# Human Capital and Technology Development in Malaysia

**Halimah Awang**
Faculty of Economics and Administration, University of Malaya *halima@um.edu.my*

*This paper examines the development of Information and Communication Technology (ICT) and its relation to the development of human capital in Malaysia as a country undergoing transformation into an ICT-driven and knowledge-based society. Education and training, being the key variable of human capital, is examined in terms of the government expenditure on education and training, years of schooling, number of enrolment and level of education of the labour force. ICT development is measured in terms of the personnel involvement in Research and Development (R&D) in related areas of technology or the development allocation and expenditure for R&D, and the extent of ICT usage in the various sectors of the economy and population.*

human capital development, technology development, ICT use, knowledge-based

## INTRODUCTION

It is well recognized that a trained, skilled and well-educated workforce is critical in enhancing work and economic performance and sustaining competitiveness as Malaysia transforms into an ICT-driven and knowledge-based society (Zainol, 1999). By using technology as a tool, ICT has emerged as an enabler in creating, manipulating and distributing information and communication to improve the quality and effectiveness of both the public and private sector programs and services (Mazlan, 1998). Under the Seventh Malaysia Plan 1996-2000, and more so under the Eighth Malaysia Plan 2001-2005, the government has placed much emphasis on ICT utilization during the implementation of policies and programs and the need to use this process as a means for the creation of new technologies.

To facilitate Malaysia's participation in the emerging networked global environment, the initiatives introduced by the government include the establishment of the Multimedia Super Corridor (MSC) and the formulation of the National IT Agenda (NITA). Government allocations have increased substantially for Research and Development, especially in Science and Technology, as well as for the development of intellectual human capital. This paper attempts to examine Malaysia’s preparation towards the new era in terms of its human capital development. And whether the manner and the means to enforce a paradigm shift in work culture to produce the kind of workforce that the Malaysian economy needs is being undertaken at the same pace, and in the right manner, as the infrastructure development.

## HUMAN CAPITAL DEVELOPMENT

In its effort towards shifting to a knowledge-based economy, Malaysia’s main responsibility lies with the development of human and intellectual capital to produce adequate supply of, support and sustain a flexible, agile, and mobile workforce with relevant knowledge and skills. One important if not the most important variable of human capital is education and training which can be measured in several ways including expenditure on education and training, years of schooling, number in enrolment and level of education of the labour force. Government expenditure on education and training as a representative of human capital variable is significantly related to economic growth variable represented by Growth Domestic Product (Ismail and Jajri, 1998).

The Federal Government development allocation and expenditure by sector during the Seventh Malaysia Plan (7MP, 1996-2000), the expenditure in education and training as shown in Table 1 was RM19.7 billion or 19.9 per cent of the total development expenditure and expended to RM22.7 billion during the Eighth Malaysia Plan (8MP, 2001-2005). The Federal Government allocation and expenditure for education and training showed a big jump in the expenditure for technical and vocational schools from RM404.9 million during the 6MP to RM756.6 million during the 7MP. The allocation for technical and vocational schools during the 8MP is further increased to RM900 million. For industrial training, the allocation of close to RM3.8 billion during the 8MP is doubled that allocation and expenditure of RM1.88 billion and RM1.83 billion respectively during the 7MP.

**Table 1. Development Allocation for Education and Training, 1996-2005 (RM million)**

| | 7MP | | 8MP |
|---|---|---|---|
| **Program** | **Allocation** | **Expenditure** | **Allocation** |
| Education | 17948.5 | 17542.2 | 18660.0 |
| Pre-school | 123.6 | 107.5 | 147.4 |
| Primary Education | 1632.0 | 2631.8 | 2750.0 |
| Secondary Education | 5330.1 | 5317.5 | 4862.6 |
| Government & Government-aided Schools | 3860.0 | 3853.7 | 3262.6 |
| MARA Junior Science Colleges | 710.0 | 707.2 | 700.0 |
| Technical & Vocational Schools | 760.1 | 756.6 | 900.0 |
| Tertiary Education | 5362.8 | 5005.1 | 8900.0 |
| Teacher Education | 350.0 | 332.5 | 300.0 |
| Other Educational Support Programme | 4150.0 | 4147.8 | 1700.0 |
| Training | 2237.3 | 2181.9 | 4000.0 |
| Industrial Training | 1876.0 | 1827.0 | 3760.0 |
| Commercial Training | 71.3 | 71.2 | 100.0 |
| Management Training | 290.0 | 283.7 | 140.0 |
| Total | 20185.8 | 19724.1 | 22660.0 |

