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Internet Penetration and Optimal Policy for Improving Connectivity in Cambodia

Thesis in Partial Fulfillment for the Master of Arts Degree in Technology Governance

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I hereby declare that the current Master Thesis is the outcome of my independent study and has been submitted to Tallinn University of Technology only.

No degree has been obtained previously with this research.

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The Master's Thesis meets the established criteria.
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Abstract

Cambodia is one of the least developed countries (LDC) among the Association of South East Asian Nations (ASEAN). Moving towards 2015, for which ASEAN has set itself the goal to become a more unified community, Cambodia needs to catch up with the other member countries in several respects. One of these is Information and Communication Technology (ICT), which is generally acknowledged as a key driver and gateway for economic and social transformation. In Cambodia, intranet, internet and cell-phone networks have been created rather recently, and connectivity, the principal access condition for ICT, is still comparatively low. The aim of the current thesis is to, first, find out how the situation of connectivity is in Cambodia and, second, how it compares to (some of) the other ASEAN counties and some further regional success stories. The next step will be to investigate current government policies to improve connectivity, and then to compare them with the reference countries mentioned before, based on secondary data. The Indochina region will be specifically focused on. These include, e.g., Laos and Myanmar (Burma) as comparable countries, and Vietnam as a model and potential benchmark. This exercise will result in benchmarking for contextually embedded policy-learning options so as to pave the way for Cambodian ICT development.

Keywords: Connectivity, Cambodia, ICT, ASEAN

Lühikokkuvõte

Kagu-Aasia Maade Assotsiatsiooni (ASEAN) liige Kambodža kuulub maailma vähim arenenud riikide hulka. Seoses ASEANi 2015. aasta eesmärgiga muutuda ühtsemaks kogukonnaks peab Kambodža mitmes valdkonnas teistele liikmesriikidele järele jõudma. Üheks selliseks valdkonnaks on info- ja kommunikatsioonitehnoloogia (ICT), mida üldiselt peetakse majanduslike ja sotsiaalsete muutuste elluviimisel üheks võtmeteguriks. Kambodža interneti-, intraneti- ja mobiilsidevõrgustikud on loodud suhteliselt hiljuti, mistõttu on ka seotus (*connectivity*) ehk ICT peamine ligipääsutingimus veel suhteliselt madal. Käesoleva lõputöö eesmärk on esiteks uurida seotuse olukorda Kambodžas ja teiseks, võrrelda seda teiste ASEANI riikide ning mõnede teiste regiooni edulugudega. Järgmise sammuna uuritakse seotuse parandamiseks valitsuse poolt rakendatavaid poliitikaid, peale mida võrreldakse neid varemmainitud riikidega, kasutades selleks sekundaarseid andmeid. Täpsema vaatluse all on Indo-Hiina maad nagu näiteks Laos ja Myanmar (Birma) võrreldavate riikidena ning Vietnam eeskuju ja etalonina. Nende sammude tulemusena valmib kontekstil põhinev poliitikatest õppimise võrdlusanalüüs mis sillutaks teed Kambodža ICT arengule.

Märksõnad: seotus, Kambodža, ICT, ASEAN

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List of Abbreviations

3G: Third Generation

4G: Fourth Generation

ADB: Asian Development Bank

ADSL: Asymmetric Digital Subscriber Line

AEC: ASEAN Economic Community

ANU: Australian National University

ASEAN: Association of South East Asian Nation

BBC: British Broadcasting Corporation

CNRP: Cambodian National Rescue Party

CPP: Cambodian People's Party

EU: European Union

FTA: Free Trade Agreement

GCIO: Government Chief Information Officer

GDP: Gross Domestic Product

GNI: Gross National Income

HDI: Human Development Index

ICT: Information and Communication Technology

IDI: ICT Development Index

IDRC: International Development Research Center

ISP: Internet Service Provider

ITU: International Telecommunication Union

IXP: Internet Exchange Point

Lao PDR: Lao People Democratic Republic

LDC: Least Developed Countries

Mbps: Megabits per Second

MIC: Ministry of Information and Communication

MOEYS: Ministry of Education, Youth and Sports

MPT: Ministry of Post and Telecommunication

MPTC: Ministry of Posts and Telecommunications of Cambodia

NEC: National Election Committee

NGO: Non-Governmental Organization

NIDA: National ICT Development Authority

NPI: National Polytechnic Institute

OECD: Organization for Economic Co-operation and Development

OSP: Online Service Provider

PAN: Pan Asia Networking

PC: Personal Computer

R&D: Research and Development

RF: Radio Frequency

RFA: Radio Free Asia

RUPP: Royal University of Phnom Penh

SIM: Subscriber Identity Module

SME: Small and Medium Enterprise

SMS: Short Message Service

STENO: Science Technology and Environment Organization

TEP: Techno Economic Paradigm

TRC: Telecommunication Regulator of Cambodia

UNDP: United Nation Development Program

UUCP: Unix to Unix Copy Protocol

VNPT: Vietnam Posts and Telecommunications

VoIP: Voice over Internet Protocol

WID: Women in Development

WIPO: World Intellectual Property Organization

WTO: World Trade Organization

WWW: World Wide Web

Introduction

1. ICT

Information and Communication Technology (ICT) is no longer a luxury for developing countries (World Bank 2012), if it ever was; today, the use of ICT is necessary for socio-economic development (Schmandt et al. 1989; Antonelli 1991; Hanna et al. 1995; Talero and Gaudette 1996; Kenny et al. 2000; Grace et al. 2004, 5-13; Dabla 2004, 2-3; Hameed 2007, 3-4).This includes the developing countries, as well – in some sense even first and foremost – as they have especially to gain from such development (Hargittai 1999; Avgerou and Madon2005, 4-10). If it is therefore true that connectivity is, "In general terms, the ability to connect systems or application programs…Ideally, these connections are established without requiring many changes to the applications or the systems on which they run"[1], the basis for ICT, then optimal connectivity is a *condition sine qua non* for development today. This, in turn, means that improving and indeed optimizing connectivity should be one of the primary priorities of developing countries – it may be said that this is the most important infrastructure measure today. However, this is not always easy; as discussed by Drechsler (2009) regarding Nurkse's point that the lack of infrastructure is one of the main obstacles to development, yet there may be several problems with this, including that capacity is needed to create it (Nurkse1956, 145-146; 1957a, 233-235; 1957b, 259-270).

ICT has dramatically changed how we globally work and live; it has had profound effects on nearly every sector of society and has transformed whole industries (National Research Council 2012). ICT is defined in so many different ways in development literature that it can become quite confusing. Often, the term "ICT" is used to describe the use of computers and the Internet. Sometimes, the term "ICT" is associated with the most sophisticated and expensive computer-based technologies, and at other times, conventional technologies such as radio and TV and

[1] http://publib.boulder.ibm.com/infocenter/zvm/v5r4/index.jsp?topic=/com.ibm.zvm.v54.hcpa6/hcsc9b3103.htm

telephony are included in the discussions. Definitions of ICT vary widely, depending on contexts and conditions of use.[2]

ICT can enhance and improve education in isolated areas through distance learning, giving faster information to local people related to important contents such as food, agriculture, health, water and technical help. ICT also connects rural communities to global markets. This can be done through radio, television, audio and video cassettes, videoconferencing, computer programs, the Internet and so on. The Internet, for example, can enable isolated villages to have access to the vast amount of information from the World Wide Web. It also provides rural areas with opportunities to share and give information about their community to the outside world. ICT brings advantages to all parties including civil society, in particular youth and women, the disabled and peasants (UNDP 2000).

According to Steinberg (2003), there are four ICT characteristics which are considered effective strategies to respond to development challenges.

- Firstly, ICT is built for multipurpose. It has potentials to tackle many different challenges. For instance, server, network, phones and PCs are used to support distance learning, information delivery and connect remote areas to the rest of the world.
- Secondly, it can reduce the geographical problem. People can, for example, access information from anywhere in the world through physical transportation, wireless or satellite and talk with each other via Voice over Internet Protocol (VoIP).
- Thirdly, it helps people from poor communities to harness the benefits of scale and network affects.
- Lastly, it facilitates for the developing countries to increase productivity and adapt to the new state of technology.

However, failure of ICTs development can result from several reasons, such as inadequacy of skilled and trained labor, lack of infrastructure, shortage of electricity and good government telecommunication policies.

[2] www.un**apcict**.org/pr/ecohub/primer-1-an...to-**ict**-for.../attachment1

Some good illustrations of ICT are computer, internet and mobile phones. Michiels and Van Crowder (2001) have defined ICT "as a range of electronic technologies which when converged in new configurations are flexible, adaptable, enabling and capable of transforming organizations and redefining social relations". They simply mean that more and more devices can be connected to each other through the combination of both new technologies (cameras, mobile phones), for instance, with conventional technologies (cable, satellite). Hence, ICT is perceived as the integration of more devices and media for the purpose of sharing, collecting and storing information.

To be clearer and more comprehensive, it would be vital to acknowledge the definitions given by UNDP in 2001:

> ICTs are basically information handling tools–a varied set of goods, applications and services that are used to produce, store, process, distribute and exchange information. They include the 'old' ICTs of radio, television and telephone, and the 'new' ICTs of computers, satellites and wireless technology and the Internet. These different tools are now able to work together, and combine to form our 'networked world', a massive infrastructure of interconnected telephone services, standardized computer hardware, the Internet, radio and television, which reaches into every corner of the globe (UNDP 2001).

The importance of ICT in the world nowadays cannot be overrated. Every activity is relying more and more on the ICT application in economy and society. As argued in the context of the European Commission's development and innovation policy (2012), in the society, deep transformations are under way, served and driven by ICT. The innovations of ICT are significantly converted employment and development for the sake of European people, government, industries and business. New enabling technologies and applications are combining, which can potentially enhance cultural understanding between people, promote innovation and provide competitive advantage for the future businesses (EU 2012).

The reason for this is that, according to Carlota Perez (2009), who is the inventor of the concept of Techno-Economic Paradigms (TEP), the future of ICT is inextricably intertwined with the

future of the global economy and of each regional and national economy (2005, 4).[3]Current biotechnology and nanotechnology would not even be conceivable without the contribution of swift and massive data-processing software and extremely precise computer-guided instruments (4). Even the creative and craft industries are innovating with ICT, while shepherds and fishermen far from modern cities use digital satellite data for their daily work (4). ICT dominates the current TEP, leading to globalization.

Perez has summarized her idea of techno-economic paradigms as follows:

> There has been a technological revolution every 40 to 60 years, beginning with the Industrial Revolution in England at the end of the 18thCentury; each has generated a great surge of development, diffusing unevenly across the world from an initial core country. The analysis of the previous four great surges of technical change reveals regularities in their pattern of diffusion that are enlightening for understanding the process of propagation of the present fifth surge based on ICT and can provide criteria for strategic and policy action (5-8; see also Perez 2002, 14-18).

The paradigms describe how the technological change and innovation of a given period are most likely to take place, and it has engendered key changes in production processes in almost all industries (including many services and agriculture). Heterogeneity, diversity and adaptability are facilitated by knowledge capital and intangible value added, which enable the interaction between market segmentation and proliferation of niches.

Importantly, globalization allows the productions and innovation to interact locally and globally with comparative advantages and market adaptability. Through this process, an economy of specialization is attained from the production developing from "mass customization", which achieves economies of scope and scale, to multiple niches. The profiles of such productions and markets are accomplished via network structure and decentralized integration of big firms in the globe. Thus, with the feasibility of global communication, contact and action, these complexities can be quite possible (21-22).

[3] If not otherwise indicated, page numbers refer to Perez 2005.

The present study will look at the Kingdom of Cambodia (ព្រះរាជាណាចក្រកម្ពុជា) as a case study.

2. Cambodia and ASEAN

Cambodia is one of the recent emerging countries in South-East Asia, together with Vietnam, Laos and Myanmar (Burma)[4] (Dittmer and Lowell 2010; Roughneen 2012; Memmott 2012; Pomfret 2013; Ito et al. 2011; Ito et al. 2013). The three countries Cambodia, Laos and Vietnam used to be grouped in a region called Indochina (See **Figure 1**). Indochina is a geographical region of South-East Asia. It occupies the Eastern most region of the Indochinese Peninsula, on land located directly East of Thailand and South of China. It was originally comprised of the French colony of Cochin, and the French protectorates of Annam and Tonkin (later united with Cochin to form Vietnam), Cambodia (formerly Kampuchea), Laos and Vietnam. Formed in 1887, its capital city was Hanoi, but this French Indochina federation of countries only lasted into the mid-1950s. After World War II and the end of the Japanese influence in South-East Asia, and later, after the defeat of the French in 1954 by the Vietnamese, this area of the world changed dramatically. Then, after the agreements reached at the Geneva Convention between China, France, Russia, the United States of America and the United Kingdom, France relinquished any claims on the area, and all three countries in question went on to become independent nations, and remain so to this day.[5]

Figure 1 Map of Indochina

[4] As the world debates ab ion rages over the country's name. As far as as Myanmar. The junta officially changed the En se language, Myanmar is the formal term and Bu Myanmar might better be referred to as the Mya ere. For more details on this, see http://www.dw.d http://news.bbc.co.uk/2/h

[5] See Worldatlas. Indoch asia/indochina.htm. (last accessed 21 April 2014). right, 1974, 1998, 2001, 2007. Available at http:// . (last accessed 21 April 2014) and also see U.S 953-1960. Available at https://history.state.gov/m

Source: www.worldatlas.com

Cambodia is also a member of ASEAN, the Association of South-East Asian Nations, which includes Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam (www.asean.org). ASEAN was established on 8 August 1967, consisting of five members from South-East Asia, including Thailand, Malaysia, Singapore, Indonesia and the Philippines (Fifield 1979, 7; Keling et al. 2011, 172). After the end of the Cold War in 1991, ASEAN's membership increased through the participation of the communist countries of Indochina. Vietnam decided to join ASEAN on the 23July 1995, and this entry consequently influenced other Indochina countries to join, Laos entered in 1997, followed by Myanmar and Cambodia in 1999 (Mohammed 2005, 103).Through ASEAN's establishment, it prioritizes economic growth and development, society and culture in the countries of South-East Asia. Apart from that, ASEAN is designed to protect mutual interest and creating regional solidarity as well as promoting regional peace and stability (Gyngell 1983, 116).

