickly build the capacity of the educational system.

Many developing countries have begun to exploit the educational possibilities offered by ICT-enabled distance education as a way to expand access and improve quality of

educational services, and to support adult education and lifelong learning. The Pakistan Virtual University (<http://www.vu.edu.pk/>) is a relatively recent innovative model that uses various distance education technologies, and partnerships with various “storefront” IT institutes all over Pakistan – some 60 locations. The Virtual University, Pakistan’s first university based completely on modern information and communication technologies, was established by the Government as a public sector, not-for-profit institution with a clear mission: to provide affordable world class education to aspiring students all over the country.

Using free-to-air satellite television broadcasts and the Internet, the Virtual University allows students to follow its rigorous programs regardless of their physical locations. It thus aims at alleviating the lack of capacity in the existing universities while simultaneously tackling the acute shortage of qualified professors in the country. By identifying the top professors of the country, regardless of their institutional affiliations, and requesting them to develop and deliver hand-crafted courses, the virtual university aims at providing the very best courses to not only its own students but also to students of all other universities in the country.

The University opened its virtual doors in 2002 and in a short span of time its outreach has reached over sixty cities of the country with more than a hundred associated institutions providing infrastructure support to the students. Pakistani students residing overseas in several other countries of the region are also enrolled in the University's programs. The Virtual University of Pakistan holds a Federal Charter, making its degrees recognized and accepted all over the country as well as overseas.

Other countries, such as China, Mexico and Brazil, have been exploiting the educational possibilities offered by ICT-enabled distance education and created mega universities (Box). The success of such programs, despite the high initial fixed cost investments, can be attributed to the large target population and thus to economies of scale.

Box : Examples of e-Learning programs and Mega Universities

Even though comprehensive cost-benefit analysis of e-learning programs in the context of the developing countries is still missing, many countries are investing in this innovation. Particular attention is given to use ICT (including educational television) to improve the quality of mathematics, science, and technology teaching at secondary and higher levels. In China, more than 100,000 students graduate each year using distance learning programs. Mega universities such as China’s TV and Turkey’s Anadolu universities do not require that students live within national borders. The Open University of the UK had 25,000 international students living in 94 different countries.

The Monterrey Virtual University of Mexico (MTU) represents the new high-tech breed of open universities. It serves about 50,000 students from ten Latin American countries. Using satellite links, the Internet, Videoconferencing and other technologies, the MTU imports and exports courses from other universities in Latin America, and deliver services to diverse clients, including corporations. Mexico’s *Telesecundaria* aimed to improve

access to secondary education in rural areas, targeting students in 200,000 rural communities with populations of less than 2500. Started in 1968, and by 1998, the program educated 15% of Mexico's lower-secondary students. It uses broadcast satellite to provide a complete package of support to teachers and students in remote rural areas. Its costs are comparable to conventional schools in the more populated urban areas.

In Brazil, the State of Sao Paulo contracted the educational arm of the Globo Television Network to prepare a new *Telecurso* for its workers. In a joint venture, industrialists and Globo contributed to provide coursework to 500,000 learners at primary, secondary and tertiary vocational levels (OECD. 2004b).

An open, dynamic and nationwide lifelong learning system is a key building block for an ICT-enabled development and inclusive information society. Such a system should replace textbook-based rote learning with practices that develop a learner's capacity to learn, create and apply knowledge. Key policy actions should guide a lifelong learning strategy: ensuring foundation skills for all; improving access to formal education; recognizing all forms of learning; optimizing resource allocation across sectors and over the life cycle; and ensuring collaboration among a wide range of partners (World Bank, 2005). In addition, this system may adopt a modular approach, to codify and segment knowledge into modules or credit hours so as to favor the earning of qualifications at different stages in life.

Digitization of knowledge, distance learning and other ICT tools enable lifelong learning systems to function and reach across the country and beyond. A national distance education strategy should be integrated with a lifelong learning strategy.

