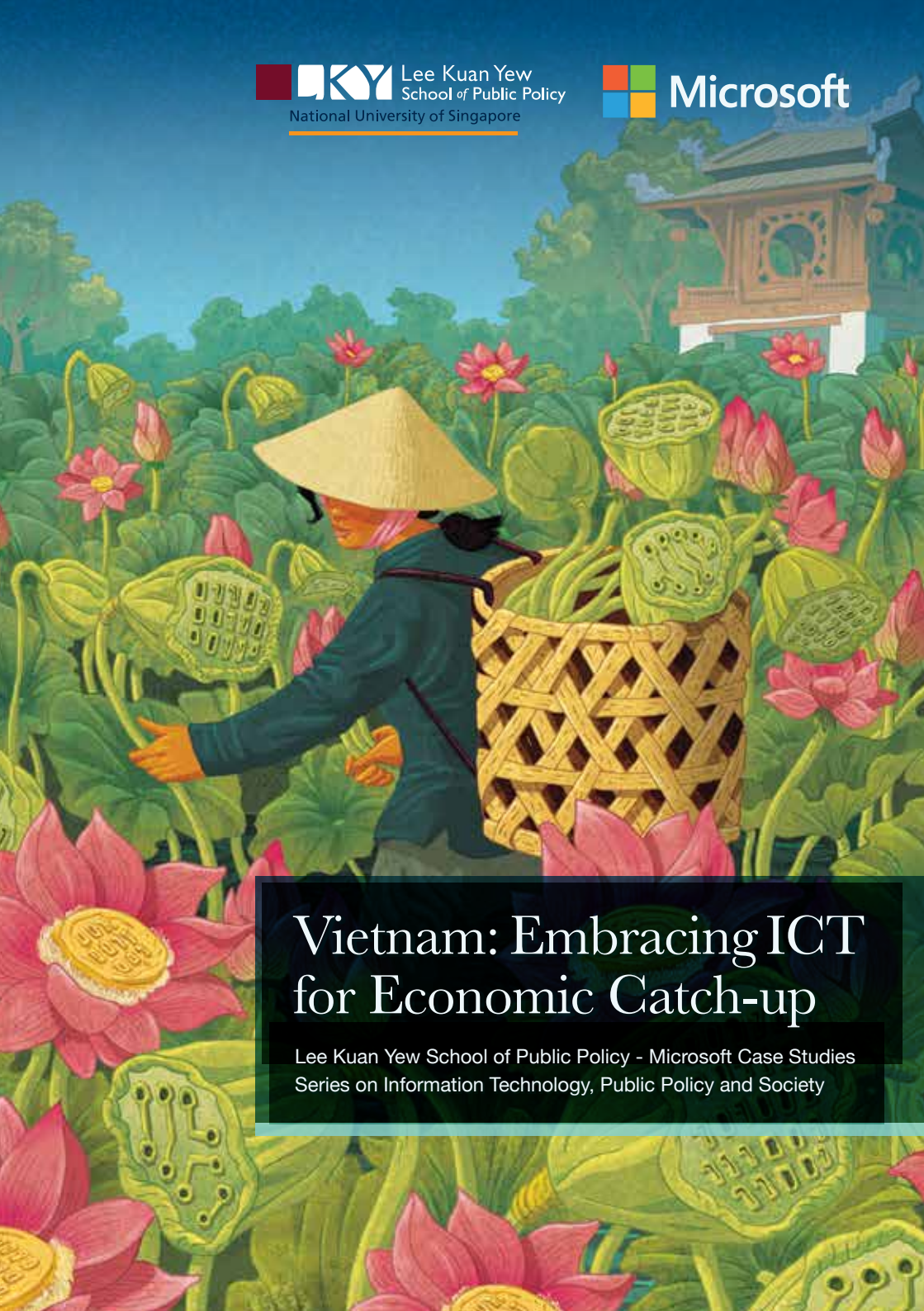


Vietnam: Embracing ICT for Economic Catch-up

Lee Kuan Yew School of Public Policy - Microsoft Case Studies Series on Information Technology, Public Policy and Society

Lee Kuan Yew School of Public Policy - Microsoft Case Studies Series on Information Technology, Public Policy and Society

