.kh

Cambodia

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Total population	13.4 million[a]
Literacy rate (age 15 and over)	Male: 82.1%; female: 67.4%[a]
GDP per capita (PPP)	USD 2,727[b]
Fixed-line telephones per 100 inhabitants	0.72[c]
Mobile telephones per 100 inhabitants	16.42[c]
Number of computers nationwide	80,000
Internet subscribers nationwide	15,950[c]
Domain names registered under .kh	1,382 (2008)[d]
Internet domestic bandwidth	NA
Internet international bandwidth	250 Mbps[c]

(Sources: [a]National Institute of Statistics 2007; [b]UNDP 2007; [c]Central Intelligence Agency 2008; [e]WebHosting.info 2008)

OVERVIEW

Between 2004 and 2007, Cambodia's Gross National Product (GNP) growth was in excess of 10 percent. Much of this growth comes from the garment industry, which employs more than 350,000 people and contributes more than 70 percent of Cambodia's exports. The tourism industry continues to grow rapidly, with foreign arrivals reaching two million in 2007. The discovery in 2005 of oil and natural gas reserves off the coast in the Gulf of Thailand will give a major boost to the economy when production commences. Mining, particularly in the northeastern parts of the country, is also attracting significant investor interest. The government has said that opportunities exist for mining bauxite, gold, iron, and gems.

The Cambodian government is working with bilateral and multilateral donors, including the World Bank and the International Monetary Fund (IMF), to address the country's many pressing needs. In 2006, a US–Cambodia bilateral Trade and Investment Framework Agreement (TIFA) was signed and the first two rounds of discussions took place in 2007. The Cambodian government has committed itself to a policy supporting high labour standards and major initiatives in improving working conditions, and terms of employment are being introduced by the government with the support of the International Labor Organization (ILO) and the Mekong Private Sector Development Facility (MPDF). The major economic challenge for Cambodia over the next decade will be fashioning an economic environment in which the private sector can create enough jobs to handle Cambodia's predominantly young population (more than 50 percent of the population is less than 21 years old).

Over the last 10 years, the government has been proactive in the development of ICT and has encouraged both training and development. In 2005, the Ministry of Education, Youth, and Sport (MoEYS) started to implement the Policy and Strategies on Information and Communication Technology in Education in Cambodia. This policy has developed the capacity of higher education institutes to generate graduates in the ICT field, with the number of graduates increasing significantly.

A Khmer Unicode system has been developed, and the localization of operating systems and software applications is ongoing. Open source software has been developed to bring ICT training to local communities in the Khmer language, and an MoEYS program has seen the installation of a computer classroom in every high school in the country. A Web-based trade information gateway implemented in 2008 will greatly increase the availability and quality of commercial and legal information. There are also major initiatives underway in e-commerce and trade.

The most recently available comparative statistics indicate that although Cambodia still ranks low in terms of GDP per capita (184 out of 229 countries), its GDP (real growth rate) shows that the country is the 16th fastest growing economy in the world. With political stability, increasing foreign investment, and a real commitment by the government to facilitate trade growth, markets, and living conditions, Cambodia can look forward to substantial progress in its economic improvement and poverty reduction strategies.

TECHNOLOGY INFRASTRUCTURE

Telecom Cambodia, a company owned by the government, is currently working to establish a national backbone around

the Tonle Sap ('Great Lake') and from the Lao border to the Kompong Som sea port. The Internet connection uses gateways from Thailand and Vietnam. A submarine cable connecting Cambodia directly to the international backbone via Singapore is currently under construction.

Currently, there are 13 Internet service providers (ISPs), with three more scheduled to commence operations before 2010. Connections are typically fixed-line DSL/ADSL, dial-up, Worldwide Interoperability for Microwave Access (WiMAX), and satellite. Fixed-line connections are limited to a number of provincial capitals. Dial-up is more generally available but also limited to areas served by the telephone network. WiMAX is mostly restricted to Phnom Penh. Internet by satellite is being extended nationwide, although this can be affected by extreme weather conditions during the monsoon season. In addition, fibre optic connections are becoming available with the installation of a fibre optic cable network in Phnom Penh due for completion in late 2008.