This is important in our context because ASEAN has its own short-term development program, programmatically fixed in its "One Vision, One Identity, One Community" strategy for 2015 aiming to transform ASEAN into a single market and production base, a highly competitive

economic region, a region of equitable economic development, and a region fully integrated into the global economy (Green 2008, 209; Prakash and Isono 2012, 4-5). ASEAN's central role and unity are essential aspects in the regional architecture, as the 10-member grouping is committed to enhancing relations with its dialogue partners, and the theme "Our People, Our Future Together" highlights the role of the people in ASEAN member states in advancing cooperation, based on the bloc's three pillars, the political-security pillar[6], the economic pillar[7] and the socio-cultural pillar[8] (Keng 2009; ASEAN 2009; Xinhua 2011; The Nation 2012; Piri 2013; Singapore Institute of International Affairs n.d.). ASEAN believes that it can reach potentials, go higher and become stronger when the members get connected (ASEAN 2009). ICT is thus explicitly a priority item of the ASEAN development agenda (ASEAN 2003, OECD 2010, 95, Lary 2012). It has been said that if ASEAN can wield it effectively, ICT can help achieve the organization's goal of regional integration and community building by enabling:

(1) effective policy coordination,

(2) enhanced participation of stakeholders, and

(3) the creation of a regional identity among the youth (Ideacorp and ASEAN Studies Center n.d.).

It has been also argued that enhancing ASEAN connectivity may bring about many economic and non-economic gains, including employment, business opportunities, convenience, as well as greater and better choices of goods and services. Furthermore, it also provides greater effectiveness of the web of ASEAN-centered Free Trade Agreements (FTAs) and speeds up the development of a free trade arrangement in East Asia as the region booms. It will benefit not only ASEAN, but also other regional and global firms operating in the region (Pushpanathan 2011). And while all these goals even underrate the importance of ICT for ASEAN development, they do focus on the matter. Thus in order to grow the economy of the nation, ICT improvement strategies may need to be set, and the previous ones might have to be better implemented or even altered. This is the task of the government and agencies which are in charge of connectivity development.

[6] Secretariat, ASEAN. 2009. ASEAN Political-Security Community Blueprint.
[7] Secretariat, ASEAN. 2012. ASEAN Economic Community Blueprint.
[8] Secretariat, ASEAN. 2009. ASEAN Socio-Cultural Community Blueprint.

3. Overview of Cambodia[9]

The Kingdom of Cambodia, with an area of 181,035 square kilometers, is located in South-East Asia, on the South-Western part of the Indochina Peninsula. It borders on Thailand in the West and North-West, on Laos in the North, and on Vietnam in the East and South-East. Cambodia is bounded by the Gulf of Thailand on the South-West with a coastline that is 435 kilometers long. Cambodia is known for its cultural heritage, and the impressive Angkor temples represent the country's major tourist attraction. The temples were built between the 9th and the 13th centuries in the religious and administrative center of the Khmer Kingdom.

The Khmer, the people of Cambodia, are the descendants of the Angkor Empire, which was in power between the 10th and the 13th centuries. The empire was weakened by the attack of Thai and Cham, and later the country was put under France by the king in 1863 before transforming into Indochina in 1887. Then Cambodia successfully gained full independence from France in 1953. Sadly, the country has struggled under Communist Khmer Rouge, led by Pol Pot, for 5 years from 1975 to 1979 when at least 1.5 million Cambodians died from tortures, execution and starvation (Kiernan 1996, 460; Fawthrop and Jarvis 2004, 3-4; Tallyn 2012, 8).

3.1 Demography[10]

The population in Cambodia in 2014 is 15,177,958, ranked 67th in the world. The annual growth rate is estimated at 1.8% and expected to reach 18.7 million by 2020. According to the Asian Development Bank (ADB), the majority of the population is rural, with only 22.8% residing in urban areas.[11] The biggest city is Phnom Penh, the capital, with about 1.4million, or 2.2 million in the metropolitan area. The population consists of 90% Khmer, 5% Vietnamese, 1% Chinese and 4% other nationalities. 95% use the Khmer Language, while English and French are also

[9] Based on *The World Factbook*. 2012. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/cb.html#People.

[10] Unless indicated otherwise, the information in this section is adapted from Cambodian Population. 2014.*World Population Review*, 14 March 2014. Available at http://worldpopulationreview.com/countries/cambodia-population/. (last accessed 10 April 2014) and United Nations Educational, Scientific and Cultural Organization (UNESCO). 2012. Institute for Statistics Data Centre; World Bank. 2012. World Development Indicators Online; The World Factbook, 2012.

[11] Asian Development Bank. Available at http://www.adb.org/publications/cambodia-fact-sheet; Cambodian Population 2014.*World Population Review*, 14 March 2014. Available at http://worldpopulationreview.com/countries/cambodia-population/. (last accessed 10 April 2014).

used, but not much. Over 95% of the population practices Theravada Buddhism, the official religion, with an estimated 4,400 monastery temples in the country. Islam is the main religion of the majority of Malay and Chams minorities in the country, while most Muslims are Sunnis. There are approximately 300,000 Muslims in Cambodia, with about 1% identified as Christian. Hinduism is also practiced, but not as an official religion.

3.2 Economy[12]

Economic growth has been maintained at a level of more than 7% for 3 year consecutively with the expansion of services and industry; in 2013 it was 7.2%. Agriculture seems to be a bit slow in the same year due to the damage of crops. Much business in Cambodia is conducted in $, as it is a heavily dollarized country with 80% of deposits and credits in the banking system in U.S. dollars.[13] The majority of Cambodians primarily use Riel (Local currency), but the NBC's statistics show that more than 90% of transactions are conducted in dollars (Makara 2012). Inflation is getting higher in 2014 (3.5%) and is expected to be the same in the following year, probably because of the very recent political unrest, protests and tensions.

Promoting Small and Medium Enterprises (SME) can contribute to the Economic growth diversification and sustainability. Services have grown to 8.4% in 2013 from retail and wholesale trading ($2.5 billion), tourism ($4.2 million), and real estate ($250.5 million). Based on the Customs data of Cambodia, thanks to the huge demand of footwear in the EU ($2.0 billion) and the United States ($2.1 billion), the garment industry rose by 10.5%. Rice milling and construction industry are also growing remarkably, valued at $577 million and $262 million, respectively.

This year, the Cambodian economy may fall to 7% before growing to 7.3% in 2015 due to the rise of demonstration of workers against the current government, which prevents and disrupts foreign investments to confidently come into the country.

[12] Unless otherwise indicated, the information of this section is taken from ADB. 2014. Asian Development Outlook 2014. Manila. Available at http://www.adb.org/countries/cambodia/economy (last accessed 9 April 2014).
[13] Investing Cambodia 2013-2014.Available at http://www.cambodianembassy.org.uk/publications/PDF/Tourism/Investing%20in%20Cambodia%202013-2014.pdf (last accessed 22 April 2014).

3.3 Government[14]

Cambodia has a long history, and its culture goes back at least to the South-East Asian Hindu state of Funan in the first century. It is known for the Kingdom of Angkor, which has its origin in the eighth century. Weakened by wars and dynastic rivalries, Cambodia became a French protectorate in 1863 and a colony by 1884. While French control over the country was temporarily suspended during the Second World War, French rule returned to Indochina once the Japanese had surrendered. The quest for independence, however, increased, and in 1954, Cambodia gained full independence under King Norodom Sihanouk. Although Sihanouk emphasized Cambodia's neutrality, the country was eventually drawn into the US-Vietnam War, and in 1969 the United States, suspecting communist enemies in Cambodia, heavily bombed the country. Internal conflicts led to the overthrow of Sihanouk in 1970 and the establishment of the pro-military regime under General Lon Nol.

Sihanouk formed an alliance with his former enemies, the Cambodian communists, called the Khmer Rouge, against the government of Lon Nol. Despite US support for Lon Nol, the government was overthrown, and the Khmer Rouge gained power in 1975. In the next four years the Khmer Rouge, under the leadership of Pol Pot, tried to convert Cambodia into a self-sufficient, agrarian country. This social and economic experiment established state control through terror, turned citizens into slave workers and killed an estimated 1.7 million people, some 20 percent of the population at that time.

Border disputes, ideological differences, and the wish to restore order in the region led Vietnam to invade Cambodia in 1979. The Khmer Rouge was pushed West wards, toward the border with Thailand, from where they fought a guerrilla war against the Vietnamese-backed government. In 1989, the last Vietnamese troops left the country, and four political groups, including a faction led by former King Sihanouk, started their struggle over power.

The signing of the Paris Peace Agreements in October 1991 launched a process of reconstruction in Cambodia after two decades of conflict and civil war. Cambodia nowadays looks democratic

[14] Unless otherwise indicated, the information in this section is adapted from the Library of Congress (2009). A Country Study: Cambodia. Available at http://lcweb2.loc.gov/frd/cs/khtoc.html.

but has an authoritarian government led by a strong man, Hun Sen, who is one of the world's longest-serving leaders, with a reputation as one "who destroys his political opponents" (Murdoch 2014). He is widely seen as a dictator that has assumed authoritarian power in Cambodia using violence and intimidation and corruption to maintain his power base (Adams 2012; Banyan 2012; Marshall and Thu 2013). He has also accumulated highly centralized power in Cambodia, including a "Praetorian Guard that appears to rival the capabilities of the country's regular military units." (Fuller 2014)

3.4 Human Development[15]

Cambodia ranks 139th out of 187 on the United Nations Development Program's Human Development Index (HDI), placing the country at the end of the medium human-development category. Although one of the lowest-ranked South-East Asian countries, only above Laos and Myanmar, Cambodia is about where it should be in terms of human development, given its per-capita income. The HDI is composed of a basket of indicators, including HDI value, life expectancy at birth, mean years of schooling, Gross National Income (GNI) per capita. According to the UNDP Report, the HDI varies greatly in the ASEAN region and that Cambodia, together with Laos and Myanmar, has the region's lowest HDI (See Table 3.1, Appendix). Cambodia's history of war and internal conflict has had a detrimental impact on the country's social and economic structure.

4. ICT and Its Roles in Development

4.1 Conceptualization of ICT Use in National Development

The study of the use of ICT in national development has been conducted by several authors (Avgerou 1998; Crede and Mansell 1998). Furthermore, there are at least four different conceptualizations of the use of ICT in national development: ICT as a commodity, ICT supporting development activities, ICT as a driver of the economy, and ICT directed at specific development activities (Maung and Harindranath 2004).

[15] United Nation Development Program (UNDP). Human Development Report 2013. Available at http://hdr.undp.org/sites/default/files/hdr2013_en_summary.pdf.

ICT as a Commodity: Foreign currency can be earned through the export of ICT as a commodity, for example, such as producing computer and other ICT-related products, offshore software development and offshore computing. ICT has been growing very fast in production and consumption during the past 4 decades, and the future growth is quite promising (Freeman and Perez 1988; Gurbaxani et al. 1990; Kraemer and Dedrick 1996a). The use and the production of ICT have positively related to economic development impact (OECD 1987; APO 1990; Kraemer andDedrick 1994, 1996b). By realizing that, both developed and developing countries are actively involved in increasing the use and production of technology as such (Brown and Rushing 1986; Yamakage 1990; Dahlman 1992; Kraemer and Dedrick 1996b; Petrazzini and Harindranath 1996; Tan et al. 1999).

ICT Supporting General Development Activities: Development planning, development projects, development training and development activities of nongovernmental organizations (NGOs) can be contributed to by ICT (Madon 1994, 1999).It is a common fact that the major problem facing the developing countries is the lack of reliable information, referred to as "information poverty", which the government and companies of those countries need in order to function efficiently and effectively. The insufficient development of systems to gather, prepare, and process information is also seen as another main constraint for development planning in the countries (UN 1985; Madon 1994).

ICT as a Driver of the Economy: ICT is seen to have an influence on the micro level of economic development such as, for instance, the development of infrastructure, education and the private sector. It is also seen as a powerful agent for economic development through products and service industries generated directly and indirectly, and through transformations permitted nationally at the firm, industry and branch levels and internationally through the changing pattern of comparative cost structures and trade flows. (OECD 1989, 11)

ICT Directed at Specific Development Sectors or Projects: ICT has a developmental impact in the context of targeted developmental initiatives. For example, some developmental applications of ICT have been seen in Odedra (1993), Han and Walsham (1993), Sirimanne (1996) and Bhatnagar and Schware (2000). ICT application in some neglected sectors such as

employment, health care and public information could positively impact the remote areas in developing countries (see Hanna 1994; see also Kaul et al. 1989; APO 1990). More specifically, some examples of ICT applications, such as community resource management and the geographical information system, have been listed by Sein and Ahmad (2001) and Soeftestad (2001).

4.2 ICT Impact Conceptualization

Understanding the effects and roles of ICT in social development is very important. While ICT is considered a partner for development, the questions remain the same: what are the impacts and how exactly does ICT bring development into existence? Based on the model initiated by Malone and Rockart (1991), and adopted later by Sein and Ahmad (2001), there are three effects of technology on society.

1. The first effect is the implementation of new technology. For instance, with the introduction of new communication technologies, old technologies will no longer be used. People will use new technologies such as the Internet, computers and mobile phones instead of old, simple ways such as writing letters and so on. (UNDP 2001).
2. Second, new technology has also enabled the following phenomenon in the development sector: Once ICTs are introduced, people communicate more and more with one another. For example, after the Internet was introduced, the scholars from sub-Saharan Africa region have been able to cooperate and publish articles with those from developed countries. The number of co-written articles keeps increasing, which could potentially impact national development. (UNDP's 2001 Human Development Report).
3. The third, and also the last, effect is the change of society and business because of new technology. New businesses such as service and training in electronic media and communication will be developed. This could help share information and make society more open. In fact, more and more specialists in the development sector have recognized the important role of ICT in social and economic development. (see Narasimhan 1984; Bessant et al. 1986; Forbes 1987, OECD 1987, 1989;Cowie 1989; Kraemer and Dedrick 1996b).