Case Title:
Vietnam: Embracing ICT for Economic Catch-up

Lee Kuan Yew School of Public Policy
National University of Singapore

Microsoft

Contents

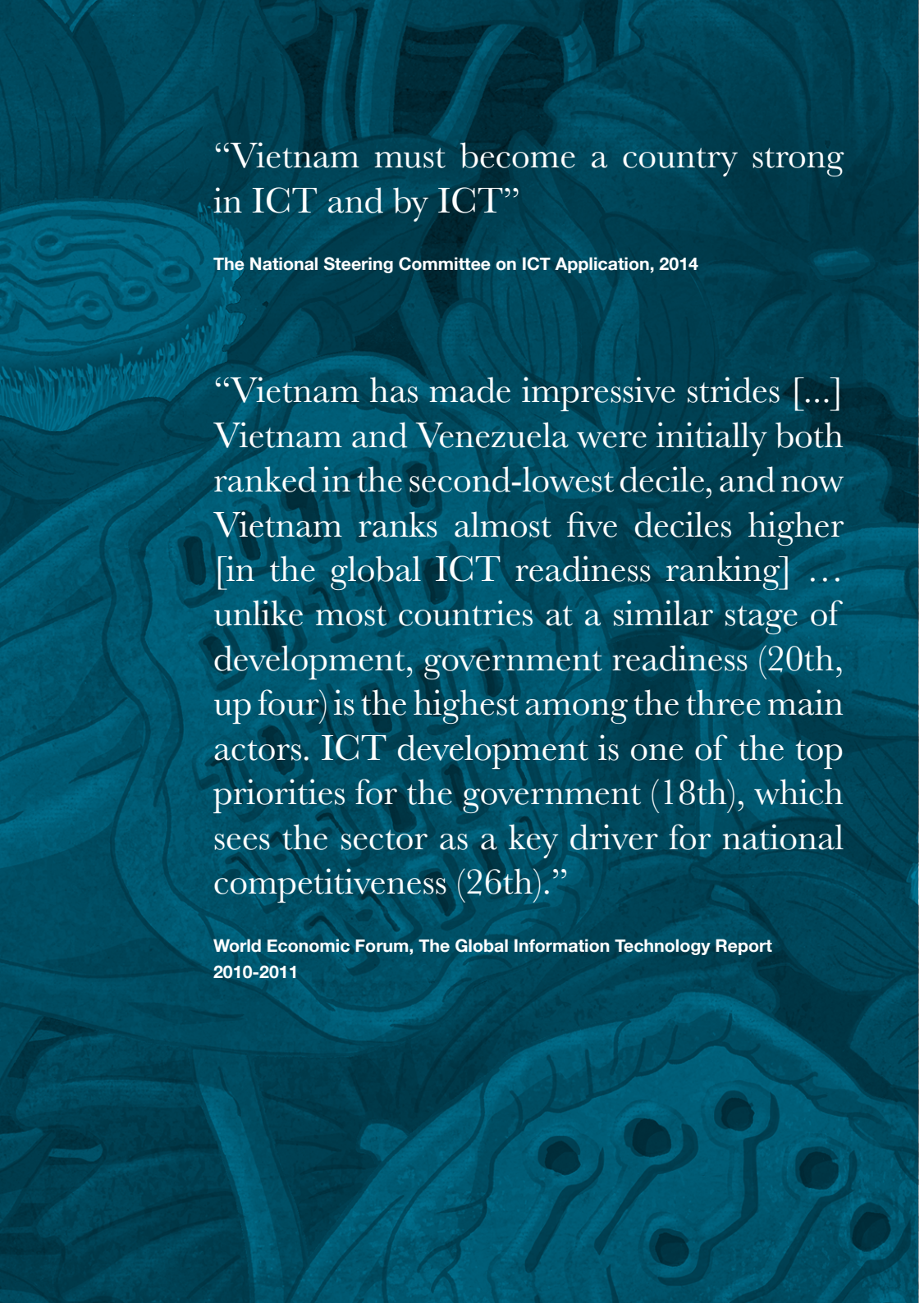
Vietnam: Embracing ICT for Economic Catch-up

Authors:
Vu Minh Khuong, Lee Kuan Yew School of Public Policy, National University of Singapore.
Robert D. Austin, Copenhagen Business School (CBS), Denmark.

With thanks to **Nguyen Chi Hieu** and **Kris Hartley** for research assistance.

Date:
August 2014

Credits:
Layout by **James Lee**
Front Illustration by **Paul Lachine**



"Vietnam must become a country strong in ICT and by ICT"

The National Steering Committee on ICT Application, 2014

"Vietnam has made impressive strides [...] Vietnam and Venezuela were initially both ranked in the second-lowest decile, and now Vietnam ranks almost five deciles higher [in the global ICT readiness ranking] … unlike most countries at a similar stage of development, government readiness (20th, up four) is the highest among the three main actors. ICT development is one of the top priorities for the government (18th), which sees the sector as a key driver for national competitiveness (26th)."

World Economic Forum, The Global Information Technology Report 2010-2011

Abbreviations

ADSL	Asymmetric Digital Subscriber Line
GITR	Global Information Technology Report
ICT	Information and Communication Technology
ITO	Information Technology Outsourcing
ITU	International Telecommunication Union
MIC	Ministry of Information and Communications
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
VECITA	Vietnam E-Commerce and Information Technology Agency
VNNIC	Vietnam Internet Network Information Center
VNPT	Vietnam Posts & Telecommunications Group
WB	World Bank
WDI	World Development Indicators
WEF	World Economic Forum

1. Introduction

1.1. Context

Since the launch of economic reforms known as "*Doi Moi*" (renovation) in December 1986, Vietnam has profoundly transformed itself from a closed, impoverished country into a highly open and fast-growing economy. This remarkable success has raised expectations that the country could play a role in the next wave of Asian miracle stories.[1]

One of the prominent features of Vietnam's economic reforms has been its vigorous embrace of Information and Communication Technologies (ICT), which has enabled the country to leapfrog from a dilapidated telecommunications system in the 1990s to a modern digital network, surpassing many peer countries in the region on key ICT development indicators. This is a remarkable transformation because until the early 2000s, the major international reports on ICT development still raised serious concerns about Vietnam's ICT situation:

> "At the bottom of the [Networked Readiness] Index stand Ecuador, Honduras, Bangladesh, Vietnam, and Nigeria, respectively. In Ukraine, Vietnam, Nigeria, Zimbabwe, and Bangladesh, the average cost of 20 hours of monthly access represents 32 percent, 41 percent, 51 percent, 59 percent and a whopping 115 percent, respectively, of average per capita income! Considering the poor service and limited bandwidth in these countries, it would take either an extremely devoted web-surfer or a very wealthy subscriber to spend much time online."[2]

> "It seems clear that the Vietnamese government is at a turning point. Should it persist with a model of state control or should it move in the direction of a free market model? The Internet, a potent symbol of civil liberties, lies at the heart of this dilemma. Can a socialist model of government be reconciled with a user driven Internet? Equally, can the Internet continue to grow without a new measure of economic liberalization?"[3]

Today, Vietnam is considered one of the developing countries with highest rates of ICT adoption and lowest cost of ICT use. Thanks to this rapid dynamics of ICT development, Vietnam has also joined the league of the ten most attractive locations for IT outsourcing (ITO) and become a hub of global ICT hardware production. In 2013, Vietnams' ICT hardware exports exceeded $30 billion and were expected to continue to achieve a spectacular growth on ICT hardware exports in the years to come.

In 2014, the government identified ICT as a unique and powerful lever to foster the country's economic growth and catch-up endeavours. The challenge in pursuing this ambition was not one of determination, but one of strategy formulation and implementation.

1.2. The policy discussion

With a strong belief that ICT can help close the economic performance gap between Vietnam and its peers, a group of industry experts and practitioners, led by Dr. Truong Gia Binh, co-founder and President of FPT (a prominent Vietnamese ICT company), formed the VINASA advisory panel (see Appendix 1.1) to promote this idea in the government's development strategy and policy. The panel has worked extensively with the government and received strong support from high-level policy makers, including Prime Minister Nguyen Tan Dung. The National Committee on ICT Applications, of which PM Nguyen Tan Dung is chairman and Deputy PM Vu Duc Dam vice-chairman, has asked Dr. Binh's panel to provide inputs to assist the government's formulation of an ambitious new ICT agenda for the next 10 years.