Source: 8th Malaysia Plan

Concomitant with the increase in allocation for education and training, there has been a substantial increase in the number of population having access to education at all levels over the past decades. Total enrolment at the tertiary level in local public educational institutions doubled from 147,927 students in 1995 to 321,729 in 2000. Table 2 showed that there were 170,794 students enrolled for bachelor degree courses in 2000, while Table 3 indicated that 392,304 students were at the diploma level and 28,154 at certificate level. This represents more than 100 per cent increase compared to enrolment at the respective level in 1995.

**Table 2. Enrolment for First Degree Courses from Local Public Institutions 1995-2005**

| **Course** | **Enrolment** | | | | | |
|---|---|---|---|---|---|---|
| | **1995** | **%** | **2000** | **%** | **2005** | **%** |
| Arts | 44886 | 59.3 | 81914 | 48.0 | 103846 | 42.5 |
| Arts & Humanities | 22262 | | 40130 | | 48208 | |
| Economics & Business | 20072 | | 37875 | | 50522 | |
| Law | 2552 | | 3909 | | 5116 | |
| Science | 18171 | 24.0 | 49575 | 29.0 | 71897 | 29.4 |
| Medicine & Dentistry | 3738 | | 6908 | | 8656 | |
| Agriculture & Related Sciences | 2472 | | 4940 | | 5961 | |
| Pure Sciences | 4032 | | 9081 | | 14739 | |
| Technical | 12652 | 16.7 | 39305 | 23.0 | 68784 | 28.1 |
| Engineering | 9756 | | 31494 | | 57684 | |
| Architecture, Town Planning & Survey | 1397 | | 4682 | | 7920 | |
| Others | 1499 | | 3129 | | 3180 | |
| Total | 75709 | 100 | 170794 | 100 | 244527 | 100 |

Sources: Malaysia 2001

**Table 3. Student Enrolment in Local Public Institutions, 1995-2005**

| | 1995 | % | 2000 | % | 2005 | % |
|---|---|---|---|---|---|---|
| Pre-school | 253675 | 5.1 | 399980 | 7.0 | 549000 | 8.4 |
| Primary | 2799359 | 56.6 | 2945906 | 51.7 | 3035018 | 46.3 |
| Lower Secondary | 1124910 | 22.8 | 1245523 | 21.8 | 1364153 | 20.8 |
| Upper Secondary | 502964 | 10.2 | 697223 | 12.2 | 921271 | 14.0 |
| Post-secondary | 80080 | 1.6 | 76755 | 1.4 | 134134 | 2.0 |
| Teacher Education (Non-graduates) | 35410 | 0.7 | 14460 | 0.3 | 31310 | 0.4 |
| Certificate | 13556 | 0.3 | 28154 | 0.5 | 88848 | 1.4 |
| Diploma | 46480 | 0.9 | 92304 | 1.6 | 148025 | 2.3 |
| First Degree & Post-graduate | 87891 | 1.8 | 201271 | 3.5 | 289806 | 4.4 |
| Total | 4944325 | | 5701576 | | 6561565 | |

Source: 8th Malaysia Plan

The increase in tertiary enrolment was consistent with the overall pattern of employment, as presented in Table 4, which registered highest average annual growth rates for administrative and managerial category followed by professional and technical category suggesting a strong demand for manpower with skills and tertiary education. The dire need to increase enrolment at the tertiary level is reflected by the very low 13.9 per cent (Third Outline Perspective Plan (OPP3)) of the population in the labour force in 2000 with tertiary education that is critical to drive a knowledge-based economy. This is also reflected in Table 5 by the small percentage of knowledge workers in the labour force, which ranges from 11.1 per cent in 1996 to 17.8 per cent in 1999, as well as the substantial increase in the projected employment of knowledge workers from 2,800 in 1997 to almost 32,000 in 2001.