5. Governmental Goals in Promoting Connectivity

Cambodia is in the stage of developing all areas, and poverty reduction is prioritized by the Royal government. In order to develop the country and reduce poverty, the government has strongly focused on the below factors:

- Keeping macroeconomics sustainable;
- Promoting the living standard for people in the countryside;
- Increasingemployment;
- Promoting human resource;
- Establishing strong institutions and good governance;
- Focusing on the safety and morality in society.

In order to achieve the above prioritized plans, the government has initiated the policy of ICT development so as to either directly or indirectly increase human resource, promote economic development and reduce poverty.[16]

Nevertheless, there is also a concern that it is not equally accessed by everyone in the country. Mobile phones, Internet and services are available in Phnom Penh while many cities and provinces cannot access these technologies. Though there is a digital gap between people in the city and remote areas, still the government can shorten the gap by providing them equal access. The importance is the gap between those who are technologically educated and those who are not. Therefore, human-resource development will vastly increase the benefits and prosperity for the country. A reasonable price of computer programs and open-source software signifies a response to the needs of Cambodia in the field of ICT and help the country reduce a huge expense on widely used software.[17]

[16] http://www.unapcict.org/ecohub/resources/cambodias-national-ict-policy-draft (In Khmer).
[17] See Cambodia National's ICT Policy. Available athttp://www.unapcict.org/ecohub/resources/cambodias-national-ict-policy-draft(In English).

The Government of Cambodia has developed a National ICT Policy which will be based on existing initiatives of the government and support in achieving Vision 2015. The policy is composed of the below criteria [18](JICA 2009).

5.1 National ICT Vision

Being in a good geographical position, Cambodia can become an internationally competitive, information- and knowledge-based society where ICT-based solutions are provided to promote the sustainability of socio-economic development.

5.2 National ICT Mission

The mission of the national ICT is to put together ICT activities in both public and private sectors supported by community framework agreements, which includes raising the understanding of global warming. It is also to provide a regulatory framework for private and public infrastructure investments in E-commerce capacity-building by increasing national ICT growth and establishing enough well qualified ICT professionals.

5.3 Goals

Mainly it aims to create and offer a national framework and policy which will allow ICT to take part in achieving national development plans. Furthermore, it is to provide global services and accessibility to ICT facilities within the country, which will unavoidably result in increasing both output and productivity. Last but not least, it is to transform the country into an information- and knowledge-based society by implementing ICT policy.

5.4 Policy Objectives

Below are the objectives that ICT Policy 2015 aims to achieve:

- Offering an ICT regulatory framework for stakeholders and citizen.
- Promoting the understanding of ICT potential at the national level, strongly focusing on sustainable development, people empowerment and governance enhancement.

[18] Unless otherwise stated, the below section is taken from JICA. 2009. National ICT Policy 2015.Policy proposal for the government of Cambodia. Available at http://www.jica.go.jp/project/cambodia/0609376/04/pdf/01_policy_e.pdf (last accessed 6 April 2014).

- Developing a lifelong-learning culture to increase human capacity and innovation of the knowledge-based system.
- Shortening the gap between people living in the city and the countryside, which is seen as having a digital divide of information accessibility (developing more infrastructures).
- Developing the competitiveness of national industry along with enough business environments, increasing life quality and the accessibility for Cambodians through ICT implementation and application promotion.
- Motivating the national ICT industry by widely spreading the adoption of ICT applications and the implementation of ICT development.
- Making the ICT access points available everywhere with a cost-effective strategy.
- Improving the quality of public services with the use of ICT and reducing the costs of public administration.
- Developing human capacity for the adoption and application of ICT.
- Fostering Women in Development (WID) in the ICT scope.
- Raising awareness of the role ICT plays within the global warming context and the prevention through the application of ICT.

5.4.1 ICT Framework

Development of National ICT Legal and Regulatory Framework

The development of Cambodia's economy is contributed to by adopting ICT and dividing it into important relevant sectors and motivating the creation of ICT strategies, legal and regulatory framework for every sector such as e-education, e-society, e-government, e-business, etc. It is very important to create an enabling environment aligned with the country's constitutional law and the consistence with regional and global best practice.

Promotion of National ICT Innovation

Cambodia's ICT innovation can be promoted by developing measures to reach the e-ASEAN Framework Agreement and keep pace with the level of ICT technology of ASEAN. The Cambodian Government has made ICT innovation consistent with regional community, ASEAN and international frameworks, such as WIPO and WTO. The planned timeframe for national

strategy shall also be consistent with the timeframe planned for developing ICT policy. Moreover, investment in human-capacity development shall be fostered.

In order to catch up with other members of the ASEAN Economic Community, planned for 2015, Cambodia needs to gather information on new technologies and continuously promotes ICT engineering and R&D. Both human resource and infrastructure development can help accelerate these gains. For infrastructure, sustainable, effective, adequate ICT infrastructure shall be promoted to meet the needs while enough accessibility and costs reduction are primarily aimed at. For human resource, it is indispensable to increase the capacity, quality and quantity of ICT professionals.

The main goal for Cambodia is not to lag behind the ASEAN level of ICT development because when it is integrated in 2015, Cambodia will face lots of challenges in the form of competition with the members in terms of investment and connectivity. If its ICT development drops behind the members, it will lose advantages to grow the economy as well as to attract more investors from the members in the region. Cambodia meanwhile mostly depends on international support, both in the private and public sectors. Therefore, the appropriate selection of ICT adoption is, nevertheless, one of the key successes regarding the development of ICT in the country.

5.4.2 ICT Service[19]

Enhance government Service via ICT application

With the application of ICT, Cambodia can possibly provide adequate information to the people across the country, and public administration can effectively manage their work and conveniently provide service for the public. The government will be in charge of ICT implementation to ensure that appropriate policies are properly put in place to keep the system of national information security safe. The creation of an e-Government supported by a dependable information-security system would also make the government more trusted, effective, transparent and efficient. Furthermore, many of its systems and operations would be implemented

[19] Unless otherwise stated, this part is taken from Sinawong. 2011. Cambodia Country Workshop on Rural ICT Development.ADB/ITU Project on "Rural Information and Communications Technology Policy Advocacy, Knowledge Sharing, and Capacity Building". Available at http://www.itu.int/ITU-D/asp/CMS/Events/2011/ITU-ADB/Cambodia/ICT_Policy_Cambodia_NiDA.pdf. (last accessed 6 April 2014).

comfortably. The first user of e-government, the public in principle, would get information related to activities and public administration, and e-government will also make the government more transparent with its nationwide services provision. With the e-Government adoption, there shall be a reduction of costs for both the provider and the user, an increase of productivity of public administration and, most crucially, an enhancement of effective communications, promoting inter-individual and inter-institutional cooperation. In principle, the establishment of e-Government shall promote more accountability of the public-administration and information-security system.

Encourage the application of ICT and e-commerce in the private sector

There is a need to support the use of ICT in Small and Medium Enterprises (SMEs) and to create the basis of an e-commerce environment for business. To effectively reach this, legal and regulatory framework and adoption of ICT shall be enforced.

Motivate National ICT industry Growth and linkage with ASEAN Region

A national ICT industry is to be grown by producing and developing ICT devices, hardware and software to keep a highly comparable technology within the ASEAN members. Moreover, technology transfer shall be promoted by attracting foreign investment, experts and new technology so that human resource is developed accordingly.

5.4.3 ICT Infrastructure[20]

Establish an adequate and reliable national ICT infrastructure

In order to reduce the gap of the information accessibility between the population in the city and the countryside, the basic ICT infrastructure shall be built across the country. Particularly, the Cambodian government shall develop a network, an information infrastructure, services and applications to ensure that the information can be accessed equally by all people nationwide.

5.4.4 ICT Development

[20] If not otherwise stated, this part is taken from Borey. 2008. National ICT Policy of Cambodia &Overview of E Government. Available at http://unpan1.un.org/intradoc/groups/public/documents/un/unpan030560.pdf (last accessed 6 April 2014).

Promote ICT education nationwide

To develop Cambodia into a so-called e-Society, the government shall provide equal chances to all people for acquiring ICT knowledge. Educational institutions and schools greatly benefit from this provision. The ICT professional training and instruction shall be conducted to reach this objective. First of all, the training of instructors focusing on the actual education field shall be conducted so as to accomplish "ICT education for Cambodian people by Cambodian people". Secondly, ICT teaching facilities shall be provided in favor of both formal and information education in the current system. Thirdly, ICT training shall be offered to decision makers and leaders in related political institution, civil society and community. Last but not least, particular attention is to be paid to women, youth, illiterate, disadvantaged and disabled people in order to tackle the issue of the ICT-knowledge imbalance.

Promote ICT skilled human capital

There is a strong demand for ICT professionals and other ICT savvy personnel in every sector in which ICT applications are deemed indispensable. To keep pace with the rapid ICT development among the ASEAN members, it is important to ensure the sufficient supply of national ICT experts. To get the goal done, there shall be the provision of enough training programs targeted at more specialized and qualified ICT savvy personnel. Action plans, long-term and short-time, on the ICT training for experts shall be conducted by the government. Initially, there will be an establishment of the position of Government Chief Information Officer (GCIO), to manage, oversee the status of current ICT experts and suggest if some action shall be taken to develop a human-resource pool in ICT skills.

Motivate Women in Development (WID) in the ICT Field

The presence of women and their involvement in the ICT sector are very important for the purpose of the equal-opportunities enhancement in the national ICT industry since they have not got involved in the field very much so far. As presented in many countries, women are also very capable of working actively and intelligently in such a specialist field. The biggest asset of Cambodia nowadays is people. So it is quite crucial to assure that both men and women have equal opportunities and accessibilities. More importantly, an enabling environment for women shall be well developed, plus the provision of short- and long-term training.

5.4.5 Commitment to Global Issues

Promote an awareness of ICT as a tool for reducing global warming

Global warming is one of the acute problems in every country around the world including Cambodia. Global warming leads to torrential rain, droughts and floods, which are the main issues that Cambodian people are facing. The Cambodian government shall actively takes action by putting ICT into use and raising the awareness among the private sector, the general public and public institutions about the government's intention for global-warming prevention.

These are the policy pillars covered in the governmental goal to promote ICT development in Cambodia toward the 2015 vision.

6. ICT and Connectivity Development in Cambodia

The Ministry of Posts and Telecommunications of Cambodia (MPTC) is responsible for all aspects relating to telecommunications in the country. The ministry is both the regulator and a major participant, which also has its own operated company– Telecom Cambodia.

6.1 Fixed-line Telephones

The number of fixed-line telephone subscribers in Cambodia increased by 4% in 2012 compared to 2011, while there was a growth in mobile-phone subscribers of 22% for the same period. Mobile-phone subscribers reached 19.1 million last year, compared with 15.7 million in 2011. According to H.E. Ek Vandy, Secretary of State at the MPTC, it was "an automatic trend" that mobile-phone subscribers are increasing much more than fixed-line users (Renzenbrink and Kimsay 2013).

There are seven fixed-line service providers in 2012, i.e. Viettel, Telecom Cambodia, Camintel, CamGSM, Sotelco, Camshin, and HACH.[21] (See Table 6.1 and Figure 2, Appendix)

[21] See ICT Application Powering The Digital Society: ICT Regulation Protecting Consumer in Cambodia. ITU-KCC Asia-Pacific Regulator's Roundtable 14-15 October 2013, Seoul, Korea. Available at http://www.itu.int/ITU-D/asp/CMS/Events/2013/RR-ITP-2013/S4_Cambodia.pdf (last accessed 23 April 2014).

6.2 Mobile Telephones

If there were no mobile phones, many Cambodians would not have any access to telecommunications. The number of mobile-phone users surprisingly surpassed the number of fixed-landline users in Cambodia, and mobile phones have been popular since 2000 because many people can afford buying the phones (Sopheap 2010). Mobile-phone penetration increased to 131% as of September 2012 because many people own more than one mobile phone.[22]The main reasons behind the huge consumption as such resulted from an extreme competition among 10 mobile-service companies (See Table 6.2 and Figure 3, Appendix) which freely offer SIM cards, reasonable calling rates, bonuses and many competitive promotions to sustain as well as grow their market. Last year, in April 2013, the MPTC tried to ban all mobile-service providers from providing more bonuses and cheap rates, mainly to protect companies linked with officials from losing out to their competitors, but it was not successful due to public criticism (Menghun and Wilwohl2013a, 2013b).

Because mobile phones are affordable, they have become more important than other traditional means of communication such as postal service and landlines. Since the country's communication infrastructure and electricity supply are still very inadequate, using mobile phones is the optimal choice to get connected and especially to gain access to the Internet. More than that, mobile phones have had a great impact on mobilization and collective actions. During the election campaigns in 2007 and 2013, most political parties used short-message service (SMS) to spread information and news because it is an effective and cheap way to have their announcements heard and well received. Groups who monitored the election also used SMS to collect data. In July 2013, the Cambodian National Election Committee (NEC), technically supported by the Open Institute and the International Foundation for Electoral Systems, started using a voice-based information service to freely offer pre-recorded details for voters prior to the National Assembly election.[23]

6.3 Internet

[22] International Telecommunication Union. "Mobile-Cellular Telephone Subscriptions, 2000-2012."
[23] Open Institute, "IVR-Based Information for the 2013 National Assembly Election Available," 18 March 2013. Available at http://www.open.org.kh/en/node/528.

After a couple of decades of domestic war and international isolation in the early 90s, Cambodia started to open the gate to the world through the election sponsored by the UN in 1993. The country lacked many services; especially e-mail and WWW, which were new and which it had never experienced. The first e-mail access was established in 1994 by Norbert Klein, who operates a store-and-forward electronic mail system, the oldest in the country, via the non-profit organization Open Forum for Cambodia.[24] At the beginning stage, the price of the Internet usage was expensive; slow and proper content, regulation and policy did not even exist.[25] Government put much effort into expanding the connection by conducting talks and negotiations with telecommunication providers from abroad (Garella 1996a, 1996b). With the establishment of a partnership between the MPTC Internet Service Provider (ISP), Camnet,[26] and the International Development Research Center of Canada[27], Cambodia was able to get its first direct Internet connection available 24 hours a day and 7 days a week with the speed of 64kbps (Garella1997a, 1997b).