However, in contemplating specific recommendations for a national ICT plan, Dr. Binh and panel members realised that engaging in general advocacy is far easier than producing a detailed set of actionable strategies that lead to real results. In a country where ICT was newly emerging, the analytical capacity of the private and public sectors was modest, and initial planning stages were beset with questions that demanded careful reflection:

1. What should be the strategic directions for Vietnam's ICT strategy over the next 10 years?
2. Who should be involved in the planning?
3. What should be the top priorities?
4. How should the strategy be executed?
5. And what lessons could Vietnam learn from its achievements up to that point in time, after having embraced ICT over the past 15 years?

2. Vietnam and Economic Reforms

2.1. The launch of economic reforms

Vietnam initiated its economic reforms in 1986, 10 years after the country's reunification.[4] During the pre-reform years, the country followed the socialist development model, building a command economy, characterized by collectivization of land and nationalization of industry and business.

The launch of economic reforms, known as "Doi Moi", was approved at the Sixth Congress of the Communist Part of Vietnam (CPV) in December 1986. Three factors, critical to major change in a rigid system, enabled the dramatic shift: receptivity, crisis, and opportunity.[5]

Receptivity: Despite vigorous efforts to promote economic development following the socialist model, including intensive aid from the Soviet Union, Vietnam suffered from relative economic stagnation during 1976-1986, growing GDP at an average annual rate of 1.4%. In 1986, Vietnam remained one of the world's poorest countries, with per capita GDP at $200 and 80% of the population living in rural areas. Facing shortages of food and scarcity of basic goods, people came to believe that the current

way of building the economy did not work and they longed for a major change. In addition, news about initial successes of China's economic reforms stimulated Vietnam's receptivity for change.

Crisis: Vietnam was on the verge of a deep crisis in 1986. Inflation soared from 90% in 1985 to 455% in 1986; food production per capita fell from 304 kilograms of paddy rice in 1985 to 301 kg in 1986 and to 281 kg in 1987. In addition, foreign aid from the Soviet Union, the major financial source of the country's development, was cut sharply, from $6 per capita in 1977-1982 to $2.60 in 1983-1987. All these factors underscored the urgency of reforms.

Opportunity: The reforms initiated in the Soviet Union by Mikhail Gorbachev when he came to power in 1985, paved the way for Vietnam to launch its own reforms. The ascendance of the country's new leadership in 1986, who better understood the pressing need for change, enabled Vietnam to be decisive in launching its economic reforms.

2.2. Economic reforms: process and salient features

Intending to generate an economy that balanced socialist orientations with a market system, the Doi Moi reforms were undertaken incrementally. Despite its new leadership's "liberal" reputation, the CPV was concerned not only with economic growth but also with maintaining political stability and legitimacy. The reforms represented a transformative change in the control of productive resources, and such an aggressive transition would need to be realised in phases, each establishing the conditions necessary for the next. The first and fundamental steps of Vietnam economic reforms involved awarding land use rights to the farmers and recognizing private business as a legal and equal sector in the economy. Among the reforms that made landmark changes in the vibrancy of Vietnam's economy were the Foreign Investment Law introduced in 1987, the Law on Private Enterprises promulgated in 1990, the Company Law introduced in 1999, and the Law on Competition in 2004.

Of critical interest to newly liberalizing economies is the treatment of state-owned enterprises (SOEs) as entrenched monopolies. In Vietnam, the reform of SOEs occurred in multiple phases. The first, in the late 1980s and early 1990s, focused on the empowerment of SOEs to pursue strategic interests independent from the directives of the country's "command" economic system. The second phase, in the mid-1990s, saw the restructuring of SOEs and their legal integration into the market economy, including the conversion of SOEs to joint-stock companies. The third phase, from 1999 onwards, included aggressive reforms with the introduction of "enterprise laws" and "investment laws" aiming to "level the playing field."

With the transfer of industry ownership from the public to the private sector, Vietnam embarked on an "open door" policy, leveraging foreign direct investment (FDI) as a means to capitalize growing industries. Legislative acts concerning FDI and industrial and export enterprise zones were adopted, complemented by a bilateral trade agreement with the United States (2000) and admission into the World Trade Organization (2006). The liberalization of the economy and abandonment of market-

limiting ideologies also thawed diplomatic relations between Vietnam and the West, further integrating the country into the global economic order.

On the domestic front, reforms in the banking sector in 1997 facilitated credit markets for private enterprises, and the adoption of value-added taxes in the same year aimed to enhance the efficiency and effectiveness of the taxation system, which encourages economic activity. Financial reforms included the opening of a stock market (2000), and the unification of the corporate income tax code with the establishment of a 25% rate in 2008.

2.3. Achievements

Vietnam's pro-market reforms made their impact on three levels: SOEs, private enterprises, and "street-level" entrepreneurship. At the highest level, SOEs were privatized and integrated into the wider competitive market for goods and services. This reform unshackled corporate strategy from strict socio-ideological constraints, encouraged competition and the associated development of efficiencies and innovation, and broadened sources of investment capital. At a middle level, socialist efforts to collectivize the means of production were phased out, allowing private enterprises to compete in markets for manufacturing, commodities, and services. This paved the way for the development of domestic corporations and the satellite presence of multi-national corporations. Introduced in 1987, the Law on Foreign Investment encouraged investment from foreign sectors into Vietnam. As reforms gathered pace into the 1990s, "street-level" entrepreneurship bloomed as well, in the form of hundreds of thousands of small, private enterprises.