Figures from the Ministry of Post and Telecommunications indicate that there are approximately 100,000 fixed landlines (0.72 per 100 inhabitants) and 2.3 million mobile phones (16.42 per 100 inhabitants) in the country. The number of mobile phones is expected to reach 6.5 million (40 per 100 inhabitants) by 2011. There are currently four major mobile providers operating and more operators are expected to enter the market. A full range of mobile services is available, including third generation mobile phone standards and technology (3G), General Packet Radio (GPRS), and Internet connectivity.

However, according to an ASEAN e-Readiness Assessment conducted in 2001, Cambodia ranked 8th out of the 10 ASEAN countries in terms of e-infrastructure, e-society, e-commerce, and e-government. It was classified as being at the 'emerging' stage of e-readiness, characterized by the need to build basic ICT infrastructure and an ICT literate workforce. Indeed, public access to computers and the Internet is limited. Although there are now about 400 Internet cafés in urban centres and tourist destinations and computer courses are popular in the major towns, with more than 80 percent of the population living in rural areas, the majority has little or no access to computers or the Internet. The major factors influencing access to the Internet are availability of electricity, cost of equipment, and cost of connection. The rural people rely heavily on radio and television for information.

KEY INSTITUTIONS DEALING WITH ICT

The National Information and Communication Technology Development Agency (NiDA) was established in 2000 to promote ICT in the country. It is tasked to formulate ICT policy for short-, medium-, and long-term development. It is under the Office of the Council of Ministers and is chaired by the prime minister. There are five divisions under NiDA — one each for infrastructure, policy, human resource, development, and enterprise and content and applications.

The Ministry of Commerce (MoC, moc.gov.kh) continues to play a leading and innovative role in the development of Cambodia's ICT infrastructure. It oversees the development of the Web-based Trade Information Gateway (TIG), which will greatly enhance opportunities for investment by providing timely and accurate information on a wide range of topics. In addition, the MoC is currently involved in the drafting of e-commerce, intellectual property rights, and trade legislation and regulation.

The MoEYS is ensuring that ICT is integrated into the secondary school curriculum through the establishment of purpose-built computer classrooms and the use of Khmer language open source software.

The Ministry of Interior, Ministry of Justice, and Ministry of Women's Affairs are currently developing ICT-based systems that are highly specific in nature and intended to monitor, control, and eventually eradicate human trafficking in commercial sex and forced labour. This development work is being done in partnership with human rights organizations, Interpol, and other concerned bodies.

Virtually all government ministries have developed information systems in their respective fields using modern software applications and techniques, producing up-to-date statistical reports and facilitating effective service delivery. Due to the social upheaval faced by the country in the recent past, much of the ICT development work being done at government level is new to Cambodia, although most other countries in the region have had such systems for many years. However, this also means that among ASEAN countries, Cambodia is in a position to effectively 'stand back' and review what other ASEAN partners are doing in the field of ICT and to learn from their experiences.

Since the signing of the Paris Peace Accords in 1991, the UN through many of its 'family members' has continued to play a lead role in the development of the ICT sector in Cambodia. In particular, the United Nations Children's Fund (UNICEF), United Nations Development Programme (UNDP), United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Industrial Development Organization (UNIDO), United Nations Population Fund (UNFPA), United Nations Transitional Authority in Cambodia, World Health Organization (WHO), World Intellectual Property Organization (WIPO), World Trade Organization (WTO), and International Trade

Center (ITC) have made significant contributions in their respective fields by providing support to government ministries and non-government organizations either in the form of direct financial aid or technical support. The UN Transitional Authority in Cambodia (UNTAC) effectively created the first uses for ICT in the country with voter registration and village information data systems in 1992–1993. Updated versions of these systems are still in use.

Likewise, the World Bank, IMF, European Union (EU), and to Association of the Southeast Asian Nations (ASEAN), through various projects implemented in partnership with the Government of Cambodia, have contributed essential technical expertise, guidance, and funding for the development of ICT infrastructure.

