



CHAPTER 8

SOUTHEAST ASIA

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OVERVIEW

The Southeast Asia region consists of a diverse group of 11 countries, namely, Brunei, Cambodia, East Timor, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam. This region of extremes ranges in population from a high of 213.6 million in Indonesia down to a low of 0.34 million in Brunei. In the middle are Vietnam, the Philippines and Thailand with populations of 79 million, 77 million and 61.2 million respectively, and the smaller countries with populations of 12.3 million in Cambodia, 5.4 million in Laos and 4.1 million in Singapore.

The gross national income (GNI) among the countries is also diverse: Singapore has the highest per capita at USD24,740, followed far behind by Malaysia at USD3,640. Thailand and the Philippines follow one after the other at USD1,970 and USD1,050 respectively and then Indonesia at USD680. Countries with lower GNI include Vietnam, Laos and Cambodia, which range from USD410 down to USD270 (World Bank 2003)

In terms of technology penetration, be it telephone and computer ownership or Internet access, available data follow the same trends. Singapore tops the list far ahead of the other countries, followed always by Malaysia or Brunei as the case may be. In the middle range are Thailand, the Philippines and Indonesia while the lower end of the spectrum includes Vietnam, Cambodia, Laos and Myanmar.

For example, data on telephone subscribers per 100 inhabitants reveal the existence of a digital divide in the region. Statistics from 2000 show that Singapore has the most number, with 120 over 100 subscribers, followed far behind by Brunei at 52, Malaysia at 41, Thailand at 13 and the Philippines 12. Those below 1 per 100 include Indonesia at 0.9; Vietnam at 0.8; Cambodia, Laos and Myanmar (ITU 2002a).

The disparity of computer ownership is also great. In Malaysia, the number of computers per 100 inhabitants is 12.61 and in Brunei it is 7.46 (2001 numbers). At the low end is Myanmar with 0.11 Cambodia with 0.15 and Laos with 0.28. In the middle are Thailand with 2.67, the Philippines with 2.20, Indonesia with 1.07 and Vietnam with 0.99 (ITU 2002a).

Internet penetration (i.e., Internet users as a percentage of population) in ASEAN countries is tremendously varied. The highest, as to be expected, is Singapore with 29.9, followed by Malaysia at 15.9, and then far behind are Thailand at 3.8 and the Philippines at 2.6. At the bottom are Indonesia at 0.9, Vietnam at 0.25, Laos at 0.1 and Cambodia at 0.05 (ITU 2002a).

Statistics show that there is an association between Internet and wealth but not necessarily with education. Countries with GNI per capita lower than USD3000 (Cambodia, Laos and Vietnam) have lower Internet penetration ranging from 0.01 to 0.25, while countries whose GNI per capita range from USD5000 to USD10,000 (Indonesia, the Philippines, Thailand and Malaysia) have better than average Internet penetration ranging from 0.09 (Indonesia) to 15.9 (Malaysia). Singapore stands out, as usual, with the highest GNI per capita and an Internet penetration of 29.9 (Gray 2001).

But literacy rates and education enrolment rates do not correlate with Internet penetration. For example, while Vietnam has an adult literacy rate of 93.1 per cent, higher than Malaysia's at 87 per cent, Internet penetration is much lower (0.25 compared to 15.9). The same is true for the Philippines and Thailand with higher literacy rates than Malaysia, but lower Internet penetration.

LEVEL OF ICT USE AND ACCESS

General

Within the education system, enormous differences in the availability and use of computers as well as access and use of Internet characterise the region.

At one end of the spectrum is Singapore where computers are found in all primary and secondary schools and junior colleges at a student-to-computer ratio of 2:1 to 5:1, and a teacher-to-computer ratio of 2:1. All schools are connected to broadband and linked to a wide area network, and all teachers and students from primary 4 and above are provided with e-mail accounts (Cher Ping 2003).

In the middle of the spectrum are Malaysia, Thailand and the Philippines. Under the Ministry of Education's Smart Schools programme, Malaysia has equipped 87 pilot schools with computers, not only in the laboratories but also in classrooms at various levels depending on the categories of technology model the schools are in. They also have Internet connection through leased lines. Thailand has equipped all secondary schools with computers at a ratio of 1 to 54 students, and 71 per cent have an Internet connection, although this is not the case at the primary level (Waitayangoon 2003). The same is true with the Philippines, where 56.4 per cent of public secondary schools have at least one computer as a result of a massive computerisation programme of the Department of Education (Tinio 2003).

Indonesia and Vietnam claim to have one computer per secondary school, while in Cambodia, Myanmar and Laos no more than 10 schools have been equipped with computers and linked to the Internet as pilot projects of donor agencies. It should be noted that all these countries except Singapore have paid more attention to equipping and connecting their secondary schools before their primary schools.

Singapore

Singapore achieved its national standards for ICT infrastructure build-up by 2002. A recent study pointed out that one computer is now available for use by two to five students depending on the school policy (Cher Ping 2003). Computers are now provided in all classrooms and other learning areas such as libraries and special rooms, besides computer laboratories, which means teachers and students have access to them at all times and can use them in the curriculum in an integrated way. Further, for every two teachers in every school, one notebook has been provided to help teachers to work around the constraints of space in staff rooms or to work at home whenever needed. The Ministry of Education also provides grants for teachers to purchase their own computers.

Every school runs a whole-school networking. All schools are linked through a wide area network (WAN), which is eventually connected to the high-speed backbone of Singapore ONE. All teachers and students from primary 4 and above are provided with e-mail accounts, and students are given a financial subsidy of SGD10 under FastTrack@School to subscribe to broadband services in their homes.

Thailand

As of August 2003, it was reported that 70 per cent of primary schools had no telephone lines, 4 per cent no electricity, and 79 per cent no computers for teaching and learning. At the secondary level, all schools had computers for student use at the ratio of 1 computer to 54 students, 71 per cent had an Internet connection and 17 per cent still had no telephone lines. Further, the provisions for hardware or software and staff development were unsystematically added onto the total school plan on a year-to-year basis. The student numbers from these schools range from a low of 300 to 500, to more than 3000 (Waitayangoon 2003).