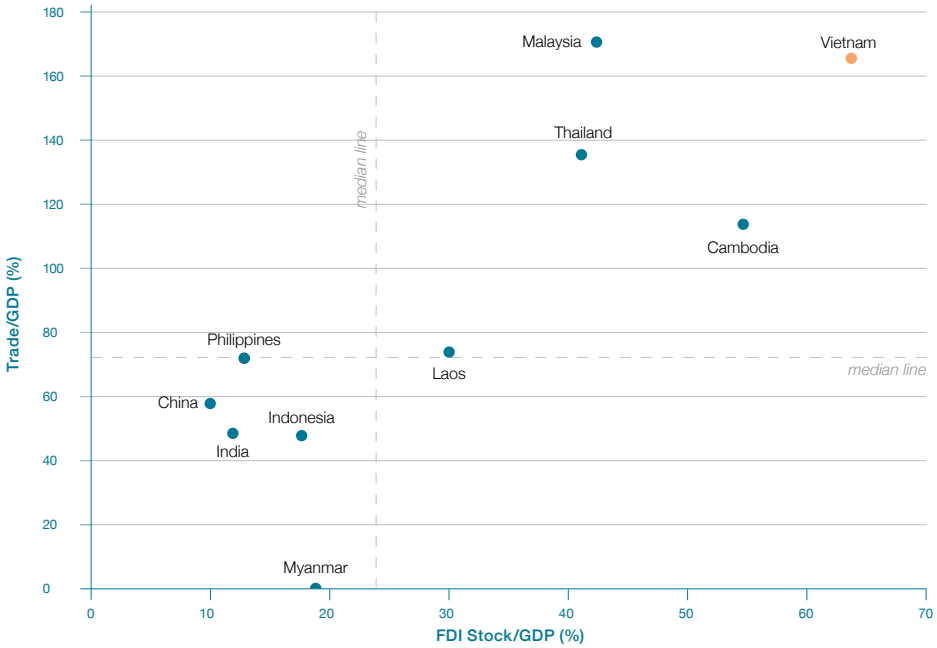
Thanks to the country's proactive efforts in embracing globalization trends and its strategic location, Vietnam rapidly transformed itself into a highly open economy. In 2010, the country outperformed its regional peers on the key indicators of openness: trade-to-GDP ratio and FDI capital stock as a percentage of GDP (Figure 2.1); these indicators of international integration show that global markets responded positively to Vietnam's open-door policy. The average GDP growth rate for 1990-2010 exceeded 7%,[6] and the nationwide poverty rate fell from 58% in the early 1990s to a rate well below 10% in 2010.[7] Market reforms also led to rapid urbanization and modernization of the country. The share of urban population increased from 20.3% in 1990 to 32.2% in 2013, while the country's electrification jumped from only 14 percent in the early 1990s to close to 100 percent in 2009.[8] In 2014, the country's two major cities, Hanoi and Ho Chi Minh City, ranked near the top (17th for Ho Chi Minh City and 22nd for Hanoi) of the list of 100 best destinations for outsourcing.[9]

However, Vietnam did not perform as well on all measures and its growth appeared to lose some steam after the global financial crisis erupted in 2008. Some attributed the slowdown to insufficient effort to deepen reforms, and to the persistence of corruption. Additionally, the banking sector was beset with underperforming loans, and was not well managed,[10] which could be interpreted as resulting from weaknesses in the country's economic development strategy.

Vietnam's development as of 2014, then, manifested both opportunities and challenges. How could Vietnam score so well on some indices and not in others, despite the comprehensiveness and mature history of its reform efforts? More

importantly, how could Vietnam sustain a transformative ICT revolution and leverage it for continued economic growth? (Appendix 2.1 provides a brief profile of Vietnam and its economy as of 2012).

Figure 2.1: Openness, 2010: Vietnam vs. Peer Countries



Source: Data from WDI and UNCTAD

3. Entering the Information Age

3.1. A brief history

Vietnam did not effectively connect to the global Internet until 1997. However, experimental Internet connectivity commenced in the early 1990s. In 1992, the Institute of Information Technology (IOIT) began a project with Australian National University (ANU) to establish a network within Vietnam. Because it depended on dial-up connections, the link was very limited in capacity and speed. With assistance from the Australian telecommunications company Telstra and a grant from the Australian Department of Employment, Education, and Training, the network was eventually upgraded into Vietnam's first internal Internet, called "VARENet" (short for "Vietnam Academic Research and Educational Network"). By 1996, the network had 300 nodes that spanned points around the country, including Hanoi, Haiphong, Hue, Nha Trang, and Ho Chi Minh City.

At the same time, with the assistance of Canada's International Development Research Center (IDRC) and its Pan Asia Networking (PAN) project, IOIT launched another network called NetNam in 1994. This initiative, which also connected with the Internet through ANU, focused on improving connectivity for NGOs and providing Internet service to a growing Vietnamese client base. By 1996, NetNam had attracted several hundred accounts, including a majority of NGOs operating in Vietnam at the time. Vietnam was officially connected to the global Internet in December 1997, after the government gave its approval to the operation of the first five Internet Service Providers (ISPs), including NetNam. In 2000, the number of Internet users in Vietnam first exceeded 100,000. Internet service via ASDL was introduced in 2003 and 3G mobile service was launched in 2009.

Meanwhile, mobile technology penetrated in Vietnam as a commercial business, generally earlier than Internet connectivity, beginning in 1993. Vietnam was one of the first countries to deploy GSM technology.[11] The country began using CDMA technology[12] in 2002, and 3G mobile networks based on W-CDMA technology[13] in late 2009. Vietnam licensed four companies to test and deploy 4G/LTE technology in 2010, but the new technology was planned to officially launch only in 2015.