The Internet has lately become popular and a part of life in Cambodia. According to the International Telecommunication Union (ITU), the Internet penetration in Cambodia was 5% in 2012.[28] The inexistence of a broad landline network has made the Internet penetration low, as the fixed landlines that broadband Internet services rely on are not available in remote areas (Kemp 2012). The MPTC reported 2.7 million Internet users in March 2013, which accounts for 18% of the total population, which is about 15 million (Heimkhemra 2013). With the emergence of wireless technology, the digital divide between rural and urban Internet users has been narrowed down.

[24] LTO Cambodia. 2012. Internet Freedom in Cambodia: A Timeline. Available at http://ltocambodia.blogspot.com/2012/08/internet-freedom-in-cambodia-timeline.html.
[25] Cambodia and Internet. Available at http://www.garella.com/rich/caminet.htm#internet%20link%20may(last accessed 9 April 2014). See also ITU. 2002. Khmer Internet: Cambodia Case Study. Available at http://www.itu.int/asean2001/reports/material/KHM%20CS.pdf. (last accessed 8 April 2014).
[26] Camnet. Available at http://www.camnet.com.kh/ (last accessed 8 April 2014).
[27] Canada International Development Research Center. Available at http://www.idrc.ca/EN/Regions/Asia/Pages/default.aspx (last accessed 8 April 2014).
[28] International Telecommunication Union, "Percentage of Individuals Using the Internet, 2000-2012."Available at http://bit.ly/14IIykM.

Currently there are more than 20 ISPs in Cambodia (See Table 6.3 and Figure 4, Appendix) – Government accounts cite as many as 27[29]–and all of them provide very reasonable rates for high-speed Internet, costing about $12 per month.[30] The variety of affordable smart mobile phones, computers, laptops and other devices have also encouraged Cambodians to enthusiastically use the Internet and more mobile phones. Based on MPTC, around 98% of all people have accessed the Internet by using a mobile phone either through a wireless connection or thorough satellite networks. Nevertheless, inadequate electricity supplies usually cause nationwide blackouts, imposing barriers on computer use and Internet access, except for mobile Internet, which can be partially substituted.

Seeing the potential growth of Internet use in Cambodia, Ezecom, one of the leading ISPs in Cambodia, has signed an MOU with Telekom Malaysia Berhad (TM) to construct the very first ever submarine cable to speed up the Internet in Cambodia.[31] The cable system under the sea amounts to1400 km from Sihanoukville, Cambodia to Kuantan, Malaysia. The cable will also be connected with the 20,000 km long Asia-America Gateway, which help link ASEAN and America.[32] Because of this cable system, Cambodia will perhaps become the gateway of Indochina and provide lots of advantages to connect to ASEAN as well as to the world. Mr. Ken Chanthan, the chairman of the ICT Association of Cambodia, perceives this initiative as beneficial both for Cambodian consumers and for the foundation of economic growth. He mentioned that "When we integrate with ASEAN in 2015, we will not only have the free flow of goods and services, but also [a foundation] for banking and for government to government exchange of information or public services."[33]

Interestingly, according to the report of Internet speed conducted by the broadband testing company, Ookla, Cambodia was ranked 4th, with 5.7 Mbps, among the ASEAN members in

[29] O.U. Phannarith, Head of CamCERT and Permanent Member of Cybercrime Law, Working Group of National ICT Development Authority, "Cambodia Effort in Fighting Cybercime in the Absence of Law." Slideshow presented at the Asia Pacific Regional Mock Court, Jakarta, Indonesia, 18-19 September 2012.
[30] "Cheap Data, Better Tech Putting More Cambodians Online." *VOA News*, 25 March 2013. Available at http://bit.ly/109eoTm.
[31] http://www.akp.gov.kh/?p=34135.
[32] http://investvine.com/cambodia-to-speed-up-internet-with-submarine-cable/.
[33] http://www.phnompenhpost.com/business/submarine-cable-web-speed.

terms of speed (See Figure 5, Appendix).[34] It shows a good progress of Internet development in the country, though it is still below the average global Internet speed, i.e. 17.5 Mbps, and the average ASEAN Internet speed, i.e. 12.4 Mbps.

6.4 Promoting ICT and Its Challenges

Affordability is considered one of the important issues; however, low income per capita may not give enough supporting evidence for the low level of ICT adoption as such. The point is actually related to the selection of technology made by the country regarding telecommunications. The decline of fixed-line use might be the factor behind the limitation of Internet expansion. The inadequacy and declined growth rate of fixed lines might result from two factors. Firstly, the fixed-line market has been monopolized by the ministry, which does not have sufficient resources in fixed-line investment and expansion. Secondly, the Cambodian government has issued quite a number of mobile-network licenses, placing mobile-phone companies in a competitive position, which the Smart CEO, Thomas Hundt, calls a "numbers game" (Post Staff 2014).

Mobile Internet is becoming popular nowadays, but only to a certain extent; it is not always convenient due to several problems:[35]The first concern is the lack of security. 86% of mobile apps lack adequate security (Goldman 2013). Mobile phones do not provide as much privacy as computers, as some websites can gather all the information on the phones, spread viruses and harmful software. Websites on the phones do not have the same type of security, encryption and firewalls as a computer. Secondly, incompatibility also causes inconvenience, since some websites cannot be loaded because they have many pages, and tools used to develop websites are not compatible with mobile Internet. Thirdly, screen size is problematic, as we need to scroll up, down, left or right to view the whole contents of the websites, while we do not have to do that on a computer. Last but not least, it causes unreliable connectivity. Web browsing used on computers is different from that used on mobile phones. Protocol of mobile Internet is less reliable than normal Internet protocol as it takes a long time to load the data, or sometimes, when the connection timeouts, it does not load at all. This is an important issue: when we perform

[34] http://features.insing.com/feature/singapore-has-highest-average-internet-speed/id-0b423101/.
[35] The Disadvantages of Mobile Internet. Available at http://www.ehow.com/info_8167624_disadvantages-mobile-internet.html#ixzz308nRuR1K (last accessed 28 April 2014).

banking transactions and the connection timeouts; we are not sure if the transaction has been finished successfully or we have to re-do all over again. Importantly, mobile phones can also create health hazard due to the transmission of Radio Frequency (RF).[36]

To tackle the problems, two options appear to be suitably considered: the first option is to expand the fixed-line market and make it more competitive, while the second option is to develop advanced mobile technology for effectively and efficiently transferring via mobile devices. Since wireless technology makes it more comfortable in data transmission, the government would encourage private investors to put such a technology to use as well. The above claims do not mean that the affordability and accessibility issues are not vital for Cambodia. Nevertheless, with open-source software available, it offers another alternative for a developing country like Cambodia to develop ICT.

Language is considered one of the constraints to access, as most online applications are not coded in Khmer. In order to improve the situation and the telecommunication infrastructure, many ICT professionals and companies have taken remarkable action and invested heavily, for instance by developing Khmer-language applications. The standard Khmer Unicode font was popularly available only after the recognition of the government (Chakrya and Strangio 2008). Recently, local developers Sous Samak and Kim Sokphearum successfully created their own Automatic English-Khmer Translation System in March (Chanseyha 2013). Additionally, with 5years of collaboration, cooperation and support by software developers, Khmer translation has become available at the end of 2013 (Mauser 2013). These contributions and efforts will facilitate Cambodian-speaking netizens to read non-Khmer content and vice versa, allowing Khmer netizens to connect to a broader audience.

Mobile phones and Internet use have never been restricted in Cambodia. In spite of less freedom of expression, the government has never planned to censor the online content like neighboring

[36] The Research Pedia. Disadvantages of Mobiles. Available at http://www.theresearchpedia.com/research-articles/disadvantages-of-mobile(last accessed 28 April 2014).

countries in ASEAN, specifically Vietnam, Laos and Thailand.[37] Nevertheless, the government has recently planned to make some Internet restrictions by suggesting ISPs to block some particular websites. Some examples below illustrate their attempts toward Internet-use restriction.

In 2007 the non-governmental organization (NGO) COMFREL sent SMS to people across the country to go to vote, but on the day of election, government blocked all SMS services.[38] The website of Khmer-American featuring a semi-naked Apsara– a traditional female dancer– was also blocked by the government due to the anger of the Ministry of Women's Affairs accusing it of affecting Khmer tradition (Brady2009a; Klein 2009). The minister of MPTC, H.E. So Khun, said that he had sent a letter to ISPs to block access to the website, but he did not know if the letter had been acknowledged (Brady 2009b). The MPTC also planned to create state-run Internet hub in order to easily control the Internet use by ISPs operated in the country (Dyer 2010).

Likewise, the UK-based corruption watchdog website, Global Witness, was also blocked after the organization's publication of a scathing report – *Country for Sale*– which explored oil and mining industries in Cambodia (Strangio and Sokheng 2009). The ISP Angkornet has confirmed that their customers could not access Global Witness's website, but it did not provide any details.

In 2011, *The Phnom Penh Post* reported that the MPTC asked the mobile-phone operators to cooperatively block some websites that affect the morality of the Cambodian people and the government (Miller 2011a). There was a leak of a congratulatory email by a senior MPTC official for successfully blocking certain websites, such as BlogSpot sites, KI-Media, Sacrava and Khmerization (Miller 2011b). The ISPs, such as Metfone, Cellcard and EZECOM, have confirmed the block. This shows that Internet censorship has been extended as part of the government policy to control the online content.[39]

[37] For information on some of the internet censorship and regulatory regimes in countries in South-East Asia, see "Silence of the Dissenters: How South-East Asia Keeps Web Users in Line."*The Guardian* (London, 21 October 2010). Available at http://www.theguardian.com/technology/2010/oct/21/internet-web-censorship-asia.
[38] COMFREL .*Final Assessment and Report on 2007 Commune Council Elections* (23 August 2007).
[39] CCHR.*CCHR Condemns Government Attempt to Thwart Online Activism* (15 February 2011). Available at www.cchrcambodia.org/index.php?url=media/media.php&p=press_detail.php&prid=148&id=5.

The above-illustrated examples show that governments do not directly block websites, but they ask ISPs to do it for them. In addition, they have also claimed not to be involved with the blockages. Nevertheless, in 2009 there was a report about "prakas"[40] issued by the MPTC saying that "inter-network connection between all telecommunication operators shall be through a central center [sic] of Cambodian Telecommunication" (Lewis and Sothoeuth 2010). The prakas stated that all companies are required to route domestic traffic via a hub controlled by a state-owned telecommunication company– TC (Telecom Cambodia) –which functions as a central filter for all Internet traffic. The ISPs in Cambodia, however, have warned that it increased costs and the imbalance of power if the Internet exchange point is monopolized by the TC (Dyer 2010). In 2011 the MPTC issued another prakas controlling Internet exchange points, which offers registration (Mullins and Kongkea 2011). The prakas ensured that licensed Internet exchange points follow the rules and regulations of Cambodia.

In 2012, the Cambodian government revealed that it had started to draft the first cyber law given the booming of modern technology and also the avoidance of false information-spreading, which could possibly impact national security (Certo and Yuthana 2012). Rights groups, however, have raised some concerns that the law will be enacted to censor websites that criticize the government and ruling party and at the same time punish those who created the websites, in a way similar to what happened in Thailand.

The government issued the first circular in February 2012 asking Internet cafés to register users and maintain surveillance on Internet activity. The second circular was also issued by MPTC in the same year restricting the permissible locations for Internet cafés and the activities of café patrons.[41]

Despite the intention of the government to strictly control the use of Internet and mobile phones in Cambodia, there is hope that, due to the fact that the Internet penetration in Cambodia still remains low, they will not impose further restrictions on Internet use and online content. Of

[40] In the Khmer language "prakas "means "edict".
[41] http://www.freedomhouse.org/report/freedom-press/2013/cambodia#.U3wo7lOyH6N.

similar importance is the hope that the government will not prevent the use of mobile phones as a means to communicate important civic and political messages.

7. Comparative Cases

1 Vietnam

Vietnam is located in South-East Asia with a total area of 331,210 km²[42], bordering the Gulf of Thailand, the Gulf of Tonkin and the South China Sea, as well as China, Laos and Cambodia.[43]The country is a one-party state, and today it is making the transition from a centrally planned economy to a market-oriented mixed economy.[44] It has one of South-East Asia's fastest-growing economies and has set its sights on becoming a developed nation by 2020.[45]As part of the country's development project, the government is promoting ICTs and e-commerce.

a. History of the Internet in Vietnam[46]

There have been many efforts and roadblocks before Vietnam finally connected to the Internet world. The Internet history in Vietnam began in 1991, when the Hanoi Institute of Information Technology, the governmental organization dealing with networking problems under the National Center of Natural Sciences, attempted to launch the Internet by discussing it with a German University. However, this first attempt, which focused on email exchange, was not successful. One year later, in 1992, Vietnam successfully established its first international connection by collaborating with the Australian National University, allowing limited email exchange through dial-up connections. In 1993, Telstra, an Australian communications company, assisted and provided UUCP protocols service. In 1994, Net Nam was established with help from

[42] http://www.countryreports.org/country/Vietnam.htm.
[43] The World Factbook.2013. Vietnam. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/vm.html (last accessed 6 April 2014).
[44] See U.S. Department of State. 2010. Background Note: Vietnam. Available at http://www.state.gov/r/pa/ei/bgn/4130.htm(last accessed 1 April 2014).
[45] BBC News. 2010.Vietnam Country Profile. Available athttp://news.bbc.co.uk/2/hi/asia-pacific/country_profiles/1243338.stm(last accessed 2 April 2014).
[46] If not otherwise stated, the information in this section is taken from: Asia Pacific Network Information Center (APNIC). 2005. Addressing the Challenge of Responsible Internet Resource Distribution in the Asia Pacific Region. *Apster* 15.Available at http://www.apnic.net/__data/assets/pdf_file/0009/27927/apster15-200509.pdf. (last accessed 4 April 2014).