Various levels of schooling are connected through different networking projects. The SchoolNet connects around 5000 secondary schools which have been equipped with telephone lines and the Internet. With the help of the Telephone Authority of Thailand and the Communications Authority of Thailand, online connection can be made at the cost of a local call, instead of long distance, throughout the country. The MOENet also offers Internet access to some schools but gives priority to connecting various educational organisations within the ministry. UniNet provides Internet services for higher education institutions focusing on distance learning and e-library. Usually, small schools with limited infrastructure use a dial-up connection with two to three Internet accounts, while medium schools have both dial-up and leased-line access depending on available infrastructure and satellite link. Small and medium schools located outside the Internet service area use satellite link.

The Philippines

A 2001 survey of public and private primary and secondary schools concluded that only 14 per cent had computers. For the past seven years, the Department of Education (DepEd) has been conducting a massive computerisation programme for secondary schools. To date, 56.4 per cent of public secondary schools have at least one computer, and it is estimated that by end of 2005, 75 per cent of public secondary schools will have computers (Tinio 2003). Once this target has been reached, the computerisation

programme will focus on public primary schools. DepEd has also deployed hardware, printers, office software and educational CD-ROMs and has conducted teacher training on basic computer literacy for 986 of the over 4500 public secondary schools.

Because of limited availability of fixed-line telephone service, the widespread use of the Internet in the basic education system has been constrained. Only 13 per cent of primary and secondary schools have landlines, and these are mostly in urban and peri-urban areas. And because most Internet service providers (ISPs) are located in urban areas, rural schools are charged long distance telephone rates when dialing up. A wireless solution, using VSAT technology for instance, is still an expensive proposition as it involves installation costs of at least USD600 and monthly charges of between USD300 to USD2000.

To encourage private companies, corporate foundations and non-governmental organisations (NGOs) to contribute hardware, software and computer literacy training, the Adopt-a-School Act of 1998 was enacted. It provides tax incentives to private organisations that donate ICT facilities to public schools. These include, among others, Intel Philippines, Citibank, the Coca-Cola Export Corporation, Philips Electronics and Lighting and the Japanese government. As a result, additional computer laboratories and learning centres have been built in more schools, and more in secondary than primary schools. This has also resulted in the proliferation of more hardware (PCs, networking equipment) over educational software.

Malaysia

All 87 pilot schools under the Ministry of Education's Smart Schools programme are well equipped with computers and Internet connection through leased lines. The 87 pilot schools, representing urban, rural and semi-urban areas, were chosen from 15 states in the country, with two or more from each state, depending on student population. However, various types of schools are equipped differently. Three models of technology infrastructure have been introduced in the pilot schools. Under these models, schools are grouped into three clusters:

- Level B provides for the 37 computers (21 of which are placed in a computer lab, and the others in the resource centre and the administrative office) as well as two notebooks and three servers. These are connected to the Internet by Fast Ethernet backbone with 128/64 kbps leased line.
- Level B+ not only provides more computers to the laboratory (81 computers, two notebooks and three servers), but six computers are placed in each of 15 classrooms and science labs, and the others are in the resource centre and the administrative office supported by 128/64 kbps leased line.
- Level A provides 520 computers, five notebooks and six servers with 512/256 kbps leased line. Of the 520 computers, 35 are placed in each of the four computer labs, seven in each of the 40 classrooms, seven in each science lab, and the rest in the resource centre, the teachers' room and the administrative office.

Each pilot school was provided its own LAN and every computer in the Smart School System is Internet-enabled and connected to the ministry's Virtual Private Network.

There is also a schoolnet project being implemented which provides Internet broadband facilities to all 10,000 primary and secondary schools in the country. At present, the first phase of the project involves connecting 110 schools in Sabah and another 110 in

Sarawak. Steps are underway to hand over the pilot schools to the Ministry of Education and to merge these 220 schools into the broader SchoolNet Project (Chan 2003).

Indonesia

The first attempt to wire schools for the Internet in Indonesia was undertaken by the Indonesian Internet Service Providers Association (APJII) with its Schools 2000 Project which was aimed at connecting 2000 secondary schools by 2000. Together with other organisations like ISP and telecom operators, and private sponsors such as CISCO and ORACLE, APJII worked with the Ministry of National Education to develop a portal. By the end of 2000, the project had connected 1180 schools, which translates into half a million new Internet users from high schools (ITU 2002c).

A report by the Center for Information and Communication Technology for Education (Pustekkom) points out that there are no data available on the number of schools connected to the Internet and no accurate data on the ratio of computers to teachers or computers to students. However, most of the schools in the cities have been connected to the Internet, usually through dial-up access. In the urban areas, most of the schools have 40 to 50 PCs, one server, one modem, one LCD projector and four printers. About 40 computers are used and placed in a computer laboratory, and the others are used for administrative purposes. There usually are only two computers that have a direct connection to the Internet. Under a ministerial decree issued by the Minister of Communication and Information, it is hoped that every school will have a computer laboratory facility through its One School One Computer Laboratory (OSOL) Programme.

ITU also reports that distance education has also been flourishing. The Universitas Terbuka (see www.ut.ac.id) established in 1984 has evolved into one of the largest open universities in the world with over 350,000 students. It had traditionally used TV, radio, and videocassettes to reach its students, but now collaborates with the Indonesian Internet Kiosk Association to use their facilities for providing Internet-delivered education applications.

The University of Indonesia estimates that by 2005, around 30 per cent of its 38,000 students will be involved in some form of distance learning. Plans call for a distance learning centre to be created at the university campus in Jakarta as well as sub-centres at two regional universities. The main centre will feature two classrooms containing 30 computers each linked to the Internet via VSAT.

Cambodia

Cambodia is known for having the lowest Internet penetration and the highest prices in Southeast Asia. This has made it difficult to use Internet in schools, especially as very few fixed lines (4000 lines for a population of some 9.3 million) are available. This condition has instead contributed to the growth of cellular phone services (ITU 2002b).

The Ministry of Education, Youth and Sports has no large-scale plan to place computers or telephones in schools because the majority do not have the money needed to support them. There was a plan by the ministry to connect three secondary schools under a World Bank-funded initiative, but due to delays in administration, the project has been postponed. One example of a high-profile NGO-funded e-school is found in the remote village of Robib, in the northern province of Preah Vihear. It makes use of solar-powered panels to run computers, but this project has met with much difficulty and criticism.

Of the tertiary institutions, four of the nine have Internet in at least one department. However, they continue to have problems even if they have computer and Internet connection.

UNESCO has arranged for several hundreds of donated computers from the Republic of Korea's Ministry of Education and the Hong Kong University to be sent to Cambodia for use at the teachers' training colleges.