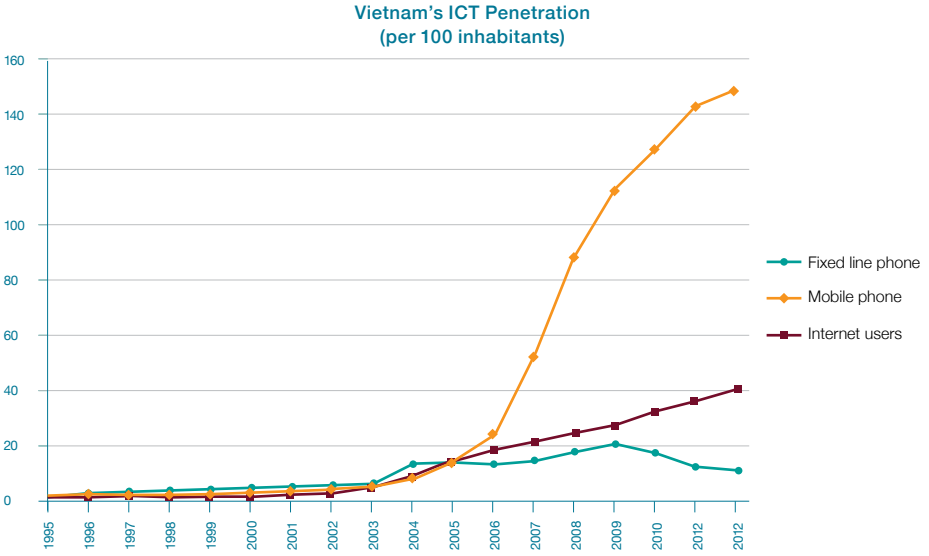
Development of the Internet and telecommunications in the 1990s and 2000s benefited also from the Doi Moi reforms, which had included reform of the telecommunications sector.[14] In 1993, the separation of commercial functions from regulatory functions within the Department General of Posts and Telecommunications (DGPT) established the Vietnam Posts and Telecommunications Corporation (VNPT), the national state-owned company in charge of the development of Vietnam's telecommunications industry. After that, the industry was gradually liberalized. Despite limitations, such as poor coordination and inefficiency, the regulatory environment governing Vietnam's ICT services and investment was relatively transparent and predictable, in keeping with the spirit of Doi Moi reforms and the government's strong commitment to embrace ICT for development. However, until the early 2000s, Vietnam remained a laggard in the race of nations to embrace the ICT revolution.

In the 2000s, regulatory progress to support ICT development significantly gathered pace. The Ministry of Posts and Telematics was created in 2002, which helped to modernize the system of Internet licensing. The Ordinance on Posts and Telecommunications, passed the same year, provided a clearer framework for regulating ICT. Other strategies promoted by the Ministry included targets for telecommunications penetration density (e.g. mobile, fixed-line Internet, and broadband). In 2005, the newly formed National Steering Committee for Information and Communication Technologies embarked on further efforts to encourage Internet development. In 2008, the Ministry of Information and Communications was created on the basis of the Ministry of Posts and Telematics and the Law on Telecommunications was passed. Responding to the exponential pattern of Internet adoption, laws and governance structures kept pace with the constantly changing ICT landscape. Indeed, reforms were expected to continue in the telecommunications sector, as part of a continuing catch-up strategy to modernize for economic growth. By 2014, the ICT market featured both domestic and international providers, and intense competition and aggressive investment in infrastructure had brought down access prices and broadened coverage.

3.2. The dynamics of ICT penetration

Until 1995, the telecommunication network in Vietnam was still very primitive, as the country suffered from an impoverished economy and dilapidated infrastructure. The penetration rate was only one subscriber per 100 inhabitants for fixed lined telephone; the rate was negligible, at 0.03 for mobile phone, and zero for the Internet. The rate of ICT penetration, however, increased rapidly, especially after the early 2000s (Figure 3.1). Mobile phones penetrated most rapidly, with a dramatic take-off after 2005, increasing from 0.98 in 2000 to 11.3 in 2005 to 147.7 in 2012. In contrast, the penetration rate of fixed line telephone increased from 3.1 in 2000 to its peak at 19.8 in 2009 and then declined to 16.1 in 2010, 11.3 in 2011 and 10.1 in 2012. At the same time, the penetration of Internet grew rapidly, at a consistent pace, increasing from 0.25 in 2000 to 12.7 in 2005 to 39.5 in 2012 (Figure 3.1).