Among the non-government and international organizations and private consultancies playing a key role in the development of the information and communications sector are:

- The Asia Foundation, which established the Community Information Centre project with US Agency for International Development (USAID) funding and which continues to advocate ICT as a crucial factor in its support of many projects in poverty reduction, human trafficking, and human rights;
- Deutche Gesellschaft fur Technische Zussammenardeit — German Technical Cooperation (GTZ), which provides technical support in GIS/GPS systems to the Ministry of Land Mapping and Urban Planning Unit;
- Open Forum, whose recent work with the MoEYS has enabled all high schools to include IT subjects in their curricula; and
- Aruna Technology Ltd, which leads in the use of satellite imagery, such as SPOT and IKONOS, and hardware (Garmin GPS), and integrates these into custom turnkey solutions for clients. Aruna has focused mostly on natural resources development and management and infrastructure applications. It has developed its own Web-based mapping software (MangoMap), which was launched as a commercial software application at Map Asia in Kuala Lumpur in August 2007. It has also produced the highly successful online 'Cambodia Atlas' (www.cambodiaatlas.com/map), which receives almost 200,000 hits a month from more than 2,200 unique users.

Private consultancies such as Smart International Consulting (www.smartconsulting.com.kh) working in partnership with the MoC and Microsoft Corporation have been instrumental in the development of websites and the localization of operating systems (OS) like MS Windows Vista, Khmer Unicode, and software applications, as well as systems development in human resource management and Web-based applications.

Telecom providers like Camintel, Mobitel, Camshin, and Samart have all contributed to the provision of infrastructure and services. A crucial aspect of this has been the substantial reduction in telephone and Internet fees making communication affordable to many more people than before. Mobile phone coverage has been extended to the whole country, and Internet access is constantly being improved through the upgrading of existing equipment and the installation of new equipment.

ICT AND ICT-RELATED INDUSTRIES

Cambodia has yet to become involved in ICT and ICT-related industries in any significant way. While there are many retail outlets for equipment and services, they serve only the local market and they deal mainly with stock imported from China, Taiwan, Thailand, and Vietnam. A growing retail service is the provision of secondhand or refurbished computers and peripherals the total annual sales of which exceed sales of new equipment. The supply of refurbished computers outstrips the demand and it is possible to buy a complete system (such as PIII, 800 MHz, 256 Mb RAM and 20 Gb HDD) for as little as USD 75.

A number of small operations provide outsourcing services. Digital Divide Data (DDD) deals mainly with document digitization from US schools and universities and emphasizes the employment of persons with physical disabilities. Others deal more specifically with a very small local demand. The level of skill in programming, systems development, and the English language is low compared to the skill levels in other developing countries like China, Pakistan, and Vietnam where such outsourcing has become an economic contributor. Thus, the range of outsourcing services that can be offered is limited.

Twenty higher education institutes produced approximately 8,000 graduates in IT-related degree programs between 1998 and 2006. It is likely that there will be more than 10,000 ICT graduates in 2008. However, the labour market is such that the number of graduates who find employment in the ICT field each year is relatively small and most find employment in positions where their qualifications may be useful, but not strictly necessary.

LEGAL AND REGULATORY ENVIRONMENT FOR ICT DEVELOPMENT

A major constraint to international companies establishing manufacturing facilities for computers/computer peripherals,

mobile phones, and the like has been the lack of clear and unambiguous trade legislation and protection. This is currently being addressed by the legislature and the appropriate ministries, and it is envisaged that the situation will improve over the next two years, enabling this potential market to be developed. In particular, the MoC is drafting an e-commerce law designed to achieve the following objectives: to facilitate domestic and international electronic commerce by eliminating legal barriers and establishing legal certainty; to encourage the use of reliable forms of electronic commerce; to facilitate the electronic filing of documents within the government; and to promote the efficient delivery of government services by means of reliable forms of electronic communications. It also aims to promote public confidence in the authenticity, integrity, and reliability of electronic communications, and prevent harmful conduct against computer data and information systems.

KEY ICT THRUSTS AND PROGRAMS

The Royal Government of the Kingdom of Cambodia has clearly outlined its commitment to the development of ICT and related resources over the next five years. The government's objectives are: liberalization of the telecom market and privatization of Telecom Cambodia, development of the national ICT infrastructure, promotion of Khmer language content development, and creation of laws and regulations on e-commerce and cybercrime.