Laos

Currently in Laos, ICT is not a part of the curriculum, and if students want to learn how to use computers or the Internet, they have to go outside the schools. The Ministry of Education plans to supply two secondary schools in each province with a computer and Internet access by 2005 which will be primarily provided to the administrative staff (ITU 2002d). There are also plans to teach basic computer courses at the secondary level and some teachers will be trained in Malaysia and Singapore. However, four Internet Learning Centres (ILCs) have been established in secondary schools in four provinces through the Jhai Foundation and SchoolsOnline. Each of the ILCs are equipped with 10 Intel based PCs, Windows 98/2000/XP, Hub/LAN, a digital camera, a printer, a scanner, 10 ethernet cards and Internet connectivity (dial-up to Laotel.com). The basic commercial software is installed in the computers, but no educational software has been made available. The goal of the ILCs is to link the upper secondary school's students to the world. More specifically, the ILCs provide Internet access/facility and technology for students, teachers, staffs, parents and local people in the surrounding areas and help schools gain effective access to the communication and information resources of the Internet.

Apart from the ILCs, two Smart Schools are also being introduced by the Malaysian government as part of their international programme to extend the lessons learned from their own national Smart Schools programme.

At the higher education level, the Japanese government has funded a computer laboratory at the National University of Laos which has 1740 students and 1486 staff, 790 of which are teaching staff. The computer lab has around 20 PCs connected to a LAN and access to the Internet.

Myanmar

With the co-operation of Malaysia, the Smart School pilot project was introduced at three primary schools in Yangon. The content development according to the curriculum is underway. The connectivity for these three schools was provided by Bagan Cybertech (BCT), which will also sponsor the connectivity of an additional 100 schools with multimedia classrooms to create a schoolnet in Myanmar. At the tertiary level, there are two universities of computer studies and 22 computer colleges under the Ministry of Science and Technology which are equipped and will see ICT professionals graduating annually starting in 2003 (UNDP 2003).

Vietnam

In Vietnam, 80 per cent of the secondary schools have computers (Quach Tuan Ngoc 2003). ICT has become a compulsory subject in specialised upper secondary high

schools (grades 10, 11 and 12), and at the university level; all university students receive compulsory courses in basic ICT use. In fact, there are some 50,000 information technology specialists in universities and training colleges and around 5000 computer graduates each year.

However, although the Internet is considered very important for teaching and learning in Vietnam, the actual level of Internet use in primary and high schools is low. About three to four per cent of the total number of 120,000 Internet accounts in Vietnam are used by the academic sector (ITU 2002e). Because connections are slow, typically just a 64 kbit/s dial-up line using the Internet is often frustrating. The Internet is still not widely used even at university due to the very high cost of access.

DRIVERS FOR SCHOOL NETWORKING

In Southeast Asia, schoolnets arose from different organisations. They were either established from the ICT sector, as in the case of Thailand; or from the Ministry of Education, as in the case of Singapore, Malaysia and Indonesia; or from an organisation outside the government, as in the case of the Philippines. Consequently, there were varied drivers of the schoolnet creation: a need to demonstrate the power of ICTs; the drive to put into action ministerial policy and master plan to connect schools and share resources; the desire to connect technical and vocational schools as part of an information technology course; and the need to experiment as a pilot project venture. The drive to set up a schoolnet to respond to the needs of teachers and students to access information resources was considered implicit, informally observed by the organisers. No needs assessment was undertaken before the establishment of any schoolnet.

Singapore

In Singapore, the school networking programme called edu.MALL was developed under the Masterplan for ICT in Education (MP1) and launched in July 1998. The SchoolNet edu.MALL was clearly an integral part and a support to the ICT for Education programme of the country. It was not only meant for the teachers and students but for parents as well.

The programme provides a one-stop Web-based access to educational resources and online information services for teaching and learning using the mall concept (Cher Ping 2003). Shopping has been a way of life in Singapore (being known as a shopper's paradise), and thus calling the schoolnet a "mall" appeals to the users and does not make them feel threatened with new interface or new means of navigation. The creation of the edu.MALL was in response to teachers' needs to have access to information and share their ideas, experiences and setbacks. It was also set up to reach out to students and parents to promote creative thinking and lifelong learning in a fun manner.

Malaysia

In Malaysia, the driver of the schoolnet was the Ministry of Education and was an integral part of the Smart School Pilot Project which set up 87 schools for pilot testing the use of ICTs in classroom teaching. The requirement for integrated telecommunications and computing infrastructure was written into the Smart School Pilot Project Agreement and was to be provided and established by a consortium of companies. A list of objectives of the school networking shows that it was set up to support a centralised and distributed

data repository; to allow school heads, teachers, students and parents to access school servers from their home computers via the Internet; to allow each pilot school to access online information in other pilot schools and for transferring files between them; and to communicate with each other through e-mail.

The Philippines

The driver of the schoolnet in the Philippines was an NGO called FIT-ED (Foundation for Information Technology in Education). The Pilipinas SchoolNet is part of the ed.venture project run by FIT-ED which covers 15 public schools under the Ministry of Education. Though the Pilipinas SchoolNet is not an integral part of the Department of Education (DepEd) ICT programme, it responds to and is being implemented in close collaboration with the ICT policy of the DepEd. A recent report points out that:

...since DepEd has no budgetary allocation for ICTs in education programmes apart from the annual national appropriation for the purchase of computers for schools, what ed.venture is doing is what DepEd has been wanting to do but for which it unfortunately does not have sufficient financial and technical resources. Indeed, DepEd has often looked to the private sector and civil society groups to drive experimentation and innovation in the public school system. Thus, FIT-ED did not encounter any strong resistance at either the national, sub-national or school levels of DepEd at any stage of the implementation of the pilot (Tinio 2003).

The pilot project is indeed supported by the DepEd from the national, sub-national and school levels which provides financial and personnel support from the provision of a room that houses the ed.venture Centre, to covering the recurring costs of operation to salaries of technical support staff.

Thailand

In Thailand, schoolnet was born more out of a need to show that technology can create equal opportunity in education than the desire to start from what specific teaching/learning needs were. The driver of schoolnet in Thailand came initially from the information and technology sector, led by National Electronic and Computer Technology (NECTEC) with the collaboration of Telephone Organisation of Thailand, and the Communications Authority of Thailand. The vision of this undertaking was in the right direction — that is, to create equal opportunity in education and thus lead to the improvement of educational standards in the country. However, the focus concentrated mostly in equipping schools with computers, network and central computer systems, telephone lines and Internet (dial-up mode), etc., which by itself was necessary as it offered the enabling environment, but which moved so fast that the other more substantive components, such as content development and integration into classroom teaching and curriculum, were left behind.