Figure 3.1: ICT penetration in Vietnam, 1995-2012

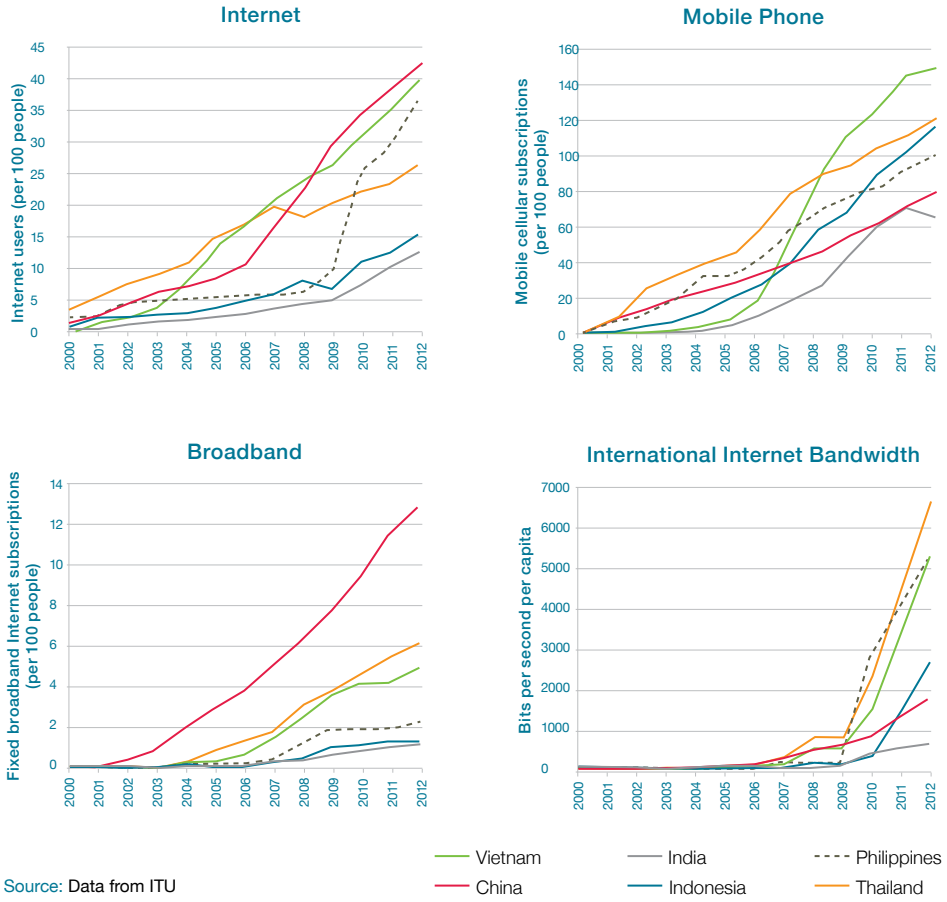


Source: Data from WDI

Compared to its peers, Vietnam's catch-up in ICT penetration is impressive. As shown in Figure 3.2, Vietnam has often outperformed China, India, Indonesia, the Philippines, and Thailand on one or more of mobile phone, Internet, and/or broadband penetration in the 2000s. Vietnam's robust ICT penetration is also evident in domain name registrations in Vietnam. Registrations of domain names with extension ".vn" have more than doubled every year since 2000, from just 543 in 2000 to 232,749 in 2012. The number of international domain names (with extensions like ".com" or ".net"), which were dominant in the early 2000s, grew more slowly. The number of ".vn" domain names surpassed the number of international domain names in 2010, and the gap has widened since then.

A few salient facts emerge from comparisons between the ".vn" and international domain names. First, they vastly differ in terms of location of their hosting servers. While 90.4% of ".vn" domain names use DNS hosting servers with domestic IP addresses, 96.9% of the international domain names use DNS hosting servers with overseas IP addresses.[15] Second, the two types of domain names are similar in the proportion of active websites within the total number of domain names. This share was 65.7% for ".vn" domain names, while it is 63.1% for international domain names.[16] Table 3.1 lists the most popular websites in Vietnam, of which 10 are ".vn" domains. In a regional comparison, Vietnam stands out among leading countries in terms of the number of top-level domains with a country specific (i.e., ".vn") name. On this measure Vietnam is far above ASEAN countries, though still far below Korea and Japan (Figure 3.3).

Figure 3.2: ICT Penetration, 2000-2012: Vietnam vs. Peer Countries



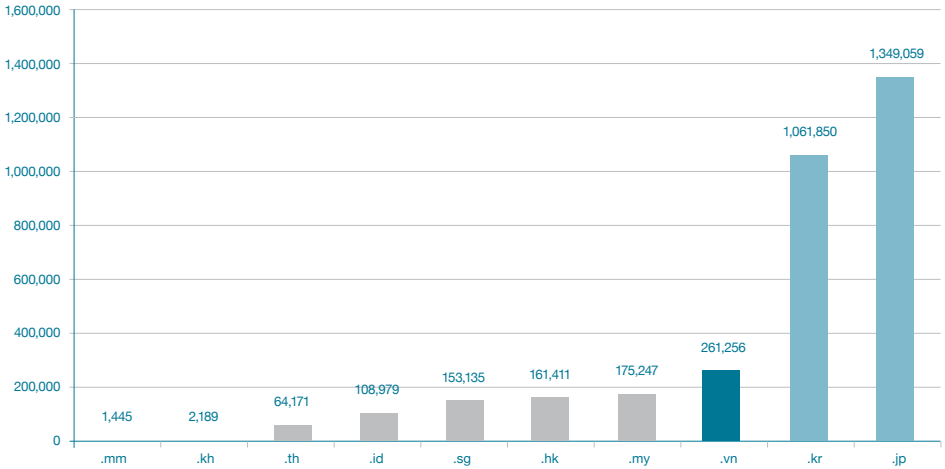
Source: Data from ITU

Table 3.1: Vietnam's 20 most popular websites (ranked by traffic)

Rank	Website	Main Focus
1	Coccoc.com	Search engine
2	Google.com.vn	Search engine
3	Facebook.com	Social network
4	Google.com	Search engine
5	Youtube.com	Video sharing
6	Zing.vn	Entertainment
7	Vuiviet.vn	Entertainment
8	Vnexpress.net	News
9	24h.com.vn	News and entertainment
10	Webtretho.com	Women forum
11	Tinhte.vn	Technology news
12	Clip.vn	Video sharing
13	Thethao247.vn	Sport news
14	Yahoo.com	Search engine
15	Dantri.com.vn	News
16	Doisongphapluat.com	News
17	Nguoiduatin.vn	News
18	Nguyentandung.org	News on Prime Minister Nguyen Tan Dung
19	Haivl.com	Entertainment
20	Ngoisao.vn	Entertainment

Source: http://www.alexa.com/topsites/countries/VN, accessed July 16, 2014.

Figure 3.3: Number of country code top-level domains: Vietnam vs. Selected Asian Countries, 2013



Source: VNICC (2013)

4. Vietnam's Internet Ecosystem

Vietnam's Internet ecosystem has rapidly evolved since the country was connected to the global Internet network in 1997. There are a number of factors that play a critical role in building a robust Internet ecosystem.[17] Among them, the most salient factors can be grouped into five pillars: (i) Infrastructure; (ii) Internet usage; (iii) Provision of Internet services and web-based applications; (iv) E-commerce; and (v) the Regulatory environment.

4.1. Infrastructure

Quality infrastructure is a foundational element of a robust Internet ecosystem.[18] Quality infrastructure ranges from the basic conditions, such as reliable electricity supply and access to Internet, to the enabling factors related to the number of Internet servers, the speed of international Internet bandwidth, and applications of new advanced technological options.

In Vietnam's economic development strategy, investment in infrastructure is considered critical for making breakthrough progress, thus it has been set as one of three top priorities.[19] With the ambition to leverage ICT to foster economic growth and catch-up, the country has made vigorous investments in ICT infrastructure. The country's international bandwidth has nearly doubled every year since 2000, from just 50 Megabits per second (Mbps) in 2000 to 640,000 Mbps in 2013.[20] As a result, connectivity speed nowadays is no longer a salient concern among Internet users in Vietnam.

Vietnam has proactively adopted new ICT technology. The number of mobile broadband Internet subscribers via third generation (3G) networks grew from 7 million (a penetration rate of 8 per 100 inhabitants) in 2009 to 15.7 million (18/100) in 2012, logging an average annual growth rate of more than 30% over this 3-year period.[21] In addition, 3G networks have covered all the 63 provinces of the country, and five companies have been licensed to test and deploy new wireless technologies such as 4G/LTE[22] since 2010.[23]

The country's massive improvements in ICT infrastructure have fuelled a commensurate rapid spreading of ICT across the country. By 2014, Vietnam was in a rather competitive position on ICT infrastructure, compared to countries at its income level. Table 4.1 provides a comparative picture for Vietnam and its ten peer countries in Asia on the key ICT infrastructure indicators. As shown in the table, although Vietnam is ranked at the 8th place on per capita income in this list of countries, it is ranked 1st on mobile phone subscription, 3rd on Internet subscription, 4th on electricity production and fixed broadband subscription, 5th on secure server penetration, and 6th on international bandwidth.