The e-Ministry Project

In 2005, with support from UNDP the MoC launched a new MoC–UNDP TRADE Project (a follow-up to an earlier program) to strengthen its capacity to manage trade reform and Cambodia's trade integration in the world economy. The program is built around five major modules, including one focusing on updating the Diagnostic Trade Integration Study to set out a strategy for strengthening and diversifying Cambodia's export basket, and another on developing a Human Impact Development Assessment of Trade (HDIA) that is intended to sharpen Cambodia's ability to turn trade development into an instrument of poverty-reduction and sustainable human development.

In accordance with the project objectives, the MoC has initiated the implementation of its e-Ministry project, which aims to set up a model of good governance and improve the ministry's internal operations through the use of Voice over Internet Protocol (VoIP), an Intranet, and a central database. The development of Khmer Unicode and the ongoing localization of operating systems and applications software have had a

tremendous impact on the capacity of ministry staff to absorb training and develop their skills.

A major component of the e-Ministry is the Trade Information Website (TIW, www.moc.gov.kh), an online service providing information on regulations, procedures, fee schedules, penalties, and required forms. This facility will effectively provide a 'one-stop shop' where potential investors can obtain all of the information and assistance they need to establish businesses in Cambodia. It will enable local producers to ascertain market prices and conditions, and provide 'real-time' information on the weather, soil conditions, transportation, and many other issues of importance in business and agriculture. The e-Ministry project is scheduled to achieve its targets by 2010.

In response to the Private Sector Promotion Program, the MoC is developing a website for a Trade Sector Wide Approach or Trade SWAp (www.TradeSWAp.gov.kh). This Web-based project management and monitoring system is intended as a tool for the MoC and its development and Cambodian partners to optimize project activities and make them more transparent. The system is expected to serve as an example for other ministries as well.

In conjunction with the development of the TIW, the MoC has submitted a draft e-commerce law to the legislature where it is currently being debated.

National Committee for the Standardization of Khmer Script in Computers (NCSKSC)

The NCSKSC has been instrumental in meeting the need for localization in Cambodia. Working in collaboration with the Royal Academy of Cambodia and the PAN Localization Project, it has developed open source software in Khmer, including applications, operating systems, dictionaries, sorting and grouping utilities, spell checkers, and mobile interfaces. These have been distributed free of charge to the general public, schools, and educational institutes, all government branches, and the private sector. (The work of the NCSKSC is discussed further in 'ICT Research and Development'.)

ICTs in Rural and Remote Areas

Progress in developing ICT infrastructure and local content has been made mainly by NGOs. Notable examples include 22 Community Information Centres (CICs) providing low-cost Internet access in rural and urban areas. This project was established by the Asia Foundation in partnership with a number of local organizations with funding from the USAID. It has since been used as a model for other developing countries in ASEAN and South Asia.

Open Forum of Cambodia is working with the Asia Foundation in pioneering the development of Web portal content in Khmer, a module of the CIC project and the largest website in Khmer language in the country providing users with news and information on a range of subjects, including human rights, history, and the environment.

In 2008, the Informatics for Rural Empowerment and Community Health (i-REACH) project funded by the International Development Research Centre (IDRC) of Canada and run by the MoC began offering ICT-enabled services to local communities in two pilot areas, Kep and Kamchai Mear. The ICT-enabled services included access to the Internet, low-cost telephony through VoIP, computer training, and community radio and video. The project beneficiaries include local authorities, civil servants, community folk, students, and monks.

ICT-RELATED EDUCATION AND CAPACITY-BUILDING PROGRAMS

The MoEYS is introducing various technology integration initiatives to improve education at all levels and to produce a national workforce equipped with technological literacy, critical thinking, and productive skills. These initiatives include non-formal education, distance education, training of professionals, upper-secondary education, and post-secondary education.

Since 2003, all students in teacher colleges have been required to attend two hours per week of ICT courses. All colleges now have a computer room. In 2003, the average student-computer ratio in Regional Teacher Training Centres (RTTCs) and Provincial Teacher Training Colleges (PTTCs) was 65:1. The ratio was reduced to 32:1 in 2004. This has enabled colleges to offer ICT courses.