After the schoolnet's establishment in 1995, the Ministry of Education, the Ministry of Science, Technology and Environment, and the Ministry of Transport and Communications were brought on board in 1998. It was a little too late in the game as their involvement became at most ceremonial. With the educational reform and the realisation that the schoolnet was weak in educational content and that integration into the educational curriculum and classroom teaching was not taking place, it became necessary to move it to the Ministry of Education. The official transfer took place in September 2003.

Indonesia

In Indonesia, the schoolnet called WAN Kota sprung from the need for the vocational secondary schools to develop a communication forum, called School Information Networks, for each region in order to build a critical mass of users of ICTs (Iskander 2003). The forum enabled teachers, administrators and students to use the Internet, exchange e-mails and information and subscribe to a mailing list. The school networking in this instance is more of a vehicle for communicating and discussing rather than for providing content for teaching/learning. As well, WAN Kota is also based in only one city.

Recently, the Ministry of Education, through its Center for Information and Communication Technology for Education, has launched the Edukasi-net, which will provide content through its repository of lessons and learning materials for use in all schools in the country. In the future, this will be the vehicle for the national schoolnet.

ORGANISING, OPERATING, MANAGING AND SUSTAINING SCHOOL NETWORKING

Organisational structure, management and services

The operation and management of Southeast Asian schoolnets has been demonstrated through a variety of models and approaches, each of which has their own strengths and weaknesses. Consider the following wide range of modalities of running a schoolnet: the government (Ministry of Education) manages it as in the case of Malaysia; a city government runs it as in the case of Indonesia; an information technology government organisation manages it as in Thailand or through equal partnership between the Ministry of Education and the information technology business sector as in the case of Singapore; and an NGO manages it, as in the Philippines. Indeed such variety of school networking approaches in this sub-region has generated a wealth of lessons learned, encompassing both strong and weak practices.

Standing out from these experiences is the fact that starting and managing a school networking from the telecommunications and technology sector side carries enormous advantages as far as start-up requirements are concerned. But there are a number of disadvantages as well. Just focusing on the education aspect and neglecting the technology component brings debilitating inadequacies.

The cases of Thailand and Malaysia are useful illustrations of this point. SchoolNet arose from the desire to try out computer and Internet technologies to connect schools and share resources to bridge the digital divide. While it had very good support from the telecommunications sectors like Telephone Organisation of Thailand and the Communications Authority of Thailand, it did not get the same level of support from the Ministry of Education. The recent transfer of Thailand SchoolNet to the Ministry of Education will hopefully correct this weakness.

Malaysia went in the other direction. It built its school networking component gradually from the Smart School project which ensured the integration of the use of ICT in the policy and curriculum of the Ministry of Education as well as in classroom teaching/learning. This primarily education orientation downplayed a number of infrastructure and technology issues required in operating a schoolnet. To correct this deficiency, the

Ministry of Education will join hands with the Ministry of Energy, Communications and Multimedia to provide Internet access to all 10,000 schools in the country. The two ministries have started discussing how best to integrate the Smart School Network with the Universal Service Provision Project of the Ministry of Energy, Communications and Multimedia to come up with wider Malaysian SchoolNet in the next phase.

While the education and government information technology sector figure prominently in the schoolnets of Malaysia and Thailand, it is the business sector which mainly supports Singapore's operations. The model adopted by Singapore, the edu.MALL, is run as a business enterprise to provide one-stop access to educational resources and online information services for teaching and learning. Though edu.MALL is an integral part of the ICT Master Plan and co-ordinated by the Educational Technology Division of Ministry of Education, Singapore has capitalised on the expertise, infrastructure and services of the business sector to deliver all aspects of creating and operating it. The responsibility of operating the edu.MALL has been given to a commercial company called CHAPTER-E.com, the venture company of National Computer Systems (NCS) and Panpac Media.com. Armed with the ICT infrastructure and capability of NCS, and the content and pedagogical expertise of Panpac Media.com, CHAPTER-E.com is able to continually push the possibilities of acquiring and constructing knowledge in creative ways through interactive activities in a learning community. In effect, the management is being handled by a virtual community organiser which assumed the role of the schoolnet operator and brought with it other business partners to expand schoolnet to other markets in the country. This has the potential of making the existing virtual community in schoolnet more compelling and more economically viable in the long run.

The Philippines offers an entirely different model that brings together the government and NGOs working hand in hand. The Pilipinas SchoolNet is run and managed by an NGO called FIT-ED. But the Department of Education (DepEd) recognises the project as an extension of their ICT strategy and a support to the department's policy and programme on ICT. The department could have done the same thing, but due to insufficient funding, FIT-ED has taken over. Both work systematically and smoothly hand in hand, with the DepEd providing various specific supports. The pilot schools used are the public schools run by the DepEd, which shoulders the salaries of pilot teachers and running costs like electricity and classroom facilities.

In Indonesia, the WAN Kota Project is an educational network launched by the City Government of Malang, not by the central Ministry of Education or by the Department of the Vocational Secondary Schools (VSS). With varying degrees across cities, steering committees have been set up to oversee the WAN Kota, comprised of local government as an advisor, heads of school principal associations of vocational secondary schools, general secondary schools and junior secondary schools as chairman, secretary, and treasurer respectively. The steering committee appoints one full-time manager, three technicians and three programmers, mostly VSS teachers and students and SIN active members, to run the project daily. The management raised funds from clients (participating schools) and built WAN infrastructure on their own. In fact, WAN Kota is entirely run from revenues from various sources (e.g., participating schools, advertisements, students and other users). The number of clients in every city ranges from 10 to 40 schools and is growing. In addition to a school system within the city, teacher training centres, universities and local government offices have also joined the network.

The co-ordination and collaboration aspect also paints a variety of pictures. In Thailand, for example, because of the top-down approach in policy formulation and programme implementation, the schoolnet initiatives have not been fully successful in soliciting the

support and collaboration of the various ministry departments both at the central and local levels. NECTEC was almost solely running the entire operations, and the rest of the stakeholders did not fully collaborate as there was lack of sense of ownership right from the start. Malaysia, on the other hand, provides a good example of distributed leadership in running the Smart Schools where the various departments within the Ministry of Education are mobilised to co-operate through a Smart School Project Team of ministry officers with different expertise and responsibilities from various departments. In the Philippines, though the FIT-ED is an outside agency, it has a close working relationship with the Department of Education and its sub-national and local departments and schools. Finally, Singapore is almost running on virtual collaboration and co-ordination that assumes automatic networking.