Vietnam, however, is behind many countries on the percentage of population covered by the mobile network. This coverage rate currently is only 70% for Vietnam, compared to 100% for Indonesia and Thailand, 99% for the Philippines, 96.8% for Malaysia, 99.5% for China, and 83% for India.[24]

Table 4.1: Selected ICT-related Indicators in 2012: Vietnam vs. Asian Peers

Country	GDP per capita		Electric power production*		International Internet bandwidth		Fixed broadband subscriptions		Internet users		Secure Servers		Mobile subscriptions	
	Current PPP$	Rank	kWh per capita	Rank	kb/s per user	Rank	per 100 inhabitants	Rank	per 100 inhabitants	Rank	per million population	Rank	per 100 inhabitants	Rank
Malaysia	22,280	1	4,523.5	1	16.4	3	8.4	2	65.8	1	65.7	1	141.3	2
Thailand	13,824	2	2,343.0	3	26.6	1	8.2	3	26.5	5	19.6	2	127.3	4
China	10,960	3	3,508.4	2	3.3	10	12.7	1	42.3	2	3.1	8	80.8	8
Sri Lanka	9,017	4	558.1	8	6.0	8	1.7	6	18.3	6	7.7	4	91.6	7
Indonesia	9,011	5	748.1	6	17.1	2	1.2	8	15.4	7	3.9	6	114.2	5
Philippines	6,110	6	727.8	7	14.3	4	2.2	5	36.2	4	8.6	3	106.5	6
India	5,138	7	861.7	5	5.3	9	1.2	7	12.6	8	3.6	7	69.9	9
Vietnam	4,998	8	1,129.1	4	13.4	6	4.9	4	39.5	3	6.7	5	147.7	1
Pakistan	4,437	9	540.7	9	7.3	7	0.5	9	10	9	1.3	10	67.1	10
Cambodia	2,838	10	72.1	11	13.6	5	0.2	11	4.9	11	3.0	9	128.5	3
Bangladesh	2,405	11	288.2	10	3.0	11	0.4	10	6.3	10	0.7	11	62.8	11

Source: World Development Indicators Database; Global Information Technology Report 2014
Note: *Electric power production is for 2011.

4.2. Internet usage

The robustness of an Internet ecosystem depends, to a large extent, on the vibrancy and sophistication of three major groups of users: individuals, businesses, and governments. In Vietnam, these groups of web users had distinct characteristics, which affected how they used the Internet and adopted new applications.

Individuals

The Internet user population in Vietnam has exceeded 30 million since 2012, a number that equates to a third of the population. A survey of 781 Internet users conducted in 2013 by the Vietnam E-Commerce and Information Technology Agency (VECITA)[25] revealed some patterns of Internet use by individuals in Vietnam. Ninety-two percent (92%) of users accessed the Internet on a daily basis. The main purposes of their Internet usage was: news (87%); social networks (73%); email (71%); entertainment (music, movie, pictures) (66%); learning and research (58%); gaming (37%); and e-shopping (20%).

Businesses

VECITA's survey of 3,270 enterprises with Internet connections, conducted in 2013, provided insights into Internet use by businesses in Vietnam (caveat: firms considered "large"[26] account for 90% of the survey's sample, so its results are biased toward large firms). According to the survey, more than three quarters (78%) of the businesses accessed the Internet through an ADSL connection, while less than one quarter (22%) of them owned a leased line, a result unchanged since the year before, 2012. Among major types of management software, accounting and finance software were used by 87% of the surveyed companies, followed by personnel management (57%), while a much smaller share of companies had adopted more sophisticated CRM (26%) or ERP (16%) software.[27]

All the enterprises that responded to the survey had high-speed access to Internet, but only 45% of them had a web presence; the trend in web presence had increased gradually, up from 38% in 2009 and 42% in 2012. By sector, the share of companies with a web presence was highest in "Finance and Real Estate" (70%) and lowest in "Construction" (39%); it was 50% in "Manufacturing" and 59% in "Education and Training".

Among companies with a web presence, websites varied largely in the level of sophistication, which the survey categorized into four levels, from 1 to 4. At level 1, the website simply introduces basic information about the company and its products; 26% of companies assessed themselves at this level. At level 2, which accounted for 41% of companies surveyed, the website has interaction features, which allow viewers to interact with the company. At level 3, 26%, the website has certain features for online transactions but it is limited in the tools for database management and security. At level 4, the website is ready for online transactions and e-commerce; only 7% of the companies with a website said they had reached this level.

Government

In recent years, the government of Vietnam has made vigorous efforts to promote e-government development at both national and local levels. However, progressively upgrading infrastructure appears to have outpaced the improvement in online

services to citizens and businesses. An assessment conducted by the Ministry of Information and Communication, and provided in its latest report on the status of ICT applications in central and local government agencies, is depicted in Figure 4.1. The Ministry classifies the e-performance of government agencies into three categories: "average," "good," and "very good." The figure shows that the shares of government agencies in "good" and "very good" categories are much larger for infrastructure than for online services to citizens and businesses. In fact, the share of agencies in the "very good" category in 2012 was zero for online services at both central and local levels, compared with 50% for central government and 27.4% for local government for upgrading infrastructure. Furthermore, the gaps between infrastructure upgrades and online services in terms of share of "good" versus "very good" performance widened from 2011 to 2012, and these disparities are more pronounced at the central than at the local government level (Figure 4.1).

Figure 4.1: Selected Features of E-Government at the Minister and Province Levels: 2012 vs. 2011

Source: Data from VECITA (2014)

In a global landscape, Vietnam was ranked 58th in 2014 on government usage of Internet among 148 countries, according to *The Global Information Technology Report 2014*. This is a significant achievement for a country in the lower-middle income group. In addition, the country's rank on government usage was higher than ranks on the individual and business usage, which were at 84th and 88th, respectively (Appendix 4.1, upper panel). This implies that the government has taken a leading role in fostering the use of Internet in the country.