**Table 4. Employment by Major Occupational Group, 1995-2005 ('000 persons)**

| Occupational Group | 1995 | 2000 | 2005 | Average Annual Growth Rate (%) | | Net Job Creation (%) | |
|---|---|---|---|---|---|---|---|
| | | | | 7MP | 8MP | 7MP | 8MP |
| Professional, technical & related workers | 791 (9.9) | 1019.8 (11.0) | 1314.0 (12.1) | 5.2 | 5.2 | 17.9 | 18.5 |
| Administrative & Managerial workers | 256.0 (3.2) | 389.4 (4.2) | 543.0 (5.0) | 8.8 | 6.9 | 10.5 | 9.7 |
| Clerical & Related Workers | 871.9 (10.9) | 1029.1 (11.1) | 1216.2 (11.2) | 3.4 | 3.4 | 12.4 | 11.8 |
| Sales Workers | 871.1 (10.9) | 1019.8 (11.0) | 1227.1 (11.3) | 3.2 | 3.8 | 11.6 | 13.1 |
| Service Workers | 887.9 (11.1) | 1094.0 (11.8) | 1346.6 (12.4) | 4.3 | 4.2 | 16.2 | 15.9 |
| Production & Related Workers | 2711.8 (33.9) | 3041.0 (32.8) | 3355.4 (30.9) | 2.3 | 2.0 | 25.9 | 19.8 |
| Agricultural Workers | 1607.8 (20.1) | 1678.1 (18.1) | 1856.6 (17.1) | 0.9 | 2.0 | 5.5 | 11.2 |
| Total | 7999.2 | 9271.2 | 10858.9 | 3.0 | 3.2 | 100 | 100 |

**Table 5. Projected Employment of K-Workers and Percentage of K-Workers in Labour Force**

| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|
| Projected employment of K-workers | - | 2805 | 7078 | 11791 | 20334 | 31628 |
| Percentage of K-workers in Labour Force | 11.1 | 17.3 | 17.5 | 17.8 | - | - |

At the first degree level, enrolment in year 2000 marked the beginning of a dominance in science and technical courses accounting for 52 per cent of total enrolment compared to only 40.7 per cent in 1995 (see Table 2). Enrolment in Information and Communications Technology (ICT) courses in higher public institutions increased from 3,770 students in 1995 to 15,050 students in 2000 (8MP) while 49,040 students were enrolled in private institutions in 2000. However, students in private institutions were concentrated in basic computer literacy courses and software

applications. During the period 1996-2000 science and technical graduates accounted for only 42 per cent of the total output for first degree of which 16 per cent are for technical courses as presented in Table 6. Although the figure showed an improvement compared to 1991-1996 greater efforts should be taken to increase enrolment and output at higher levels in science and technical fields especially in ICT courses to cater to the need of qualified manpower.

**Table 6. Output of Degree Courses, 1991-2000**

| | 6MP | | 7MP | | 8MP | |
|---|---|---|---|---|---|---|
| **Course** | **No.** | **%** | **No.** | **%** | **No.** | **%** |
| Arts & Humanities including Economics, Business & Law | 49018 | 62 | 87882 | 58 | 161102 | 48 |
| Sciences including Medicine, Agricultural Sc., Pure Sc. & Others | 19642 | 25 | 38273 | 26 | 100967 | 31 |
| Technical, Engineering, Architecture, Surveying & Others | 10508 | 13 | 24343 | 16 | 70650 | 21 |
| Total | 79168 | 100 | 150498 | 100 | 332719 | 100 |

The changing trend from resource-based to knowledge-based employment means that a school leaver today will need to be retrained at least five times in their working life. This is due to the fact that shelf life of worker's knowledge and skills are becoming shorter as a result of rapid continuing technological changes. It was estimated that 50 per cent of what is learnt in school becomes obsolete in five years and in the field of electrical engineering the shelf life of current knowledge is 2.5 years. It would be even shorter in the field of ICT. Training and retraining is therefore crucial to make workers multi-skilled and versatile to be able to cope with these changes.

## TECHNOLOGY DEVELOPMENT

Studies have shown (Alias, Jaafar and Anuar, 2000; Othman, 1999; Samsudin, 1999) that economic growth cannot be separated from technological changes, and that the latter in turn depend on human capital involved in research. Technology development can be measured in terms of the personnel involvement in Research and Development (R&D) or the development allocation and expenditure for R&D. During 1985-1995 there were 500 R&D scientists and engineers per million population in Malaysia as presented in Table 7. This has placed the country in the third bottom position compared to 11 other countries most of which are developed. The ratio of R&D scientists and technologists of 7 per 10,000 labour force in 2000 (OPP3) puts Malaysia in the 16$^{th}$ position relative to 21 other countries, described in Table 8. Table 9 shows that, research activities are heavily concentrated in government research institutes and public institutions of higher learning and are still largely focused on agriculture and pure research.