Services offered

The services delivered by schoolnets also vary from country to country. Singapore has the most holistic approach to services including provision of high-quality teaching and learning resources through its eduLibrary; professional development offering an updated list of ICT-related courses for teachers, heads of departments and principals; infrastructure and support which provides information about ICT support and services for schools; showcasing of innovative projects and good practices (success stories and setbacks) through its eduGallery and research and development through eduQuest; a consultancy centre which provides advice and guidelines and addresses enquiries for implementing ICT in schools; a forum which provides a platform for educators to engage in discussions on the use of ICT in education; and a news brief which includes regular e-mail updates on ICT in education and information and classroom resources.

Thailand SchoolNet provides for Thai open source software called Linux which serves as a platform for the contents on the Web site. To promote the use of information on the site, local content development is promoted through its Digital Library Project. The project creates national Web sites in the Thai language for secondary school students in seven major academic subjects. The software used, the Digital Library Tool Kit, offers easy-to-use functions that allows teachers and especially those with no knowledge of HTML to develop Net-based lessons for students. It offers opportunities to participate in international collaborative projects through the Global Learning and Observations to Benefit the Environment (GLOBE) programme and the ThinkQuest Project. Apart from providing content and information resources on the Web site, it also offers Internet and Web page development training courses, seminars and activities to teachers and students of participating schools.

The Malaysian BESTARinet portal was meant to serve as the hub for all the pilot schools with the Data Centre and the Smart School Pilot Project Team at the Ministry of Education's Educational Technology Division in Kuala Lumpur. The portal was also meant to allow parents to access their children's records online through the Smart School Management System of their children's schools. In addition, an online forum, e-mail, search engines and other online services were made available on the portal. Teaching-learning materials in the form of courseware and printed materials for Bahasa Melayu, English Language, Science and Mathematics are also available.

The Pilipinas SchoolNet provides the latest news on the school networking activities; a directory of participating schools; a database of telecollaborative projects; a repository of lessons and materials in Math, Science, English, Filipino, Makabayan and multidisciplinary subjects; and links. The various sub-sites are for the large part still empty. Teacher training is also provided.

Indonesia's WAN Kota offers e-mail, mailing lists, newsgroups, ftp, WWW, technical support and help desks, a virtual library, school magazines, modular (interactive self-instructional) learning packages, multimedia learning activities, information technology training packages, and an education information centre. Some WAN Kota offer VoIP and videoconferencing services.

Support from various sectors

All schoolnet projects enjoy support and collaboration from various sectors including the telecommunications sector, the information technology industry and businesses, private and voluntary groups and civil society, academic training institutions and universities and local community groups. The kinds of support vary from one-shot deals such as donated equipment to project-based contributions such as pilot testing of materials. In the end, this varied support leaves schoolnet programmes struggling for survival and sustainability.

Support by local telecommunication companies

To promote affordable connectivity, the Internet connection for almost all the countries was supported and enhanced by the local telephone companies. In Thailand and Malaysia, the respective telephone companies offered a specific telephone access number for schoolnet members to connect to the Internet at local telephone rates instead of long distance rates. Telekom Malaysia, the country's main telecommunications company, has proposed a special education rate for telecommunications services to the schools and the Ministry of Education. Maxis, another telecommunications company, is co-operating with Telekom Malaysia to provide Internet access and telephones to 220 remote schools and their surrounding communities in Sabah and Sarawak. In Thailand, through the joint support by the Telephone Organisation of Thailand and the Communications Authority of Thailand, Internet dial-up access can be accessed anywhere in the country for the cost of a local telephone call.

The Philippines has done better by obtaining free telephone time and Internet access for one year to schools and extending a 50 per cent discount for succeeding years. FIT-ED joined forces with DepED and other NGOs to broker a deal with the leading telecommunications companies, namely Globe Telecom/Isla Communications (Globe-Isla) and the Philippine Long Distance Telephone Company (PLDT), the two biggest telecom companies in the country, which are also the ed.venture connectivity partners. One school has been provided a DSL connection by PLDT. The three schools not covered by the e-rate have been provided with dial-up connections that were paid for during the first year by ed.venture.

In Indonesia, Indosat built an intercity backbone connection using fibre optics and satellite facilities to connect the schools in the city of Malang through a wireless WAN. However, the costs for maintaining the facilities are being shouldered by the schools and the students.

Public-private partnerships

Experiences of all countries have shown various initiatives in mobilising different private companies so that schools are able to obtain a reduction in costs for computer equipment and software and applications. In Malaysia, the consortium that developed the Smart School Integrated Solution for the Ministry of Education is helping the ministry tap into

the resources of local and international hardware, software and applications companies in order to promote volume reductions for the schools. Microsoft has a special education pricing for schools and other educational institutions as well.

In Thailand, the information technology sector, namely Compaq, Intel and Powell Computer, have contributed as well. Powell Computer donated Pentium computers to 32 schools in rural areas, and Microsoft donated 50 sets of Windows 95 and utilities to speed up the schools' activities on the Net.

To reach the Singapore society in the low-income bracket, six hardware and software providers and one ISP donated computers and other software. The recipient households were provided with used PCs bundled with free Internet access and basic training. The Philippines reports of a long list of private companies (e.g., Coca Cola, Intel, Microsoft) which have supported the school networking

INFRASTRUCTURE AND CONNECTIVITY

Type of connections

A good physical and technological infrastructure and affordable connectivity are necessary pre-conditions for the operation of a schoolnet. Various countries are at different stages of development as far as ICT infrastructure and connectivity for schoolnet is concerned. At one end of the spectrum is Singapore, which has not only achieved 100 per cent connectivity to all schools through a WAN but is offering broadband connection as well. Indonesia has managed to connect its schools in a city-wide wireless WAN by an intercity backbone connection using fibre optic and satellite connection. Malaysia, under its Smart Schools Project has connected 87 schools using both broadband and ISDN and is about to launch its expansion phase. It is only Thailand and the Philippines which are generally using dial-up access. Thailand has connected 5000 schools out of approximately 34,000 nationwide to its schoolnet with free Internet dial-up access. In the same way, the Philippines has established a schoolnet to connect 15 pilot schools under dial-up Internet access in a decentralised way.