Youth and ICT

Demographics present unprecedented opportunities and challenges that must be integrated into strategic thinking about ICT for development. As of 2007, about 1.5 billion people are ages 12-24 worldwide, 1.3 billion of them in developing countries, the most ever in history (World Bank, 2007b). In most developing countries, the number of young people is peaking or will peak in the next decade. These numbers can be a fiscal and economic risk—exerting unprecedented burdens on education and health systems and can be a constraint on growth. They can also be an opportunity as they will constitute fast growth in working-age population and contribute to falling dependency rates in most developing countries—a window of opportunity that may stay open for up to four decades. Investing in this “youth bulge” now is essential to succeed in an increasingly competitive and skill-intensive global economy. Even as countries struggle with basic needs, the global economy is demanding increasingly more technical and problem solving skills and life long learning. Investing in youth's e-literacy and knowledge economy skills should build the foundational human capital of the information society.

Young people are the main users of the new ICTs, especially the Internet and more advanced features of mobile phones and participative Internet (social networking). Youth account for 43% of all Internet users ages 15 and older in China, 50% in Armenia, 53 %

in Bolivia, 60% in Egypt, and 70% in Indonesia (World Bank, 2007b). The cost of investing in the skills required to learn how to use ICT and to do complex processing tasks are less for youth. Also, long working lives mean that young people have more time to reap the benefits from such investment. With the rapid expansion in ICT and shared access solutions, young people are able to connect to ideas and people outside their communities and traditional channels.

Fortunately, youth use of ICT will increasingly matter for development outcomes and will have wide-ranging effects on youth transitions. ICT offers unprecedented opportunities to youth: harvesting worldwide knowledge, informing and educating inside and outside schools, changing the environment for learning, encouraging peer-to-peer learning, and offering new employment opportunities and second chances. ICT diversifies the opportunities and channels of learning through distance education. Close to one million students in higher education are studying online in China. Mexico's Telesecundaria program gives those finishing primary schools in rural areas a way to continue schooling without long travels.

ICT also broadens employment opportunities for youth and provides second chances for work for youth with disabilities. IT-enabled services and business process outsourcing offers considerable scope for future growth in youth employment in developing countries. Offshore employment is estimated at 4 million in 2008, out of 160 million (11% of all worldwide service) jobs that could be carried out remotely (World Bank, 2007b). Such employment acts as an alternative to migration. The average age of a call center employee in India is 23. Youth are also highly represented as Internet café workers, programmers, local language website developers, and village telephone operators. New ICTs, including mobile phones, also provide information about non-ICT openings to youth. Many ICT jobs do not require mobility, and coupled with possibilities for telecommuting, this opens options for young people with disabilities (ILO, 2001).

Young people are extremely active participants in the global flows of migration. ICT can help migrants to stay connected with their home communities and with one another while abroad. Pre-paid phone cards and voice over Internet Protocol (VOIP) calls lower the costs of connecting home.

In formulating a human resource strategy as a key pillar of e-development, governments may adopt specific policies to enhance the development impact of youth use of ICT. Priority may be given to ICT education in schools as well as the promotion and use of multipurpose telecenters for promoting e-literacy among youth. Government regulation can have dramatic effects on the incentives for private entrepreneurs (often youths) to set up telecenters and thus determine youth access. A key priority for governments is to ensure an investment climate that allows the private sector to serve the growing demand for ICT services. This may include easy entry and competition policies. Moreover, governments can reach youth through the media they use, and stimulate demand for e-literacy by supporting local content development and providing public service content online. Innovation and experimentation to provide youth with the skills needed to take advantage of the new technologies will be necessary.

A Holistic View of Human Resources

The above discussion underlines the need for a holistic view of the human resources and the co-evolution of skills, jobs and practices in sync with emerging and future technologies. Human resources development is a key pillar of a national e-transformation strategy and an innovation economy. It spans the skills needed to supply a dynamic ICT infrastructure and industry, and those needed to establish effective demand for ICT use and diffusion across all sectors of the economy. Moreover, ICT human resources and skills span all levels of education in increasingly knowledge-intensive and innovation-driven economies. Prioritizing, sequencing, selecting entry points and making other difficult choices concerning human resources will need to be based on the logic and dynamics of educational transformation and overall ICT-enabled development strategy.