**Table 7. Public Sector R&D Expenditure and Number of Scientists and Engineers for Selected Countries**

| **Country** | **R&D expenditure (% of GDP) 1998** | **Scientists and Engineers (per million population) 1985-1995** |
|---|---|---|
| Australia | 1.7 | 3166 |
| Canada | 1.6 | 2656 |
| China | 0.7 | 350 |
| India | 0.7 | 149 |
| Ireland | 1.5 | 1871 |
| Japan | 2.9 | 6309 |
| South Korea | 2.7 | 2636 |
| Malaysia | 0.4 | 500[1] |
| New Zealand | 1.0 | 1778 |
| Singapore | 1.8 | 2728 |
| United Kingdom | 1.9 | 2417 |
| United States | 2.5 | 3732 |

Source: OPP3 2001-2010
Note: [1] Refers to preliminary figures for year 1998

**Table 8. Country Position by Components of Knowledge Development Index, 2000**

| Country | Knowledge Index | Computer Infrastructure | Infostructure | Education and Training | R&D and Technology |
|---|---|---|---|---|---|
| United States | 1 | 1 | 10 | 8 | 3 |
| Japan | 2 | 8 | 3 | 10 | 1 |
| Sweden | 3 | 5 | 2 | 3 | 2 |
| Finland | 4 | 2 | 4 | 4 | 4 |
| Norway | 5 | 4 | 1 | 1 | 10 |
| Denmark | 6 | 7 | 5 | 2 | 9 |
| Australia | 7 | 6 | 6 | 6 | 11 |
| Switzerland | 8 | 13 | 7 | 9 | 5 |
| Canada | 9 | 3 | 12 | 5 | 15 |
| Netherlands | 10 | 10 | 9 | 13 | 8 |
| United Kingdom | 11 | 9 | 8 | 11 | 14 |
| Germany | 12 | 12 | 13 | 12 | 7 |
| New Zealand | 13 | 11 | 14 | 7 | 17 |
| Ireland | 14 | 15 | 15 | 15 | 12 |
| South Korea | 15 | 16 | 11 | 16 | 13 |
| Singapore | 16 | 14 | 16 | 19 | 6 |
| Malaysia | 17 | 17 | 17 | 17 | 16 |
| Thailand | 18 | 19 | 21 | 14 | 19 |
| China | 19 | 18 | 19 | 18 | 20 |
| Philippines | 20 | 22 | 18 | 20 | 18 |
| Indonesia | 21 | 21 | 20 | 21 | 21 |
| India | 22 | 20 | 22 | 22 | 22 |

Source:OPP3 2001-2010

**Table 9. R&D Personnel by Institution and Qualification, 1998 (%)**

| | PhD | Masters | Bachelor | Non-Degree |
|---|---|---|---|---|
| Government Research Institute | 37.2 | 54.4 | 23.1 | 21.0 |
| Institutions of Higher Learning | 54.8 | 29.0 | 18.7 | 33.6 |
| Private Sector | 8.0 | 16.6 | 58.2 | 45.4 |
| Total | 100 | 100 | 100 | 100 |

Source: 8th Malaysia Plan

Looking at the development allocation and expenditure for R&D, it showed a significant increase in expenditure for R&D during the 7MP compared with during the 5MP and 6MP, and the allocation is further increased during the 8MP. Total allocation for S&T during the 8MP is more than double the expenditure for S&T during the 7MP. However, as shown in Table 10, more than 50 per cent of the total expenditure for S&T during 7MP and allocation during the 8MP were for S&T infrastructure and development. The R&D expenditure as a proportion of Gross Domestic Product (GDP) is very small (0.4% in 1998) and compares unfavorably with that of developed countries (see Table 7).