Canada's International Development Research Center (IDRC), connecting through ANU's route in Australia. By 1996, a hundred users and most NGOs operating in Vietnam used this network. In 1994, the same year when Net Nam was established, the Australian Department of Employment Education and Training granted email service to Hanoi University. Later, this network became Vietnam's first internal network, the Vietnam Academic Research and Educational Network. There were around 4000 individual users; 1500 customers were estimated to use this network by mid-1998. In the late 1990s, small networks such as Toolnet, Vinanet, Vinet and TriTue Vietnam appeared in Vietnam. In December 1997, after debates and discussions, the government issued decrees and resolutions on Internet use, and ISPs were finally allowed to provide commercial Internet access.

b. Internet Development in Vietnam

In the communist country of Vietnam, the Internet was officially established in 1997. Compared to 2000, the number of Internet users in Vietnam has risen by more than 15 times.[47]In 2012, Internet users in Vietnam accounted for 35.49% of the total population, with 31,196,878 users. Vietnam ranks 3rd in ASEAN, 8th in Asia, and 18th worldwide based on its Internet population.[48]

Since it officially opened its gateway to the Internet in 1997, there has been a significant growth in Internet use. In 2011, the number Internet users reached 31 million, and its penetration is 31 percent.[49]In 2012, a company in market research, Cimigo, reported that Internet users in Vietnam keep growing dramatically, making this communist country become the fastest growing Internet population in ASEAN. With this strong growth, it is not surprising that Vietnam's Internet use rate is on par with that of Thailand and China. According to the Ministry of Information and Communications (MIC), in 2012, more than 31 million people, or over one-third of Vietnam's population use the Internet regularly.[50] Young people, who account for 60% of the total population, use the Internet the most. The penetration rate is very high, especially in big cities,

[47] Vietnam Internet Network Information Center (VNNIC). 2012. Report on Vietnam Internet Resource. Available at http://vnnic.vn/sites/default/files/tailieu/ReportOnVietNamInternetResources2012.pdf (last accessed 3 April 2014).
[48] See http://www.internetstatistics.vn (last accessed 5 April 2014).
[49] "Vietnam." Freedom House: Freedom on the Net 2012. 2012. Available at http://www.freedomhouse.org/report/freedom-net/2012/vietnam(last accessed 4 April 2014).
[50] VietnamPlus. 2012.*Vietnam Marks 15 Years of Internet*. Available at http://en.vietnamplus.vn/Home/Vietnam-marks-15-years-of-Internet-access/201212/30292 (last accessed 5 April 2014).

such as Hanoi and Ho Chi Minh, where the rate is up to 95% from age 15 to 22.[51]Public access centers, such as Internet cafés or post offices, were no longer the first place for accessing the Internet, as users surf more at home (Nguyen 2010). According to a study by Yahoo! and Kantar Media,71 percent of users were reported to have accessed Internet from their homes. This data was collected from users in big cities like Can Tho, Danang, Hanoi and Ho Chi Min.[52]This, however, does not mean that Internet cafés have become unpopular and have no customers at all. Users such as youth, online game players, or those who cannot afford to pay for broadband still find Internet cafés as their first place for accessing the Internet. In Vietnam, getting a license for providing Internet service is not a problem; any firm can get it. However, companies will not be able to get a license or be allowed to provide Internet exchange or Internet access service unless they are owned by the state. So far, the MIC has given licenses to 5 Internet-exchange providers, 9 Internet-access-services providers and 15 online-service providers.[53]As of 1 November 2010, the Vietnam Posts and Telecommunications (VNPT), the Internet-service provider which is owned by the Vietnamese government, accounts for 74 percent of broadband market share, followed by Viettel, FPT Telecom and SPT with 11 percent, 10 percent and 2 percent, respectively.[54]Only Internet Exchange Points (IXPs) is allowed to connect to the international Internet. Online Service Providers (OSPs) and Internet content providers can only connect to ISPs and IXPs.[55]Although Vietnam has been enjoying Internet growth a lot, connectivity speed is not fast if compared with countries in the region, the speed being 3.77 Mbps for upload and 6.66 Mbps for download.[56]

c. Internet Policy in Vietnam[57]

[51]Cimigo 2012.NetCitizens.Available at http://www.cimigo.vn/en-US/ReportDetail.aspx?ProductId=266 (last accessed 6 April 2014).
[52] Ibid.
[53] See Ministry of Information and Communications of the Socialist Republic of Vietnam."Operators."Available at http://english.mic.gov.vn/Statistics/staticstics_open/Trang/operators.aspx; Viet Nam Internet Center."Diagram of the ISP Market" [in Vietnamese]. Available at http://www.thongkeinternet.vn/jsp/ thuebao/chat_dt.jsp.
[54] Viet Nam Internet Center."Diagram of the ISP Market."
[55] Ibid., Article 27.
[56] John E. Dunn. "Asian Cities Dominate Fast Broadband."*PC World*,24 October 2010.Available at http://www.pcworld.com/article/208550/asian_cities_dominate_fast_broadband.html; "World Speed Test. Net Results." *Speedtest.net*. Available at http://www.speedtest.net (last accessed 21 December 2010).
[57] If not otherwise stated, the information in this section is taken from: 2013 Country Reports on Human Rights Practices. Available at http://www.state.gov/j/drl/rls/hrrpt/2013/eap/220244.htm(last accessed 6 April 2014).

Accessing the Internet directly by using foreign ISPs is forbidden. In order to control Internet activities effectively, the Vietnam government requires local ISPs, which are owned by the state or joint ventures (state and private companies), to help public security with technical assistance and workspace.

Moreover, transmission of the information on the Internet has to be stored for at least 15 days. Internet cafés have to install software approved by the government so as to check the online activities of users. More than that, the owners must register customers' personal information and record their visited sites. Also, Internet cafés have to be far from schools; otherwise, a curfew will be applied if the location of an Internet café is within 220 yards of a school. Online access to Internet cafés from 11 p.m. to 6 a.m. is not possible as the government wants to control as well as reduce online gaming. Regulations and law about Internet use state that users are not allowed to post anything related to state secrets, national security or anything that encourages crimes or violence. As a result, users will not be able to download or share any document which Vietnam government considers not appropriate or offensive. Every 6 months, Global Internet firms that operate with blogging platforms are required to send their report to the Vietnam government. In some cases, the government also requests information about individual bloggers. The Vietnam government has been involved in hacking and attacking websites criticizing the government, most of which were news sites. Firewalls are used in order to block websites which the Vietnam government suspects of containing inappropriate culture or political contents. Some famous Western websites, such as BBC and Radio Free Asia, were reported to have been blocked occasionally. Owners of local websites, no matter whether they are run by Vietnamese or foreigners, are required to register and submit the scope and planned content to the government prior to approval. Even though Vietnamese citizens enjoy having more access to the Internet, the government takes serious control and keeps its eyes on their activities, such as e-mail, sensitive key words and so on, which has been strongly criticized by NGOs for controlling and violating privacy. The government, through state media, has admitted to blocking thousands of "bad, poisonous websites and blogs". The state convicted at least 63 bloggers and other nonviolent democracy activists in 2013 of criminal offenses according to Human Rights Watch. The

propaganda chief of Hanoi's Communist Party, Ho Quang Loi, said it employed 900 people to counter online criticism.[58]

According to a report from Reuters, anyone caught criticizing the Vietnam government on the Internet will be fined 100 million dong (approximately $4,740) under a new decree signed by Prime Minister Nguyen Tan Dung (Petty and Fernandez 2013). They will be fined if their comments are considered to be "propaganda against the state" or spreading "reactionary ideology". There will be a sentence to prison if comments fall into the "criminal offense" category.

2 Laos

Laos, officially called Lao People's Democratic Republic[59], is one of the poorest countries in South-East Asia with an area of 236,800 km² (91,400 sq mi) and located between Cambodia, Myanmar, Thailand, Vietnam and China.[60]The capital city is Vientiane, and it is a landlocked, mountainous country, densely covered largely by tropical forest.[61] Less than 5% of the land is favorable for agriculture cultivation, which, however, offers around 80% of employment.

a. History of the Internet in Laos

Speaking of the Internet, Laos is one of the last countries in the region to set up full Internet connectivity. Realizing the importance of connectivity in developing the country, many people have tried to establish full Internet connectivity. This process involved the Lao people and foreign collaborators. The initial movement began in 1994, when a group of people discussed the advantages of the Internet for the Lao in the electronic bulletin board Soc.Culture.Laos. It was stated that the Internet will bring a lot of benefits to Laos and the Lao people politically, economically and socially (Thongvilu 1996, 9). It was held that the Internet could be a development resource and could promote, share and preserve Lao culture, too.[62] Admitting the fact that Laos lack Internet connectivity, users in Soc.Culture. Laos created a group named

[58] http://bigstory.ap.org/article/vietnams-cyber-troops-take-fight-us-france.
[59] http://www.bbc.com/news/world-asia-pacific-15351898.
[60] http://www.countryreports.org/country/Laos.htm.
[61] https://www.cia.gov/library/publications/the-world-factbook/geos/la.html.
[62] Ibid.

LaoNet, which was formed by Laos expatriate around the world, to continue a project called "Lao Internet node" with the aim of connecting Laos to the global Internet.[63] Historically, the first e-mail service, based on Fidonet technology, which dialed into a Permanet.org host in the United States, was initiated and established at the Lao National Polytechnic Institute (NPI) by a member of the LaoNet group working as an Internet consultant in Bangkok.[64] However, without much support and money from authorities, the service was finally discontinued. Nevertheless, this initial attempt allowed NPI staff to receive information and take part in Internet developer transnational networks.

Later, there was another attempt to bring the Internet to Laos. This time it was a joint collaboration between LaoNet, Lao government agency Science Technology and Environment Organization (STENO) and the Pan Asia Networking program (PAN) of the Canadian International Development Research Centre (IDRC).[65] The first step was to provide email access to everyone in the country. The second step was to establish full Internet access if a number of users had reached the target. Unfortunately, only the first step was achieved. It was not until August 1998 that Lao had it local ISP set up in Vientiane, providing full Internet service including WWW. This ISP was run by Globenet, a joint collaboration between an American expatriate and KPL, the government news agency. Prior to that, there were three Internet service providers. They were STENO, which clients had been complained about due to its slow speed, Thai service provider Loxinfo, which was a bit more expensive but reliable, and SITA, the international airline telecommunications- and information-services provider. With good quality, reliability and affordability, Globenet attracted many users. In November 1998, two Internet cafés were opened in central Vientiane. One was run by Planet Computers, a local computer hardware and software retailer, and the other one was located in Globenet's offices at Lao Plaza Hotel, offering service mainly for guests at the hotel.

According to data from the World Bank from 2009 to 2012, the number of Internet users (per 100 people) in Laos has slightly increased from 6.0 to 7.0, 9.0 and 10.7, respectively. This means out of 100 people, 10 people have access to the Internet. This figure is still better than some other

[63] http://www.global.lao.net.
[64] Ibid.
[65] http://www.panasia.org.sg.

Asian countries like Cambodia, Timor Leste, and Myanmar, but it is not high.[66]In 2012, Laos was ranked 166th in the world based on the number of Internet hosts available within a country with a total number of 1,532.[67]

b. Internet Development in Laos[68]

A 3G Internet connection is available for PC via USB 3 wireless Internet modems and via 3G SIM cards for mobile-phone users. Lao Telecom, Unitel and ETL are 3G Internet providers, whose price ranges are the same, with Lao Telecom being a little bit more expensive. The average speed is around 1.8 Mbps. The three providers need to improve their service and face the challenge to keep up with the demand of the IT service market, as it keeps increasing. While there are plenty of 3G providers available, currently Planet is the only one that provides a 4G connection and is available only for Vientiane customers. Planet, like the other 3G providers, does not offer an unlimited package to their customers. Once the limit for download is reached, the speed will be cut rather than disconnected.

Lao Telecom, one of the leading telecom companies, aimed to develop its service and network by expanding mobile-phone and Internet services with additional base stations, Internet, installation of transmission lines and fixed-line facilities. For instance, it planned to launch 4G Internet by the end of 2013 by installing equipment, carrying out tests and asking the government for a license.[69]With this plan, it hopes to attract more than 1,000 Internet customers at its launch, including users of USB 3G wireless Internet modems. However, there was neither 4G Internet in Laos for most of 2013 nor confirmation about when exactly it can be launched.[70]

It seems like Internet providers are ready to join the Internet technology race in Laos. The 3G providers are trying to keep up with their customers' demand, whereas 4G providers are focusing

[66] The World Bank. Internet users per 100 people. Available at http://data.worldbank.org/indicator/IT.NET.USER.P2 (last accessed 7 April 2014).
[67] Internet hosts 2013 country ranks, by rank. Available at http://www.photius.com/rankings/communications/internet_hosts_2013_0.html (last accessed 7 April 2014).
[68] If not otherwise stated, the information of this section is taken from Stephan. 2011. "Internet Provide in Lao: What Comes Next?"Available at http://jclao.com/internet-price-shake-up/ (last accessed 7 April 2014).
[69]http://laoinvestorshouse.com/2011/09/27/telecom-operator-to-launch-4g-internet/.
[70]http://retireasia.com/blog/laos-telecoms-no-4g-lte-services-in-2014/.

on building their networks. Maintaining old customers and trying to improve services and networks are what providers should focus on, rather than just promising false promotion in order to attract new customers. This will lead to customers' disappointments. A new approach which focuses on customers should be adopted so as to ensure that Internet service is reliable and stable for a reasonable price.

Due to an increasing demand for high-speed Internet access, the Lao government has signed an agreement with Japanese telecom company NTT to have a direct Internet connection with the international gateway via the international undersea Internet cable (Asia News Network 2012). If connected directly with international connection, Laos will be able to provide faster Internet service, high-speed, stable and secure Internet connectivity. At present, Internet-service providers have to buy indirect Internet connections from neighboring countries such as China, Vietnam and Thailand, which can result in slow connections and weak signals.

c. Internet Policy in Laos

Domestic Internet servers and usage are sporadically monitored and controlled by the government, but cannot be blocked, given the lack of ability on the part of the government.[71]Additionally, the government also maintains the infrastructure to route all Internet traffic via a single gateway, which allows it to control and restrict the content. The Internet system is administered by the National Internet Committee under the supervision of the Prime Minister's Office. All Internet-service providers are required to submit quarterly reports and link their gateways to enable controlling, yet the enforcement capability of the government still seems to be rather limited. In order to prevent cybercrime, the government had launched a Computer Emergency Response Team.