The Open School Program was launched in January 2008 to develop Open Source Khmer Language software for all teacher training colleges and high schools in Cambodia. In addition, a new Khmer language ICT textbook will be used by all public teaching institutions to facilitate the shift to Khmer language computing in all schools and the phasing out of teaching programs in English or French. Teachers from all upper secondary schools and educators from all teacher training centres have been trained to teach Khmer language computer applications.

ICT RESEARCH AND DEVELOPMENT

The development of the Khmer Unicode has probably been the most significant event in the Cambodian ICT field. It has opened up the market in training and systems development and it has enabled the local ICT industry to compete with neighbouring countries. However, the work leading to this breakthrough has been very challenging.

The NCSKSC had to build technical capacity from scratch, and overcome difficulties in the translation of technical concepts and language. While the staff have been trained to a sufficiently high level of proficiency, difficulties were encountered in retaining them. Due to their increased skills level, they became more 'attractive' to private industry and consequently able to obtain higher salaries elsewhere. In addition, the Khmer script is unique in Southeast Asia in that it uses under-stroke and over-stroke characters to form words, and special provisions had to be made for this.

The NCSKSC team is now focusing on a number of new and innovative projects, namely, Khmer text-to-speech research, Khmer mobile messaging content development, and Khmer optical recognition.

Another important ICT research and development (R&D) concern in Cambodia is covered by the work of the Low Cost Computing Laboratory for Education that is part of the Open Schools Program, a joint initiative of the MoEYS and the Open Institute. The Laboratory aims to identify, measure, and recommend technologies that will lead to sustainable use of ICT in education (see 'Issues in the Localization of Operating Systems and Applications').

CHALLENGES

Electricity

The adequacy of the national supply of electricity continues to be a major problem. Although the national supply company is bringing in more generators, it still meets only about 40 percent of demand in Phnom Penh, the capital, and the rest is supplied by private generators. As the national supply company adds capacity, more users switch to the national grid and the problem continues. The current high cost of fuel is also a factor and in the dry season, there are frequent power cuts in the city. Outside of Phnom Penh most provincial capitals have access to the national grid, but in many towns supply is restricted to 10–12 hours per day. In the rural areas, 90 percent of the population does not have access to generated electricity and power is supplied by 12-volt rechargeable batteries.

Alternative means of power generation are currently being investigated, such as solar power and methane gas, but the high initial cost of such installations is a deterrent. It is estimated that the installation cost per kilowatt of solar-generated electricity is almost USD 600.

Issues in the Localization of Operating Systems and Applications

More than 90 percent of computer systems in Cambodia use MS Windows operating systems. Consequently, the translation of MS Windows Vista and associated applications has been a priority. A private consultancy firm, Smart International Consulting, has been contracted by Microsoft to undertake this task. In the course of this work, two critical issues have been identified which are indicative of the degree of difficulty involved in such an undertaking. The first of these is related to the structural differences between Khmer and English.

Khmer, the language spoken in Cambodia and parts of Thailand, Laos, and Vietnam, has its etymological base in the ancient languages of Sanskrit and Pali. Originally it was the main language of the Khmer Empire that covered most of Southeast Asia. Over the centuries, as political boundaries changed, the language was modified to suit local needs in Thailand and Laos. The Cambodian language is widely regarded as the only language that has remained true to the original. The Cambodian government and the Royal Academy wish to preserve this cultural aspect of the language.

The Cambodian dictionary was recently updated by the Royal Academy. However, this update did not cover technical words and expressions. Many of the words and expressions commonly used in ICT are relatively recent and have no equivalent in Khmer. Prior to the development of Unicode, it was possible to use Khmer fonts within English language applications, but this was limited to user input. Menus, filenames, folders, and help-screens were still in English. A review of training materials used in computer training schools illustrates the problem: as much as 50 percent of the content is in English because there is simply no Khmer translation. There are also grammatical and structural differences between Khmer and English, which means that even where words or phrases may translate directly, the meaning changes depending on the context.

The second issue is the shortage of appropriate human resources. Less than 1 percent of the population has access to personal computers and although computer training schools proliferate throughout the capital, many of the training materials use English technical expressions. The universities are producing more than enough ICT graduates to meet current demand, and English language skills are increasing rapidly, but there is an acute shortage of people with combined IT and English skills developed to the level required for the translation of ICT operating systems and applications.