**Table 10. Development Allocation for Science and Technology, 1996-2005 (RM million)**

| Program | 7MP | | 8MP |
|---|---|---|---|
| | Allocation | Expenditure | Allocation |
| Intensification of Research in Priority Areas | 755.0 | 718.0 | 1000.0 |
| Malaysia-MIT Biotechnology Partnership Program | 35.0 | 33.0 | - |
| Technology Development for SMIs | 58.0 | 41.2 | 30.0 |
| Technology Acquisition Fund (TAF) | 118.0 | 118.0 | 250.0 |
| Commercialisation of Technology | 208.0 | 203.9 | 610.0 |
| Industrial Research & Development Grant Scheme (IGS) | 50.0 | 45.9 | 200.0 |
| MSC Research & Development Grant Scheme (MGS) | 65.0 | 65.0 | 200.0 |
| Demonstrator Application Grant Scheme (DAGS) | 30.0 | 30.0 | 100.0 |
| Commercialisation of Research and Development Fund (CRDF) | 63.0 | 63.0 | 110.0 |
| S&T Infrastructure and Development | 2413.3 | 1496.7 | 2818.9 |
| Total | 3587.3 | 2611.2 | 4708.9 |

Source: 8th Malaysia Plan

## ICT USE IN MALAYSIA

ICT has not only emerged as a strategic enabling tool but a driving force to support knowledge-economy. The important role of ICT in the economy has been well documented and that its contribution to output and productivity growth in ICT-using sectors is through enhancing their efficiency by harnessing new technology (Bassanini, et.al, 2000). The development in Information Technology and the convergence between ICT and multimedia has brought about many changes and new approaches in the way people work, conduct businesses and communicate. It has also provided the catalyst for the emergence of the development of new industries in the e-spectrum such as electronic commerce, edutainment, infotainment and high-value added communications services.

The MSC concept created in 1996 was the key initiative towards transforming Malaysia into an IT-cultured and knowledge-based society. The ICT expenditure by the government, education and research and other economic sectors rose from RM3.8 billion in 1995 to RM5.9 billion in 2000 with a total ICT expenditure during 1996-2000 close to RM25 billion, presented in Table 11. In 2000, manufacturing has the highest ICT expenditure (RM1.2 billion) followed by banking and finance (RM827 million), distribution (RM650), government (RM532 million), and telecommunication and home (RM473 million). ICT expenditure for education and research is the same as for utilities and professional ICT and other services (RM236 million). The ICT expenditure for manufacturing, education and research, professional ICT other services, and distribution in 2000 are at least double their respective expenditure in 1995. The biggest increase is for home ICT expenditure from RM76 million in 1995 to RM473 million in 2000.

**Table 11. ICT Expenditure by Sector, 1995-2000 (RM million)**

| Sector | 1995 | % | 2000 | % | 1996-2000 | % |
|---|---|---|---|---|---|---|
| Banking & Finance | 1026 | 27.2 | 827 | 14.0 | 3723 | 15.0 |
| Manufacturing | 494 | 13.1 | 1182 | 20.0 | 4041 | 16.3 |
| Government | 380 | 10.1 | 532 | 9.0 | 2062 | 8.3 |
| Telecommunications | - | - | 473 | 8.0 | 2323 | 9.3 |
| Distribution | 304 | 8.1 | 650 | 11.0 | 2586 | 10.4 |
| Oil & Gas | 380 | 10.1 | 296 | 5.0 | 1623 | 6.5 |
| Utilities | 266 | 7.0 | 236 | 4.0 | 1253 | 5.0 |
| Professional ICT & Other Services | 125 | 3.3 | 236 | 4.0 | 236 | 1.0 |
| Healthcare | - | - | 59 | 1.0 | 59 | 0.2 |
| Education & Research | 114 | 3.0 | 236 | 4.0 | 1008 | 4.0 |
| Transportation | 114 | 3.0 | 177 | 3.0 | 1147 | 4.6 |
| Home | 76 | 2.0 | 473 | 8.0 | 2004 | 8.0 |
| Plantation & Mining | 76 | 2.0 | - | - | 100 | 0.4 |
| Others | 418 | 11.1 | 532 | 9.0 | 2736 | 11.0 |
| Total | 3773 | 100.0 | 5909 | 100.0 | 24901 | 100.0 |

Source: 8th Malaysia Plan

During the 8MP the flagship applications of the MSC project is given the highest development allocation of RM1.8 billion, shown in Table 12, of which RM435 million goes to the development of E-Government. For computerization and bridging the digital divide, the development allocations are RM1.6 billion and RM1.1 billion respectively. Almost all of the allocation for bridging the digital divide is for the development of computer infrastructure for rural schools.