At the end of 2012, about 11% of the population could access the Internet, and Lao-language content, though remaining low, is gradually increasing. More and more Laotians, especially the young, dare to discuss social issues on social media. Given that the development of the Internet is undeniable, the government seems to show an interest in adopting the censorship policies and

[71] Country Reports on Human Rights Practices for 2013. Available at http://www.state.gov/j/drl/rls/hrrpt/humanrightsreport/index.htm#wrapper.

technologies of its neighbors, Vietnam and China for instance, by consolidating the Internet infrastructure to a single gateway and establishing other initiatives to ensure that Internet usage is well administered and maintained.[72]

3 Myanmar

Myanmar is located in South-East Asia bordering the Andaman Sea and the Bay of Bengal, between Bangladesh and Thailand.[73] The country is now in a triple transition – from a military controlled system to democratic governance, from a centrally planned economy to an open-market economy, and from six decades of conflict to peace in its border areas.[74]

However, telecommunications and Internet access are still very limited. Based on the data from the World Bank from 2009 to 2012, the number of Internet users (per 100 people) has slightly increased from 0.2 to 0.3, 1.0 and1.1, respectively. This indicates that the number of people who use the Internet in Myanmar is still the lowest in South-East Asia, as out of 100 people only 1 person has access to the Internet.[75]

Moreover, according to the World Bank, 73 percent of the populations do not have enough electricity. The country has been ranked one of the lowest electricity consumers with 20 times less than the world average. The existing power supply and infrastructure can only meet half of the current demand, leading to frequent blackouts and rationing of the electricity supply.[76]

a. History of the Internet in Myanmar

[72] http://www.freedomhouse.org/report/freedom-press/2013/laos#.U3wmQFOyH6M.
[73] The World Factbook. East and South East Asia: Burmar. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/bm.html (last accessed 7 April 2014).
[74] The World Bank. Myanmar: Interim Strategy Note for the Period FY 2013-2014. Available at http://www.worldbank.org/en/country/myanmar/projects/operationaldocuments?teratopic_exact=Governance& (last accessed 7 April 2014).
[75] The World Bank. Internet Users (Per 100 People).Available at http://data.worldbank.org/indicator/IT.NET.USER.P2 (last accessed 7 April 2014).
[76] The World Bank. Myanmar Overview. Available at http://www.worldbank.org/en/country/myanmar/overview (last accessed 7 April 2014).

The first official email service was established in 1997 by the Ministry of Post and Telecommunication (MPT), and the first public WWW access was launched in 1998.[77] The government of Myanmar has had strictly controlled personal access since the Internet was introduced to this country. It is not easy for applicants to get Internet connections. They have to obtain a letter signed by relevant authorities which certifies that they are not politically dangerous (Shawn Crispin 2007). Usually, average Burmese citizens use Internet cafés, which can mostly be found in urban centers, to get access to the Internet, since the procedure to subscribe to a connection is complicated, and the cost is very high.[78] Broadband Internet connections are available, too, but mainly for businesses and the government. Electronic communications such as email have been strictly controlled by the government, and so far they have blocked some websites related to movements of democracy, political opposition, pornography, free web space and gambling, all of which are their main targets. The ONI report finds out that content related to politics is the government's priority interest to be blocked, not morality or culture.[79]Two independent ISPs were shut down in 1999 by the Myanmar authorities, giving the government more control over the Internet. In 2000, the government stepped up its efforts to fully control the generation of Web content inside Myanmar. New rules of online conduct under the 2000 Web Regulations were introduced.[80]

b. Internet Development in Myanmar

There were approximately 111,000 Internet users in Myanmar in 2009, which represented a 0.2 percent penetration rate.[81]15,000 users also subscribed to broadband, which represented a 0.03

[77] See Swe Thu Han. ICT Development in Myanmar. Available at http://www.ocw.titech.ac.jp/index.php?module=General&action=DownLoad&file=20092224710020-113-0-22.pdf&type=cal&JWC=20092224710020 (last accessed 7 April 2014).
[78] "Internet Filtering in Burma in 2005: A Country Study." OpenNet Initiative, October 2005.Available at http://opennet.net/studies/burma/ (last accessed 7 April2014).
[79] "Internet Filtering in Burma in 2005: A Country Study." OpenNet Initiative, October 2005.Available at http://opennet.net/studies/burma/ (last accessed 7 April2014).
[80] Bertil Lintner. "Access to Information: The Case of Burma." The Right to Know: Access to Information in Southeast Asia, (Philippine Center for Investigative Journalism Publication, 2001).Available at http://www.asiapacificms.com/papers/pdf/burma_ac-cess_to_information.pdf (last accessed 15 April 2014).
[81] International Telecommunication Union (ITU)."Internet Indicators: Subscribers, Users and Broadband Subscribers."2009Figures. Available at http://www.itu.int/ITUD/icteye/Reporting/ShowReportFrame.aspx?ReportName=/WTI/InformationTechnologyPublic &ReportFormat=HTML4.0 &RP_intYear=2009 &RP_intLanguageID=1 &RP_bitLiveData=False.

percent penetration rate of fixed-broadband subscriptions.[82] The access to the Internet has been limited by the slow connection speed and high cost. In 2009, the cost for just the initial setup of a dial-up connection was around $200 and approximately $2,000 for an asymmetric digital subscriber line (ADSL) (Mizzima News 2009).[83] Myanmar citizens use the Internet as a way to challenge limitations and restrictions that they face in their society. For instance, bloggers created by a small group of citizens and journalists shared videos and photos taken by mobile phones and cameras on the Internet, broadcasted over radio and TV to communities in Myanmar.[84]

The government shut down the Internet subsequently so as to prevent information and reality in Myanmar from flowing outside. Even though the Myanmar government thinks that the Internet can cause instability in the country, necessitating a strict control of content and access, they also perceive the Internet as a way to develop the economy by issuing a licensing tender and passing a new telecommunications law in 2013.[85] The telecommunications law provides ease and convenience for international telecom companies to operate in Myanmar. As a result, the two biggest telecom companies, Telenor and Ooredoo, will invest billions to build out the country's mobile network and will also begin to offer more affordable SIM cards. In the next five years, they expect to cover at least 90 percent of Myanmar's population. Additionally, Yadanabon Cyber City in Pyin OoL win is part of the ICT master plan of development and will be the largest IT development (Xinhua 2007; Lwin 2008). The master plan of ICT development indicated the government's interest in and commitment to developing the economy.

The Myanmar telecommunication sector has struggled under the military junta, since it has so far been controlled by state-owned monopoly services. At the moment, there is still a very low investment in the telecom sector by foreign investors because of the situation and closed market economy of the country in spite of the recent commitment of government toward telecom-industry development. However, with the reforms in 2012 the industry seems to be gradually

[82] Ibid.
[83] Digital Democracy."Burma/Myanmar Report 2009."Available at http://www.scribd.com/doc/41186709/Digital-Democracy-Burma-Myanmar-Report/.
[84] OpenNet Initiative, "Pulling the Plug."
[85] https://www.devex.com/news/is-myanmar-ready-for-a-telecommunications-revolution-83498.

promoted. Based on the recent data from 2011 to 2013, fixed-line-services subscribers rose from 1.1% to 1.2%, while mobile-services subscribers increased from 3% to 14%.[86]

c. Internet Policy in Myanmar

According to the Computer Science Development Law (CSDL) enacted in 1996, all network computers and fax machines must be registered with MPT before importation, possession or use.[87]MPT determined the fees and license agreement for such registration.[88] A possible penalty and 7 to 15 years imprisonment will be carried out if a computer or a network fails to register.[89]In 2000, a list of regulations concerning Internet access and usage was issued by the MPT, most of which relates to content prohibition and hacking. However, one regulation forbids owners of registered Internet connections from sharing their connections with others. MPT reserves the right to correct or revamp regulations without prior information.[90]According to section 34 of the CSDL, violations of the 2000 regulations will be punished[91], which can be 6 months imprisonment, a fine or both for not complying with the order.[92]

Due to the high price of the Internet connection, only 1% of the total population accessed the Internet. Though all Internet-service providers are owned by the government, the popularity of using e-mail, Facebook, Youtube, blogs and other social-media platforms has still grown. The government also reduced the price of SIM cards for mobile telephones, even though they remained among the most expensive ones in Asia. With unfavorable and complex payment schemes for SMS, it is very costly and politically risky for the Burmese to use SMS as another platform for information, news, or civic mobilization.[93]

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[86] Budde Comm. Myanmar (Burma): Telecoms, Mobile and Internet. Available at http://www.budde.com.au/Research/Myanmar-Burma-Telecoms-Mobile-and-Internet.html (last accessed 7 April 2014).
[87] Computer Science Development Law, 27, 28.Available at http://www.myanmar.com/gov/laws/computerlaw.html (last accessed 7 April 2014).
[88] Computer Science Development Law, 31.
[89] Computer Science Development Law, 32, 33, 35.
[90] The NewNet Regulation in Burma. *Digital Freedom Network*. Available at http://web.archive.org/web/20010220220441/.
[91] The New Net regulations in Burma. *Ditigal Freedom Network*.
[92] Computer Science Development Law, 34.
[93]http://www.freedomhouse.org/report/freedom-press/2013/burma#.U3wqdFOyH6P.

8. Analysis and Policy Recommendations

8.1 Analysis for Cambodia and the 3 Cases

According to the case studies of the above-mentioned countries, we can see that Cambodia is progressing well regarding connectivity development, comparable to Myanmar and Laos, though it falls behind Vietnam. Based on the ICT development index (IDI) in 2012, globally Vietnam was ranked 88th, Cambodia 120th, Laos 123rd and Myanmar 134th, respectively.[94]

Vietnam has a competitive advantage because it started adopting and using the Internet several years before Cambodia. Its failure, when they first started, did teach it some lessons and paved the way for it to successfully connect to the world a few years later. Cooperation on ICT adoption with foreign institutions in countries such as Australia and Canada has been established. Furthermore, more than two-thirds of the total population can access the Internet from home, while Cambodian people are not able to do so, basically due to the expensive price of accessibility and infrastructure.

To be concrete, as an example of my own case, I would like to get connected to the Internet at my house, and I have contacted the Internet-service providers. My house is just 3 kilometers from the city center of Phnom Penh, but they said their services have not been expanded to my area yet. I was very surprised and decided to use a modem to connect to the Internet, even though it is very slow and uncomfortable. Infrastructure, technology and location are the main barriers here for Cambodian to be able to get connected. Additionally, political threats also indirectly prevent people from posting information and criticizing the government online, for example on Facebook.

The number of Internet users in Cambodia, however, has significantly increased, showing that Cambodian ICT development is positively thriving locally, regionally and globally. With the latest data I got from 2000 to 2012, in terms of the percentage of individuals using the Internet, Cambodia has risen from 0.05% to 4.94%, Vietnam from 0.25% to 39.49%, Laos from 0.11 to

[94] Measuring the Information Society. 2013. The ICT Development Index. Available at http://www.burmalibrary.org/docs16/MIS2013-ICT_Development_Index.pdf (last accessed 8 April 2014).

10.75 and lastly, Myanmar from 0.00% to 1.07%. Among these countries, Vietnam ranked 1st followed by Laos, Cambodia and Myanmar, respectively.[95]

Cambodia has more advantages, compared to the 3 countries, regarding Internet contents and policies, since it has not been strictly controlled by the government so far. As mentioned, the Internet has been developed remarkably in Vietnam, but as a socialist state the Internet is accessible through government ISP only, and there will be a punishment and fine if anyone breaks the rules and policy. Not so different from Vietnam, Myanmar has been under authoritarian military control, which firmly oversees Internet access within the country. The country does not hesitate to close down Internet access when there is criticism toward the government. Lao Internet regulation is not as strict as the two mentioned earlier, but language content seems to be a constraint. In addition, Cambodia may not be able to enjoy using the Internet much, although it has historically not yet enacted any law restricting the freedom of expression online, while its neighbors, Vietnam and Thailand, have already done so.[96] However, with more and more people having Internet access, the current ruling party, the Cambodian People's Party (CPP) has planned to control Internet use via the drafting of a cybercrime law.[97] The law consisting of 6 chapters and 40 articles drafted in 2012 was leaked, revealing acute threats to freedom with fines and punishment. The law was obtained in 2014 by ARTICLE 19, a London-based human-rights organization, which defends the freedom of expression and information.[98]The main problem of this drafted law is that it was drawn up behind the closed door, i.e. without the participation, acknowledgement and consent from civil society. This secrecy shows the lack of transparency from the government to publicize their initiatives and plan for ensuring the trust for all Cambodian people.[99] Meanwhile, the CPP oversees most media in order to censor as well as investigate all information they consider harmful to the party itself and to the government. Many recent peaceful protests are entirely hidden from the media platforms such as TV, radio, Newspaper, leaving the Internet as the only source of uncensored information for the people.

[95] See "Percentage of Individuals using the Internet 2000-2012." International Telecommunications Union (Geneva), June 2013 (last accessed 8 April 2014).
[96] http://www.dw.de/its-not-just-cambodia-vietnam-southeast-asia-struggles-with-internet-freedom/a-17638244.
[97] http://www.article19.org/data/files/medialibrary/37516/Draft-Law-On-CyberCrime_Englishv1.pdf.
[98] http://www.article19.org/resources.php/resource/37516/en/cambodia:-secret-draft-cybercrime-law-seeks-to-undermine-free-speech-online.
[99] https://www.eff.org/deeplinks/2014/05/cambodian-cybercrime-draft-law-threatens-freedom-expression-online.