Reaching the marginalised areas

A few cases respond to the issue of providing alternative provision for connectivity (like satellite) to reach remote areas or economically disadvantaged groups. In Malaysia, some of the pilot schools were given satellite and wireless connection to the Smart School Network because of problems with the land lines in their areas. Indonesia automatically solves this problem through its wireless and satellite connection. Singapore has been committed to bridging the gap by committing SGD25 million to promote PC and Internet awareness and use through collaboration with community groups and voluntary welfare organisations. Households with a monthly income of not more than SGD2000 have been provided with used PCs bundled with free Internet access.

Problems in connectivity

Problems remain for all countries. In Thailand, many schools in the remote area that cannot afford the cost of utilities (electricity, water supply, and phone bill) are still unable to access the Internet. With the transfer of SchoolNet to the Ministry of Education and

the merging of the SchoolNet to EdNet, the new programme is expected to eliminate or reduce the cost for Internet access for schools which do not have sufficient funding. Through the co-operation between the Telephone Organisation of Thailand and the ministry, the monthly fee charged is a negotiated “educational price,” including the leased line and telephone lines. For the schools that have the budget, the cost of Internet access can be shared between the schools themselves and the ministry.

In Malaysia, the budget was a constraint in determining the design of the network, especially in terms of the server capacity at the schools and data centre, and the bandwidth to be provided. Lack of access to computers was a common complaint by teachers and students in the Level B and B+ schools. The costs of the use of videoconferencing for Level A pilot schools were prohibitive and the Internet connections costs are yet to be offered at an “educational price.”

In the Philippines, there is a need to provide funding for Internet connections after the free service offered by the telecommunications sector has expired, to promote more participation in the school networking activities, and to connect the schoolnet schools using an appropriate networking connection as well as expanding the pilot phase to cover more schools.

Singapore is confronted with the issue of the digital divide in a different way. Its preoccupation is to equip households with incomes below SGD2000 with computers as a result of a survey which showed that the personal computer ownership and Internet penetration were higher in private housing units than in public housing units.

Sustainability and incentives

Sustainability of operations confronts schoolnets built both outside the Ministry of Education and those run by the ministry on a pilot basis. Thailand and the Philippines are two examples of schoolnets run by an information technology organisation and an NGO respectively. Because they were run outside of the ministry, minimal support and involvement was given by the government and activities were often isolated from the mainstream programmes.

As for schoolnets launched as pilot projects, the key question mainly deals with the ability of the Ministry of Education to financially support widening the geographical area to cover more schools using the most effective technology model tested. At the operational and practical level, sustainability also becomes an issue when teachers and students are not motivated enough to participate actively in the schoolnet.

Solutions to these problems were identified by Thailand when it transferred its SchoolNet to the Ministry of Education in 2003 after seven years of operation. The Philippines has yet to do this, but there it is still early to make a transfer for several reasons: the SchoolNet has yet to place all its mechanisms at a fully operational level, the Department of Education is not ready to take over, and the Foundation for Information Technology in Education is considered by the Department of Education as their arm in sustaining its implementation.

To make it easier for schools to join the a schoolnet, the problem of connectivity should be tackled first. There are a number of solutions that could be considered. These include providing free hosting facilities and domain, providing free Internet connection for the first year, and paying the monthly fee at a negotiated “educational price” including the leased line and telephone. For schools that can afford it, the cost of Internet access could be shared with the ministry.

Sustaining interest must also be addressed. The following incentives are proposed by many of the country case studies:

- Organising competitions for both teachers and students to develop the best school Web site, best educational software or lessons, best teaching materials, etc.
- Sponsoring collaborative projects with some seed money or rewarding the best collaborative projects if not in cash, in kind
- Providing free hours for teachers to practise what they have learned from the training and to contribute to the schoolnet Web site activities
- Organising activities that will ensure the use of the lessons and teaching materials on the site in the actual classroom teaching
- Connecting more computers to the Internet and allowing their use beyond school hours
- Preparing and disseminating guidelines for the optimal use of the schoolnet Web site resources
- Building a reward system for teachers who demonstrate innovation in their use of ICTs
- Providing follow-up training on a continual basis
- Conducting seminars and discussion groups among students and teachers on the topic of ICTs

TRAINING TEACHERS AND STAFF

The optimum utilisation of the resources and facilities offered in school networking depends on the readiness and skills of the teachers. Three of the four countries included in the analysis have provided training to ensure that the teachers know how to participate and operate the systems and facilities offered. The various training given varies in terms of where it started, the type of school personnel covered and the contents and skills provided.

Teacher training on school networking could emanate from the schoolnet project itself which is outside of the ministry programme (as in the case of Thailand and the Philippines), or it could be an integral part of the ministry ICT training programme (as in the case of Malaysia). Some programmes have targeted teachers only, while others have included the training of the school administrators and technology or technical personnel themselves, as in the case of the Philippines. It is only Singapore that has not separated training for school networking and use of the edu.MALL because the various training programmes given under the Master Plan were intensive and complete enough to enable teachers to automatically go on board in the posting, sharing and accessing of information under the schoolnet.

The expected knowledge and skills to be learned after the training also vary from country to country: Thailand focuses only on the use of Internet and Web page development; Malaysia focuses largely on the creation of knowledge and skills in basic computer literacy, and the Philippines has gone further by going into ICT integration in curriculum and telecollaboration. It is Singapore which has developed the knowledge and skills of the teachers in authentic integration of the use of ICT in subject teaching such as Mathematics, Science, English and Humanities, and the use of ICT-based pedagogical principles and skills.

Singapore

Teacher training in Singapore is intensive, continuous, both general and needs-based, online and asynchronous, and undertaken by various institutions from government to private companies (Cher Ping 2003). The general training given to all the teachers based on the Master Plan followed a four-tier fan model. First, the senior ICT instructors were given training to serve as master trainers. The senior ICT instructors then trained the heads of departments and selected teachers in schools in Phase 1, who in turn co-trained the teachers of three to four schools each, together with the senior ICT instructors, in Phase 2 of implementation. The fan approach generated a multiplier effect, enabling the sharing of expertise and experiences between schools. The senior ICT instructors played the roles of the key trainers, mentors and co-ordinators for all schools during the planned implementation.