For example, in India, ICT-related human resource development focused early and primarily on technical education and specialized ICT training, mainly to exploit ICT potential for exporting software and ICT-enabled services. Until recently, the promotion of e-literacy for digital and knowledge inclusion took a back seat. Similarly, an e-development strategy with a primary focus on an export-driven ICT services industry did not put much emphasis on developing e-leaders or educating potential domestic business users of the new technology for competitiveness and globalization. Also only recently did India give much attention to the use of ICT to improve access, quality and learning at all levels of education, for similar reasons. Rather, IT in education has been primarily focused on preparing the technical skills needed for the ICT industry. The overall logic of an export-driven and an ICT industry-focused e-development strategy provided the rationale and entry points for the ICT-related human resources programs. A broad and knowledge-based development strategy or one that promotes inclusive innovation and social development, and thus digital inclusion, would have provided a very different set of priorities and choices for human resource development.

Human resources issues interact with other elements of e-development to create either positive or negative cycles, and unless addressed, would reinforce the digital divide among regions within a country. For example, brain drain is a major issue in China as trained and skilled ICT professionals tend to migrate to the urban centers and the more developed eastern regions of China. Successful integration of ICT in development requires a trained and skilled workforce—precisely the types of workers who tend to emigrate. Not only are residents of more developed regions unwilling to work in underdeveloped areas, but few graduates return to rural areas once they get urban residency. One reason for the migration of skilled labor from China's rural areas is low awareness of the significance of ICT for economic development in the underdeveloped areas. Low awareness leads to low investment in ICT infrastructure, impeding further investment in ICT programs. All these factors drive away educated, technologically savvy residents from underdeveloped areas.

A key issue for a human resources strategy for e-development is e-inclusion. As e-skills take center stage in enhancing employability and lifelong learning, so does equal access

to acquire such skills. This is a cross-cutting issue for an e-skills strategy and should be linked to all key elements of e-development. For example, rural telecenters can play a key role in promoting e-inclusion through special emphasis on e-literacy. Integrating ICT into education, particularly at the basic level, is another channel to promote equal access to e-skills. Targeted programs to introduce e-skills to women or disadvantaged groups can enhance employability. E-government services primarily targeted to the common man may also stimulate demand for e-skills. Similarly, e-trade, e-customs, e-taxes and other ICT applications to induce transaction costs between business and government could also be used to induce SMEs to adopt ICT and e-commerce, as was the case with Singapore's introduction of e-Trade Net.

At a more micro level, ICT-related human resources development investments should be linked and sequenced to support the broad thrusts of ICT applications in government, business and the economy. Structural changes to public administration and business enterprises should be anticipated to incorporate ICT as a strategic function and enabler of structural transformation. Sectoral priorities may also guide phasing and sequencing of public investments and incentives to develop ICT-related human resources, for example to promote the use of ICT in education, agriculture and rural development, social inclusion, or to improve the business environment and promote the export-oriented sectors in the economy.

An e-skills strategy has to be based on sound understanding of the domestic as well as the global market for ICT skills. It requires understanding and monitoring current supply and demand and potential partnerships among public and private sources to bridge current and potential gaps.

Finally, an integrated e-skills strategy requires a multi-stakeholder approach, a shared vision, and a determined leadership. The preceding requirements cut across all sectors and levels of society. They imply many policy and institutional reforms. Educational reforms in particular tend to be demanding and highly contentious, as they engage many stakeholders and vested interests. These are unlikely to be enacted by decree or top-down programs alone. Leadership must be able to engage all major stakeholders around a set of shared objectives and strategic thrusts. Business and civil society must play key and complementary roles. Many ICT multinationals such as IBM, Microsoft, Cisco, HP, Oracle, and Intel are also interested in playing a role in promoting e-skills. The excitement about ICT and its potential to transform educational and learning systems may help accelerate such needed educational reforms, not only to rapidly develop e-skills, but also the capacity to learn in a fast changing information economy.