One of the well-known bloggers in Cambodia, Ou Ritthy, expresses how the Internet has become a great platform to read what truly happens in the country, share political debates and discuss the future of the country. He told Al Jazeera, "If this draft law is passed, my peers and I will be more cautious with our political expression despite the fact that we have never defamed or abused any ruling official…E-democracy has just [been] born in Cambodia, but this cyber law will be undermining its process." Phil Robertson, deputy Asia director for Human Rights Watch, has said, "The monopoly over the national TV and radio, and much of the printed press, doesn't mean as much as it did when more and more Cambodian youth are going online to learn what is happening. That's the thing that has got the Cambodian government worried."[100]

The law-enacting process starts to become extremely important after the national elections of July 2013, when the opposition made substantial gains against the ruling CPP party, which has held an iron lock on power for decades, according to Deutsche Welle.[101] During the election, the biggest opposition party, the Cambodian National Rescue Party (CNRP), used social media, Facebook in particular, to help bring more than 100,000 Cambodians out on the streets welcoming CNRP president Sam Rainsy's return to Cambodia prior to the elections, after years of exile. Protests and demonstrations were mainly neglected by mainstream media, but online, Ritthy commented, "information about politics, the elections and electoral irregularities spread like wildfire among voters, triggering social dissatisfaction and leading to mass demonstrations. Facebook has made [the] CNRP more interesting, lively, updated and relevant to youth, and the young inform their families and… communities." (Peter 2014)

I personally think that in the near future, Cambodian people may not enjoy accessing the Internet, given that the cybercrime law will strictly restrict them from expressing their own opinions on political issues or any government-related problems. For instance, article 28 in the drafted law stated that any persons who engage in activities such as establishing contents that is deemed to hinder the sovereignty and integrity of the Kingdom, publications or continuation of publications that are deemed to generate insecurity, instability, and political cohesiveness, will

[100] http://politikoffee.blogspot.com/.
[101] http://www.dw.de/leaked-draft-of-cambodias-proposed-cyber-law-reveals-threat-to-free-expression/a-17629723.

be jailed from 1 to 3 years and fined from 2 million Riels up to 6 million Riels.[102] The government should encourage the young to share their ideas and involve them in the political discussion to develop the country rather than forbid them to express their thoughts online.

Based on the above studies, the other main challenges that Cambodia, Laos and Myanmar have encountered in terms of ICT development are the high price of Internet connections and usage, an inadequacy of infrastructures, the language barrier, a lack of technology transfer and political unrest. These three countries have very low GDPs per capita compared to the price of using the Internet, i.e. 0.5$/hour, 1.5$/hour and 2$ in Cambodia, Lao and Myanmar, respectively. Therefore, they mostly cannot afford using the Internet, which is why ICT knowledge and human resources remain extremely low. Since the countries, particularly Cambodia, had civil wars and political unrest, the infrastructure has been damaged or even vanished. The lack of infrastructure disrupts the favorability of developing ICT. English is widely used in Internet content and websites, so people in the countryside who do not speak English are not able to understand the contents, leading to the impossibility of accessing information online.[103]Khmer, the Cambodian language, has been added to Google's translation service, which is meant to target speakers of Khmer. Technology transfer seems to be in short supply due to the insufficiency of foreign investment, especially in the technology market. Actually the countries have just attracted foreign investment in recent years, which at the same time allows new technology into the local companies and market.

Cambodia is badly in need of policies to improve connectivity as well as to develop ICT in order to enhance economic development. Currently only a small number of Cambodians have access to the Internet and can afford a dial-up connection. Internet access in academic institutions, schools and universities are almost non-existent, especially in remote areas. A few Internet cafés can only be found in the big cities, where most foreigners live and work. Some administrative offices in the countryside are not provided with adequate computers and technical support so that people do not have the possibility to be exposed to Internet usage, skills and technology. With the Internet, the transportation barrier does not exist anymore. For instance, when the transport of

[102] http://www.article19.org/data/files/medialibrary/37516/Draft-Law-On-CyberCrime_Englishv1.pdf.
[103] http://www.voacambodia.com/content/how-google-figured-out-khmer-translation/1667726.html.

books, newspaper and letters is not guaranteed due to bad road conditions, mainly in the remote provinces, the items could be sent through the Internet.

In the ASEAN region, Cambodia is ranked among the lowest countries regarding their level of ICT development. This basically reflects its low GDP, which affects other important factors, such as education and literacy, especially in the ICT area. Likewise, the Khmer Rouge[104]slowed down the establishment of communication infrastructure from 1975 to 1979. The term "Khmer Rouge" comes from the French word Khmer + Rouge = Red Khmer, named by the former King Norodom Sihanouk, for the label of the Communist Party of Kampuchea (CPK) in 1971. The organization was originally formed as the Revolutionary Army of Kampuchea in January 1968. In 1981, it turned into the Party of Democratic Kampuchea. It seized power in 1975, and in 1976 the Khmer Rouge established a new constitution with a new flag under the official name Democratic Kampuchea. As one of the most violent regimes of the 20th century, the Khmer Rouge regime was responsible for the deaths of approximately 1.7 million people by execution, starvation and forced labor (Doyle 2014).[105] The decrease in fixed lines, plus the focus being only in the big and tourist-attracting cities, such as Phnom Penh, Siem Reap, Battambang and Sihanoukville, is the major constraints on Internet development in Cambodia. The concrete reason why Cambodia has one of the lowest Internet penetrations in the region is the high cost of accessing Internet and technology knowledge. It is considered very expensive for the average Cambodian to afford the cost of connection and usage. Moreover, people from the older generation or people in the countryside do not know how to use smart phones to surf the Internet.

Positively, the country has the highest ratio of mobile-phone subscribers to fixed-line subscribers in the world. The large number of mobile-phone subscribers mainly results from a free and open market for mobile-operator competition and, importantly, from an acknowledgement of the rapidity and the reasonable price of the installation of communication infrastructure, which is wireless technology, so to speak. The use of wireless on mobile phone has proven to be the optimal choice of connectivity development, but mobile operators have taken action somewhat slowly in producing the required network to support the development as such.

[104] http://content.time.com/time/world/article/0,8599,1879785,00.html.
[105] http://www.cambodia.org/khmer_rouge/.

ASEAN is strongly promoting ICT through the ICT Master plan 2015, which works to improve Internet connectivity for regional economic growth.[106]As mentioned earlier, Cambodia will join ASEAN integration in 2015. So the endeavor to develop ICT is meant to align the ICT in Cambodia with the ASEAN ICT Master plan 2015 – as the countries become the ASEAN Economy Community (AEC). The AEC aims to develop ASEAN as a single marketplace and production base, featuring the free flow of services and skilled labor, the free flow of investment and freer flow of capital throughout all 10 ASEAN member states (Piseth 2014). A major success of AEC is information connectivity. Cambodia has a great advantage in terms of its geographic position, as it is located at the heart of ASEAN, which puts it in the best position to benefit from the plan. The plan offers an ASEAN-wide "broadband corridor" and an initiative to develop ICT infrastructure and resources among ASEAN member states. The CEO of Ezecom, Paul Blanche-Horgan, has told Telecom Review [107] that "currently Cambodia already has connectivity to its neighbors including Vietnam, Thailand and Laos and is also connected to the world via Asian American Gateway. This will lead Cambodia to become the major player in helping ASEAN to achieve its 2015 ICT aims."[108]As the country develops, the communications industry will also boom, and Cambodia is playing an important role as a hub attracting more and more investment from ASEAN members.

8.2 Policy Recommendations

In order to address the concerns and tackle the problems that hinder current ICT in Cambodia to be developed, I would recommend some policies which are highly important to overcome the challenges mentioned below:

Internet Price Reduction

It is very clear that being one of the least developed countries, Cambodia cannot afford to have a very high cost of Internet usage. For instance, very few Cambodian people can afford the price of Internet access compared to their average salary. Reducing the price is seen as one of the top

[106]http://www.aseanbriefing.com/news/2013/11/26/asean-seeks-to-develop-ict-infrastructure.html.
[107]http://www.telecomreview.com/.
[108]http://www.telecomreviewna.com/index.php?option=com_content&view=article&id=657:building-a-new-international-ip-hub&catid=52:march-april-2014&Itemid=104.

policies the government has to enforce. The main factor that has made the cost of access high is international connectivity. So in order to reduce the price, on one hand, the government should offer more ISP licenses so that people can enjoy taking advantage of the competition in the market, such as lower costs, good quality, variety of services and technological innovation. Moreover, on the other hand the government shall also attract more entrepreneurs and facilitate investing by establishing quite a number of Internet coffee shops. Importantly, it should request aid from its foreign partners, NGOs as well as private companies to provide citizens with opportunities to use the Internet free of charge. Recently, the government launched a project, sponsored by Cellcard[109], which provides free Wifi Internet for students at public schools. According to Mr. SokTha, Director of the Technical Department at MOEYS, there are 27 high schools in Phnom Penh, and another 10 provinces will enjoy using free Internet under this project (Soklim 2014).

Global Access

ICT is not equally developed in Cambodia's cities and countryside. In a place in which not many people can afford the cost of access, wide and reasonable public Internet access shall be granted. This simply means:

1. Internet access for a relatively low price or for free should be offered at institutions, schools, universities and libraries. Additionally, there should be a provision of personal computers and training for students and employees so that they are able to get themselves exposed to ICT use.
2. Funding is to be created by relevant ministries and telecommunication operators to develop the communication infrastructure in the city, urban areas and the countryside as a whole. For instance, public Internet access should be financially installed in all remote provinces across the country. Meanwhile in the countryside, there is no free public Internet access in schools, libraries or even hospitals. In the city, only a few public libraries provide free Internet access, such as the National Library of Cambodia, the Pannasastra University main library and the Hun Sen Library at RUPP (Post Staff 2010). So having technical and financial support from the above relevant ministries and organizations, people may have more possibilities to access the Internet.

[109] Cellcard is the leading telecom company in Cambodia. http://www.cellcard.com.kh/.

3. Pre-paid mobile cards should be widely promoted for the sake of universal voice access. To reach this, mobile operators are to cover their signals as broadly as possible. Apparently, when people go into the particular forest and mountainous areas in Cambodia, there is no signal at all from the operators, which stops them from being connected. In addition, SMS, e-mail and web access are to be encouraged. In this respect, the government should promote the use of the Khmer language on the websites since the majority of Cambodian people are English illiterate. With such forms of government initiative, people will enjoy surfing and accessing the Internet more and more.

Avoidance of Conflicts of Interest

It is inevitable for the MPTC to have a conflict of interest with its own company that provides a fixed-line telephone network– Telecom Cambodia. Basically this is so because the MPTC itself is in charge of creating policy and at the same time functions as an operator. So in order to achieve transparency and avoid conflicts of interest, the policy-making of MPTC and the operation of Telecom Cambodia should be separated. There should be a provision of autonomy to all telecom operators in the country, and the privatization of operators should also be promoted to absorb technology transfer through foreign investment.

4G mobile Promotion

Cambodia has been ranked 1st in term of share of mobile phones to total telephones. Therefore, it truly benefits a lot from mobile Internet. Nevertheless, mobile-phone operators in the country have managed to provide only the basic voice service so far. With some experts and skilled foreign employees working for them, the operators should introduce 4G mobile Internet to improve the speed, quality and ubiquitous accessibility across the country, which encourages people to use text message, SMS, GPRS, so on and so forth.

E-government

There has been no online application for Cambodian people to fill in, register or submit for the purpose of information storage in the database. Every application has been manually processed,

the accuracy, flexibility and accessibility of which are hardly maintained. Government websites are mostly built in English, which targets and serves only the purpose of foreign partnerships and NGOs. Thus the government should start adopting online applications to facilitate and speed up any registration process for Cambodian citizens so that all information related to them is accurately stored and can be comfortably accessed from anywhere at all times.

Cooperation

There has been an enthusiasm in promoting ICT access in the country shown by many bi-lateral and multi-lateral organizations. They also initiate projects with financial support to make such a development possible. The entry of the Internet into Cambodia also benefits from bi-lateral cooperation. To archive this, active participation and support from the government, project donors and NGOs in charge of ICT development is needed. In this respect, meetings and discussions should be conducted quarterly and annually to ensure that proposed and initiated projects are rightly indispensable for developing ICT and connectivity for the country.

Conclusion

Cambodian connectivity and ICT are on their way toward significant development with the hope of being able to catch up with other ASEAN countries such as Vietnam or even Singapore. Compared to the last decade, it has been progressively developing with the support of strategic foreign investors as well as NGOs' ICT initiatives. The country has come across certain challenges that prevent it from speeding up the development of ICT. Those are the high cost of Internet access, a lack of communication infrastructure, uneven development, the insufficiency of ICT education and the inadequacy of governmental policies and intervention.

In order to tackle those challenges, the government of Cambodia has made a strong commitment to improving the connectivity by designing promising and optimal policies focusing on developing the national legal and regulatory ICT framework. The government has said that it will establish ICT strategies, legal and regulatory frameworks for every sector necessary for economic development, such as e-education, e-commerce and e-government. Additionally, national ICT innovation is to be promoted aligning with the international framework, including

WIPO, WTO, and the regional community – ASEAN. More importantly, ICT R&D, human capital and infrastructure will be promoted with cost effectiveness, capacity, quantity and quality, respectively, according to plan. E-government is also scheduled to be introduced in order to provide Cambodian citizens with ease of access to information, increase administrative productivity and develop effective communication between individuals as well as the institutional level. The government will also pay attention to ICT industry and support the use of ICT in SMEs which contribute to e-commerce development. Promoting ICT in education is also prioritized, conducting ICT training, both short-term and long-term, for leaders who are responsible for ICT development and sponsoring ICT facilities in academic institutions. Last but not least, the government is set to raise awareness of ICT as a tool to reduce global warming as well as motivate women to actively involve with ICT for the sake of having equal access and balance of ICT knowledge in the community.

In conclusion, I reckon that if the government of Cambodia puts the abovementioned policies into use and genuinely practices them, the development of ICT in the country may progress well, and it may even be possible, if one is very optimistic, for the country to catch up with other technologically leading countries in ASEAN for the regional context and with other countries for the global context in very few years. What is needed is governmental resolve as well as capacity, and this means first of all the insight into the need of ICT development, and therefore especially connectivity, as the basis of Cambodian development, and then the decision to act accordingly, in spite of what perceived dangers of rapid ICT developments there might be.

9. Scope and Limitations of the Research

Regarding my research, some major constraints have to be taken into consideration. I have encountered great difficulties in collecting the latest data and information, since they simply are not publicly available yet – the numbers given are always the latest I could gather. It would have been important to conduct interviews with government officials and policy makers, but due to the problems of finance, time and especially approachability, this was unfeasible. Therefore, there may be too much reliance on secondary sources, which may lead to data bias, since the Cambodian ICT situation and connectivity policies have not been described yet, let alone analyzed, by many scholars or researchers. This thesis thus is just a first step into the direction of a scholarly or professional investigation of the topic.