Teachers in Singapore have various opportunities to constantly refresh their skills and knowledge to keep up with the latest developments in education, both pedagogies and technologies. Teachers are entitled to 100 hours of in-service professional development each year. Teachers are also fully sponsored or highly subsidised for courses, conducted by private training agencies that enhance their professional competence. For pre-service programmes, the following content focus of teacher training is given: basic ICT skills, integrating ICT into schools, and ICT-based pedagogical principles and skill sets such as “Constructivist Learning with the Internet” and “Instructional Multimedia Design.” Besides these courses, there is also an ICT component integrated into all subject areas such as Mathematics, Science, English and Humanities. In the foundation courses, the tutors employ a fully dynamic online learning environment to complement onsite activities for this module. In 2002, there were four major components in the module: anywhere/anytime lecture, onsite laboratory tutorial, online independent hands-on session and online asynchronous discussion.

Thailand

In Thailand, the training courses basically focus on the Internet and Web page development. An evaluation of the Thailand SchoolNet project has shown that the training has been inadequate in empowering teachers to use ICT in an integrated way in their classroom teaching.

Malaysia

In Malaysia, both the school administrators and the teachers are trained in basic computer literacy. While the training covers more topics than those given to the Thai teachers, the focus is still on basic computer literacy and hardware. Basic ICT integration is also a part of the pre-service and in-service training, but these skills are not linked to effective participation in the Smart School Network programme. A gap is seen between teachers trained and actual participation in the schoolnet. Learning from this experience, a recent study recommends that future training for school heads and teachers should focus more on how to integrate the school network activities into school management and classroom activities (Chan 2003).

The Philippines

In the Philippines, the training given for both the teachers and the school administrators is much more holistic and comprehensive and linked to the operations of the school

networking. The three types of training include instructional use, technical support and ICT management. The instructional use training includes basic computer and Internet skills, information literacy and telecollaborative learning, and ICTs and curriculum integration. The second module on technical support training aims to build the school's capacity for "autonomous maintenance" (i.e., the local staff provides first-line troubleshooting and maintenance and arrangements with external service providers are optimised). The following areas are covered: PC troubleshooting (hardware and software), network administration, software installation and configuration, and network security. The third module dealing with educational technology management training for school administrators focused on curriculum integration planning, business modelling, and community mobilisation and partnership building.

An assessment of the training programmes undertaken by the three countries shows a common trend: the lack of use of knowledge and skills gained from the training in actual classroom teaching and school networking activities. The solutions proposed are similar: provide incentives and a reward system to the teachers for hard work and innovations, focus training on the development of knowledge and skills that are directly linked to the school networking programme activities and ICT integration into the curriculum; undertake follow-up and continuous professional development, provide an enabling environment after training (i.e., easy access to computers or to procure computers and Internet connection for teachers use), motivate teachers to develop Web content instead of using their skills for troubleshooting or school management, train all personnel in the schools and not only teachers and, most important, provide some free time for the teachers to practise and use computers.

CONTENT DEVELOPMENT AND USING SCHOOLNET EDUCATIONAL RESOURCES

Content development for use in school networking has followed different approaches depending on the policy mandate and organisational location of the different countries. In Malaysia, Singapore and the Philippines, the content and teaching/learning materials followed the national curriculum in order to ensure integration into classroom teaching and learning. In Thailand, the lessons and teaching/learning materials were contributed by teachers and students directly from various school members, which may or may not have direct bearing with the national curriculum.

The originators of Internet-based lessons and teaching materials also differed from country to country. In Thailand, the major contributors were from the field (i.e., teachers, students and school heads of the school network). But an evaluation found this inadequate and suggested that the content development should also involve experts and subject specialists in other departments and sectors in the Ministry of Education as well as students. It pointed out that very often teachers are very busy and do not have the time to prepare lessons and are not skilled in developing ICT-based lessons.

It was the other way around for Malaysia where the content was basically initiated and updated by the Smart School development team rather than the teachers and students. The team members comprise ICT-competent educators who manage both the technical and the pedagogical aspects of the portal, and so the content was developed mainly by subject specialists. It was, therefore, proposed that more involvement from teachers and students should be solicited to reflect various users' needs (Chan 2003).

The Philippines realised the importance of letting students help drive the programme by actively involving them in designing curriculum integration activities and developing

materials to support the teachers who were mainly responsible in developing the content.

It was only Singapore that enjoyed the multi-sectoral involvement in content development. In addition to the materials developed by teachers and students, the content was also generated by technical experts and commercial companies as well as links to existing sites.

The language of the content was another consideration. In Thailand in the early years, content was mostly in English derived from its international links to Global Learning Observations to Benefit the Environment (GLOBE) Program and the ThinkQuest Project. Because of this, the Internet-based English materials posted on the Thai Schoolnet Web site were not used by non-English speaking Thai teachers and students. To encourage more usage by teachers who did not use English, the SchoolNet Content Development project, called Digital Library, was started in 1998. It was commissioned to Kasertsart University in conjunction with the Institute for the Promotion of Teaching Science and Technology (IPST). The Digital Library became a repository of Thai-based teaching/learning lessons contributed by a university and science centre-based team and later on by teachers and students.

On the other hand, Malaysia found the need to have more content in English. After the pilot project, some of the browser-based courseware was converted to Web-based materials and placed on BESTARinet. It was recommended that more content in English be placed on the portal now that Science and Mathematics are being taught in English.

The Philippines and Singapore have materials both in English and their national languages. Most lessons and materials developed have a sound pedagogical basis. In the Philippines, the content is rich in interactive lessons and classroom activities. One activity, dealing with an online treasure hunt, is inquiry-based with the students being given questions, the answers to which can be found in a series of Web sites pre-selected by the teacher. Similarly, Webquests, which are also inquiry-based and make use of online resources, target the development of a student's higher-order thinking skills (e.g., analysis, application, synthesis).

In Singapore, the main repository of content for schoolnet use is the edu.MALL Web site which provide access to a wealth of information resources in multimedia formats (e.g., CD-ROMs, Web sites, videos and lesson plans). ICT-based tools are available on the site to allow teachers to collaborate in building lesson plans and explore the best ways to integrate ICT into their lessons. The site is multimedia endowed and uses interactive, enquiry and constructivist-based materials.

Not all countries documented the use of the Web-based contents in a specific classroom setting. In Thailand, it was found that there was limited use of schoolnet content in actual teaching, and this was considered a weak point of the school networking which otherwise was quite effective. The materials developed in the Philippines were used in the ed.venture pilot schools as they were integrated into the national curriculum for Science, Mathematics, English, Filipino (the national language), and Social Studies. Singapore seemed to project actual use of the Web-based resources in teaching/learning, while Malaysia was not clear on this issue in their reports.