In terms of the extent of ICT usage, both the personal computers (PC) and Internet penetration are showing phenomenal rate of growth from 610,000 and 18,000 subscribers in 1995 to 2.2 million and 1.5 million 2000, respectively, as shown in Table 13. The number of PCs installed per 1,000 population also rose from 29.5 in 1995 to 85.7 in 2000. However, Malaysia is in the 17th position with regard to Infostructure and Computer Infrastructure when compared to 21 other countries (see Table 8). Infostructure includes newspaper circulation, telephone subscribers, mobile phones

while indicators of computer infrastructure include number of computers per 1,000 population, computer power per capita and connections to the Internet.

**Table 12. Development Allocation for ICT-Related Program and Projects, 2001-2005**

| Program / Project | Allocation (RM million) | % |
|---|---|---|
| Flagship Applications | 1824.9 | 35.4 |
| E-Government | 434.8 | |
| Smart Schools | 401.1 | |
| Telehealth | 400.0 | |
| Multi Purpose Card | 418.1 | |
| R&D Cluster | 1.9 | |
| Cross Flagship | 169.0 | |
| Computerization | 1641.8 | 31.8 |
| Research & Development | 300.0 | 5.8 |
| Bridging the Digital Divide | 1098.0 | 21.3 |
| Infodesa (Rural Info) | 30.2 | |
| Internet Desa (Rural Internet) | 3.0 | |
| Universal Service Provision | 119.8 | |
| Computer Infrastructure for Rural Schools | 945.0 | |
| Local Content | 10.0 | 0.2 |
| Others | 284.4 | 5.5 |
| Total | 5159.1 | 100.0 |

Source: 8th Malaysia Plan

**Table 13. Selected ICT Indicators 1995 and 2000**

| Indicator | 1995 | 2000 |
|---|---|---|
| Newspaper circulation per 1000 population | 162 | 159[1] |
| Telex subscribers | 6578 | 3105[2] |
| Personal computers (units installed) | 610k | 2.2m |
| Personal computers per 1000 population | 29.5 | 95.7 |
| Telephone lines per 1000 population | 161.07 | 204.76[2] |
| Telephone subscribers | 3.33m | 4.65m |
| Mobile phones | 873k | 5.1m |
| Number of Internet subscribers | 18k | 1.5m |
| Number of Internet users | 30k | 6.0m |

Sources: MECM, PIKOM
Note: [1] Refers to 1998, [2] Refers to 1999

## DISCUSSION

The crucial role of human capital development and R&D requires firm commitments, support and direction from the government. The adoption of ICT in the public sector is inevitable in the light of the changing technology and huge investment by the government to turn electronic all aimed at improving efficiency and effectiveness of the public service. One of the seven MSC flagship applications is Electronic Government that sets the aspiration to employ multimedia technologies to re-invent the way the government operates. The changing landscape of the Public Service through extensive use of ICT especially the Internet services will create a more knowledgeable society that will demand for better quality of services and governance. The introduction of ICT-enabled processes compounded by the rapid change in ICT products and services require the need to learn new skills and processes. The use of ICT and other new technologies at the operational levels are for creating more productive and efficient workers. Hence employees must require new skills as well as the skill to acquire new skills on a continuous basis. A core generic skill would be ICT skills that all employees must have together with other skills to perform multiple tasks. A study by Hazman (2000) on extent of IT use in 500 public service departments revealed wide use of IT in finance, budgeting, enforcement activities and inventory control. Low use of IT was observed in human resource management, communication, counter service and record keeping. The study also found that quality of service depend on employee readiness with regard to ICT

competence, satisfaction with ICT in terms of beliefs and attitudes about ICT, knowledge of ICT potential as well as work productivity impact of ICT and other technologies.

Certainly there is a need to increase enrolment in tertiary education especially in science and technical field because of the growing demand for new inventions and innovative products. The application of ICT as an enabling tool in teaching and learning should be spread for wider coverage that cuts across all levels of education and regions. More efforts should be geared towards promoting a learning culture, that is, learning to learn and lifelong learning to develop the ability to independently learn and use new knowledge and skills to meet changing needs. Thus there is a need to look at alternative pathways to acquiring these skills and knowledge such distance learning, adult learning, outreach education program and visual learning to take advantage of ICT.

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