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Appendix

Table 6.1 Fixed-line Service Providers (2012)

Rank	Provider (Brand/System)	Subscriber	Market Share
1	Viettel (Methome/PSTN, WLL)	469,958	84.0%
2	Telecom Cambodia/PSTN	33,516	6.0%
3	KTC/PSTN	14,524	2.6%
4	Mobitel/WLL	14,493	2.6%
5	Beeline/ WLL	11,950	2.1%
6	Mfone/WLL	9,820	1.8%
7	Hello/ WLL	5,120	0.9%
Total		559,381	100.0%

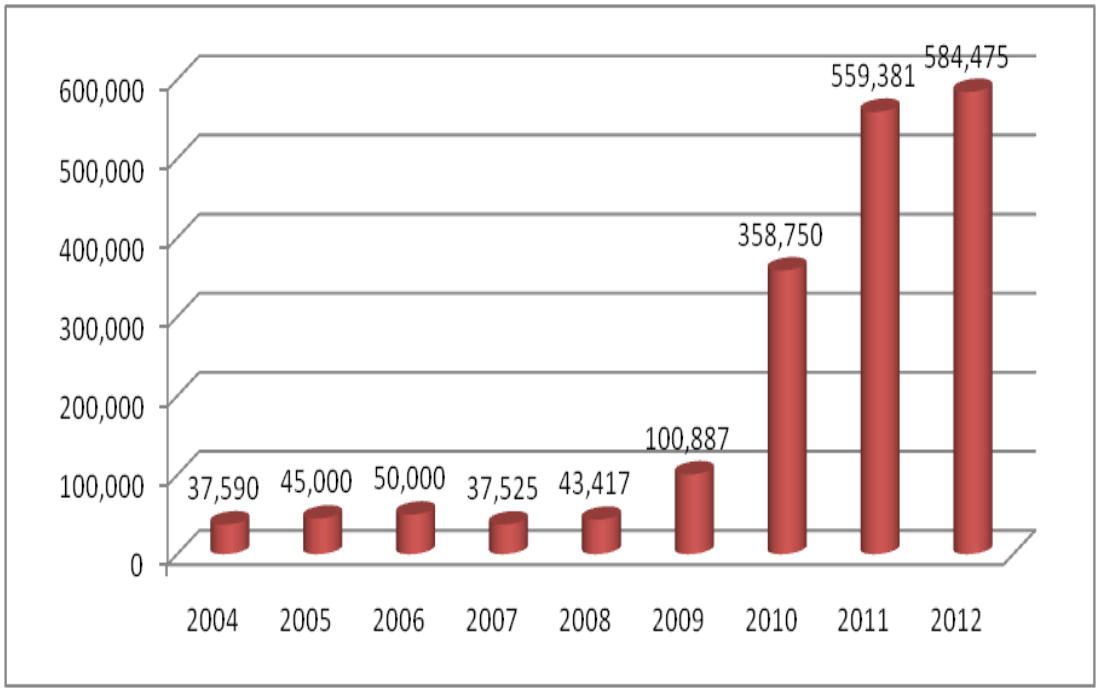
Source: Telecommunication Regulator of Cambodia (**TRC**)

Table 6.2 Mobile Service Providers (2012)

Rank	Provider	Market Share	Based Country
1	Viettel (Metfone)	47.2%	Vietnam
2	CamGSM (Mobitel)	18.7%	Cambodia & Luxembourg
3	Latelz (Smart Mobile)	12.4%	Cyprus
4	HACL (Hello)	11.2%	Malaysia
5	Camshin (MFone)	4.6%	Cambodia & Thailand
6	Sotelco (Beeline)	5.1%	Russia
7	Cadcomms (qb)	0.6%	Cambodia
8	GT-Tell (Excel)	0.3%	Cambodia
9	XinWei	Plan for Starting Operation	
10	Camintel(KTC)	Not in operation	
	Total	15,678,829	

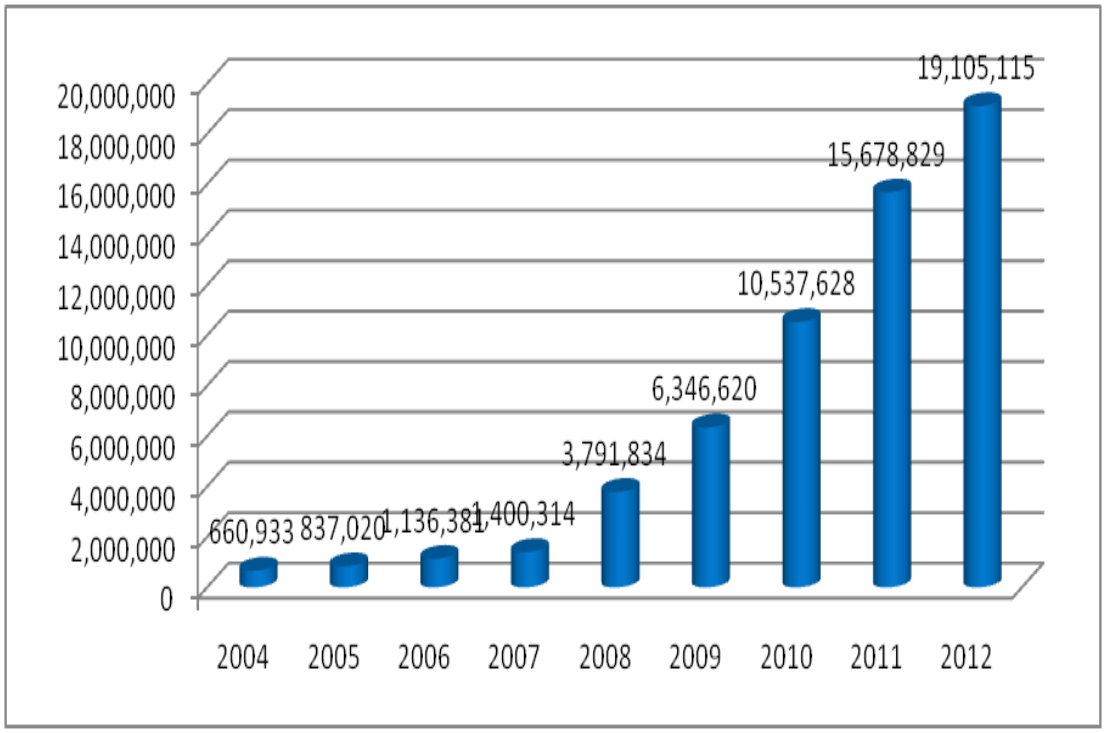
Source: Telecommunication Regulator of Cambodia (**TRC**)

Figure 2 Fixed-line Subscribers (2004-2012)



Source: Telecommunication Regulator of Cambodia (**TRC**)

Figure3 Mobile Phone Subscribers (2004-2012)



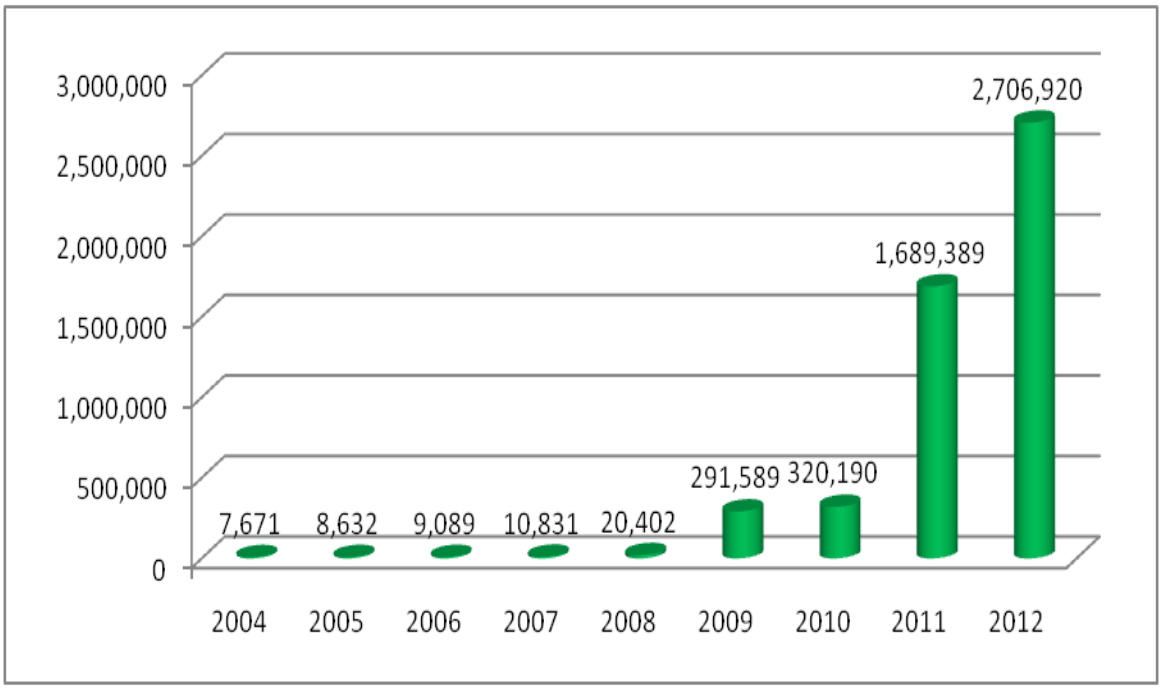
Source: Telecommunication Regulator of Cambodia (**TRC**)

Table 6.3 Internet Service Providers (2012)

Rank	Provider	Subscriber	Market Share
1	Latelz (Mobile Internet)	273,735	40.3%
2	CamGSM (Mobile Internet)	162,762	24.0%
3	Sotelco (Mobile Internet)	91,497	13.5%
4	Viettel (Fixed & Mobile Internet)	60,579	8.9%
5	Mfone (Mobile Internet)	57,950	8.5%
6	Hello (Mobile Internet)	52,264	7.7%
7	CADCOMMS	14,483	2.1%
8	GT-TELL (Mobile Internet)	6,827	1.0%
…….	……	……	…….
37	Mat Co. Ltd	2	0.0%
	Total	629,281	

Source: Telecommunication Regulator of Cambodia (**TRC**)

Figure 4 Internet Subscribers (2004-2012)



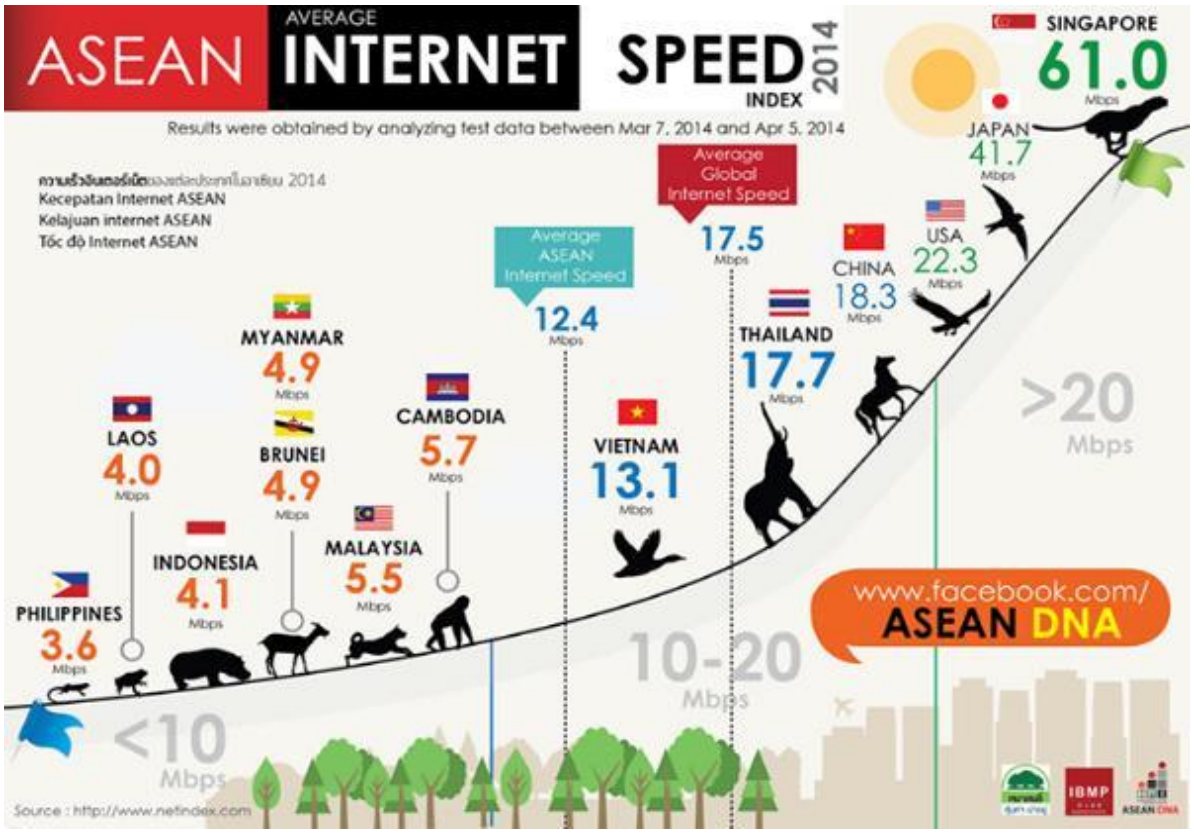
Source: Telecommunication Regulator of Cambodia (**TRC**)

Table 3.1 Human Development Indices (2012)

HDI Rank	Country	HDI Value
18	Singapore	0.895
30	Brunei Darussalim	0.855
64	Malaysia	0.769
103	Thailand	0.69
114	Philippines	0.654
121	Indonesia	0.629
127	Vietnam	0.617
138	**Cambodia**	**0.543**
138	Lao People's Democratic Republic	0.543
149	Myanmar	0.498

Source: United Nation Development Program (UNDP), 2013

Figure 5 ASEAN Internet Speed (2014)



Source: http://www.aseanbriefing.com/news/2014/04/24/internet-speeds- across-asean.html