CONCLUSIONS: MAKING SCHOOLNETS VIABLE FOR ENRICHING TEACHING AND LEARNING

Value added

The cornucopia of experiences and lessons learned from school networking in Southeast Asia has added to the growing body of global knowledge in the area of ICT use in education. The mass of information can be translated into a handy and practical set of do's and don'ts useful to those about to embark on a similar initiative or in the process of upgrading their existing schoolnets. The UNESCO Asia and Pacific Regional Bureau for Education and the Commonwealth of Learning have seized this opportunity of making all of these experiences and lessons learned do-able and practicable by coming out with guidebooks or toolkits for establishing viable schoolnets.

Needless to say, the experiences described above have shown successes as well as failures. Despite the gaps and inadequacies of schoolnet ventures in the region, school networking has offered tremendous value to the use of ICTs in the education systems.

First, school networking has accelerated technology-based modernisation of the education systems and schools through the rapid increase in number of computers, installation of Internet, setting up of local area and wide area networking, training of school heads and teachers in the use of computers, and local content development through the expansion of Web-based educational resources.

It has helped address the digital gap by mobilising the telecommunication and information technology sector to reduce telecommunications costs and offer free Internet connections through various arrangements, thus expanding the number of schools which can make telephone calls and connect to Internet. It has also helped to lower student-computer and teacher-computer ratios and enhanced accessibility of teachers and students to computers due to more open access areas and local area and wide area networking,

It has attracted and mobilised public-private partnerships and leveraged more support through consortiums of telecommunication companies, ICT vendors, business enterprises, educational content developers, and training and academic institutions that contribute to the various operations of schoolnets through a range of hardware, software and applications support, apart from cash, discounts, subsidies, technical assistance and organisational backing and the like.

It has networked educators and communities who otherwise have neither the tools nor the time and money to get together to connect for dynamic partnerships and strengthened skills in collaboration and working in teams through its various telecollaboration activities and projects both at the national and global levels. As part of networking, schoolnets have provided a useful forum for Internet communication and activities, enabling teachers and students to set up a network of contacts and initiate discussions with other teachers and students within the school and between schools in the country and all over the world.

It has provided a one-stop Web-based access to educational resources and online information services for teaching and learning and has served as a platform for virtual library, news and events, a showcase of collaborative and research projects on the use of ICT in education and good practices and, most importantly, promoted access to improved pedagogy-based educational resources. Similarly, it has stimulated rapid development of content through lessons, teaching/learning support and multimedia materials contributed

by teachers and students made easily accessible online. Schoolnets have served as an experimental laboratory for the creation of educational software and multimedia technologies, and the testing and evaluation of open source platform and software, inspiring creativity and productivity.

School networking has also stimulated the development of knowledge and skills of school heads and teachers to participate and contribute to the programme through both one-shot and continuing training courses, some of which are offered on the schoolnet portal. Apart from announcing scheduled training courses for school staff, online ICT courses are also linked to enable teachers to learn anytime and anywhere.

Lastly, many schools in rural areas have suffered from lack of technical help when troubleshooting is required for damaged ICT hardware and systems. One of the most important components of a schoolnet is a built-in help desk which provides instant maintenance advice online.

Future needs and challenges

The list of value-added items by schoolnets above might underemphasise the many gaps and problems that beset operations in Southeast Asia. Based on the trends and developments examined in this document, some urgent issues, needs and challenges have emerged which have to be addressed if schoolnets are to become viable vehicles for ICT-based education programmes. These include the need to:

- Institutionalise schoolnets into the Ministry of Education and more specifically into its ICT master plan, as well as further integrate its operations into the various departments of the Ministry of Education, in order to promote sustainability and a more systematic integration into the national education curriculum and systems
- Establish a team approach in management by creating an interdepartmental advisory and co-ordinating committee or unit to oversee and orchestrate the functions and activities of schoolnets to ensure more efficient management, co-ordinated action and wider support from the entire education system
- Promote nationwide upscaling of the pilot phases as adequate experiences and lessons learned have been accumulated to serve as basis for further expansion
- Address the need to explore connectivity options in order to reach the marginalised or disadvantaged schools as in the case of Thailand, Malaysia, the Philippines and Indonesia
- Ensure sustainability in technology infrastructure support and maintenance and Internet connectivity by negotiating mutually beneficial arrangements with telecommunications sector, ICT vendors and service providers
- Promote effective partnerships by identifying what value each partner adds to the programme and the terms of the partnership as well as by keeping them regularly informed on the benefits and impact that their contributions are bringing to the programme
- Incorporate or join other initiatives that focus on the development of ICT resources, infrastructure and connectivity, and support and professional development of educators by other sectors. Schoolnet's potential will not be optimised if it does not support or is not supported by other initiatives
- Develop a realistic technology plan as a precondition to a successful implementation of schoolnet and, based on this, build a viable school networking infrastructure and

connectivity with long-term support from all sectors guided by strong leadership from the Ministry of Education

- Create more innovative strategies to motivate schools, teachers and students in participating more actively and contributing consistently to the schoolnet programme activities and portals as well as promoting greater collaboration among schools in order to strengthen their sense of ownership and confidence on the quality of content and activities
- Ensure the participation of all sectors in content development from subject specialists and content experts to teachers, students and parents and commercial and educational industry players to reflect the various needs of the users as well as enhance the breadth and depth and robustness of the schoolnet educational resources in support of the national curriculum
- Ensure that the teaching and learning materials posted in the schoolnet portals are integrated into the national curriculum, and built-in mechanisms for the integrated use of schoolnet content and educational resources are instituted into classroom teaching and learning
- Adopt a more holistic approach towards the operation of the schoolnet to cover ICT resources, professional development, infrastructure and support, dialogues on practices (success stories and setbacks), showcase of innovative projects, and research and development
- Place greater attention on the training of school heads and teachers in integrating the activities into school management and classroom teaching and activities to accelerate intensive use of schoolnet
- Devise ongoing professional development of teachers and school administrators in various aspects of school networking in order to continually upgrade their knowledge and skills to adapt to rapidly changing technology requirements
- Establish technical support and a help desk which are not only provided online but established within the schools as technical problems have been found to be the best way of dampening enthusiasm and interest in schoolnet participation
- Formulate a set of operating guidelines for the schools to enable them to operate and participate in the schoolnets effectively

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