The issues outlined above are relevant to all fields where technical expressions abound (e.g. engineering, medicine, and finance). However, computer technology and usage is common to all and it is arguably one of the most important technical skills for people to acquire to facilitate national economic development. Consequently, accurate translation of computer terminology is of paramount importance.

(Sources: Institute of National Languages at the Royal Academy of Cambodia 2005; Virak 2007)

Cost of Equipment

Secondhand, Internet-capable computer equipment can be obtained for as little as USD 65. But this is still beyond the means of most families outside of a few major cities where the monthly income can be as low as USD 25. Internet charges at private shops supplying the service have dropped from a high of USD 10 per hour 10 years ago to USD 0.25 per hour at present. But outside of Phnom Penh, hourly rates vary from USD 1 to USD 4. Internet installations in private homes and businesses can be had for as low as USD 40 per month, but access speeds are slow. A satellite connection at 2 Mbps is USD 3,000.[1]

Limited Coverage of ISPs

Currently, the only Internet supplier with nationwide coverage is Camshin. However, the satellite-based service is affected by adverse weather conditions such as low cloud ceiling, rain, and thunderstorms during the monsoon season from April to December. The fixed-line operators are expanding their customer base rapidly, but only in the major cities and towns where lines are available. The recent introduction of GPRS and 3G capable mobile phones has resulted in greater accessibility throughout the country, but at a relatively high cost, and these are generally only suitable for email. Relay stations are continually being

built and services will improve accordingly. As customer bases increase in size, costs will be further reduced.

Digitization of Content for Websites

Few Khmer language websites are available on the Internet, partly because of lack of development capacity and partly because of the difficulties posed by the Khmer script. With the introduction of Khmer Unicode and the increased localization of applications software, there will be a substantial increase in the number of available sites and the quality of content. However, the quantity of content will remain an issue for some time. Although most of the documentation produced in the last 10 years has already been digitized through the use of computers in government departments and other organizations, a wealth of historical information is in written form only and digitizing this will be a major effort.

Exposure and Experience of Users

While computer usage is increasing in industry and commerce, most businesses rely on old methods of information storage and retrieval. The ICT sector lacks experienced professionals with the capacity to develop effective electronic retrieval systems such as databases that can be Web-based, and expertise in content management systems is generally limited to foreign consultants, with a few notable exceptions. This situation will be resolved in time, with an increased realization of the importance of ICT skills.

CONCLUSION

In summary, Cambodia has come a long way in the last 10–15 years not only in terms of ICT-related issues, but also socially and economically. The statistics quoted in this chapter do not adequately reflect how much progress has been made. Very few other developing countries have experienced the social and civil upheaval that Cambodia faced in the second half of the 20th century, which makes most statistical comparisons misleading. It would be more accurate to take what is happening now — the changes and improvements that are taking place almost on a daily basis, together with the infrastructural development — and look at what is possible, or indeed probable, in the next five years.

Standards in educational institutions are being upgraded regularly, legal processes are being put in place to safeguard intellectual property rights, investment and business regulations are being modernized, and access to information for business purposes is being streamlined. It is true that Cambodia does not

have the English language skills of countries such as India and Pakistan, which has enabled them to become market leaders in ICT industries like outsourcing and telecommunications. Nor do Cambodia's ICT professionals have the programming skills of the Vietnamese that have enhanced Vietnam's ability to compete in systems development outsourcing. However, Cambodia does have a very steep 'learning curve' and it can learn through the experiences of other developing nations.

Much is being done by the government and its partners in development, such as non-government and international organizations, community-based self-help groups, and many teams of volunteers in the field of education and self improvement. All these will ultimately come together and empower the Cambodians to hold their own with any nation in the world in ICT and other fields. The next two years in particular will be important for the country. Many of the current plans will either be implemented or be ready for implementation, and most of the old constraints have been reduced or eliminated. There is political stability, educational facilities are improving, and more Cambodians are going abroad to study in international universities and returning with valuable skills and knowledge to contribute to the development process. With this increased knowledge and an effective economic investment infrastructure, including appropriate legislation, brought about by the innovative and cost effective use of ICT, the future for Cambodia is bright indeed.

NOTE

1.   All prices quoted are as of February 2008.

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