This ranking of the government usage of the Internet is derived from its ranks in three component areas: importance of ICT to government vision, government's success in ICT promotion, and government online services. Among these components, shown in Appendix 4.1 (lower panel), Vietnam's rank was impressively high on success in ICT promotion (36th), but much lower on government online services (88th). In addition, on the e-participation index, Vietnam's score is 0.11 on a 0-1 scale, where 1 is best.[28] On this measure, Vietnam was notably below its Asian peers. As reported in *The Global Information Technology Report 2014*, Vietnam ranks 92nd on this measure; the comparable ranking was 31st for Malaysia, 47th for Thailand, 63rd for Indonesia, the Philippines, and China, and 71st for India.

4.3. Provision of Internet and telecom services and web-based applications

Internet and Telecom Services

Amid a global picture of ICT readiness, Vietnam stands out as a country with impressive strength on affordability (i.e., low costs of Internet usage; see Appendix 4.1, upper panel). On this measure, among 148 countries, Vietnam ranked 8th, compared to 37th for Indonesia, 60th for China, and 75th for the Philippines.[29] This is a remarkable achievement given that until 2001, Vietnam was still a prohibitively expensive place to use the Internet. An ITU report in 2002 noted "current Internet pricing is unaffordable for most Vietnamese; 30 hours of monthly use would be roughly equivalent to the country's per capita GDP."[30] In the same year, the American Chamber of Commerce observed that American companies located in Vietnam incurred expenses on telecommunications approximately 100 times greater than in the US.[31]

A key factor that drove down the cost of Internet usage in Vietnam was the government's liberalizing of the telecommunication industry to foster competition. Beginning in the early 2000s, the industry underwent profound transformation, from a single state-owned monopoly, Vietnam Posts and Telecommunications Corporation, to a highly competitive environment with multiple players in each type of services; in 2013, for example, 85 companies were licensed for Internet operation, and 57 were in actual operation (see Appendix 4.2).

Although VNPT remained a major player, other companies have rapidly expanded their market shares. While the xDSL market was dominated by three ISPs in 2013, VNPT (60.7%), FPT (30%), and Viettel (8%), the leased line market was more fragmented. In the emerging 3G mobile broadband market, VNPT, with 64% market share, is rivalled by Viettel, with 36%.

The robust competition of Vietnam's ICT services sector has been recognized in international reports. The 2012 ITU country profile[32] pointed out that all the ICT

services sectors of Vietnam had reached a high level. At the same time, the Global Information Technology Report (GITR) gave Vietnam a high mark on Internet and telephony competition.[33] On a scale of 0-2 (best) Vietnam's score on this measure was 2.0 for 2012 and 1.87 for 2013 and 2014.[34]

Web-based Applications

In 2014, Vietnam's web-based applications industry was still in an early stage of development, but its growth and vibrancy were impressive. The number of companies in the industry increased from 2,844 in 2009 to 3,883 in 2012; their total revenues grew from US$690 million to US$1,235 million; and employment grew from to 41,000 to 63,000 over this same period. The average annual wage in the sector grew rapidly also, from US$2,820 in 2009 to US$5,201 in 2012.[35]

One factor that played an important role in stimulating dynamism and innovation in the web-based applications industry was the entrance of foreign venture investors. Among them, IDG Ventures (USA) and NTT Docomo (Japan) had become notable players. IDG Ventures Vietnam (IDGVV), set up in 2004, managed a US$100 million portfolio of more than 40 companies by 2014. Among these companies, many were leading players in the Internet-based services sector, such as www.Moore.com (online ads and marketing), www.Yeuthethao.com (online sport media), www.Yeuamnhac.com (online music), www.Webtretho.com (Women-focused forum), www.Vinapay.com (mobile top-up & payment platform), www.Vatgia.com (e-commerce), www.Vietnamworks.com (online job matching), and www.Tamtay.com (social networking). NTT Docomo invested US$18 million in 2011 to acquire a 25% stake in Vietnam's VMG Media. VMG provided mobile applications, games, and music, and was also involved in billing and CRM.[36] Expectations of rapid growth in Vietnam's digital content market were the major driver of foreign venture capital investment in Vietnam.

4.4. E-commerce

B2C e-commerce in Vietnam remained in an embryonic stage in 2014, but showed signs of promise. The VECITA report for 2013 estimated that 57% of the Internet users had used the Internet for shopping during that year, to make purchases totalling US$2.2 billion, an average of US$120 per e-shopper.[37] E-shoppers concentrated mostly on three product categories: apparel/footwear/cosmetics (62%), electronics (35%), and home appliances (32%). The share of e-commerce for other products and services were also significant: air tickets (25%), grocery (20%), books and stationery (20%), tourism (16%), video/music/game (12%), and professional services (business consultation, training) (10%). Payment methods remained fairly primitive, however. According to the VECITA report, only 11% of the e-shoppers used credit/debit cards for payment; 74% paid cash on delivery, and 41% used bank transfers.

Customers were somewhat satisfied with their e-purchase experiences; 5% and 29% said they were very happy or happy, respectively, while 4% said they were unhappy. The remaining 62% of the e-shoppers ostensibly found their experience barely satisfactory. Three top reasons for e-shoppers to have concerns with e-commerce were: the quality of products is lower compared to advertisement (77%); the price is not competitive or transparent (40%); and shipment and logistic services are poor (38%).

Also according to the VECITA report, Vietnamese e-commerce businesses were significantly more concerned about hindrances related to social awareness and cyber-security than those associated with the e-payment system, delivery services, regulatory environment, or human resources (Table 4.2). The levels of concern on all the six trended favourably, however, from 2009 to 2013.

Table 4.2: Perception of businesses about the elements that hinder efforts for e-commerce development

Element	2009	2010	2011	2012	2013	2009-2013 Change
Social awareness	4.07	3.55	3.36	3.47	3.42	-0.65
Cyber-security	3.83	3.54	3.38	3.45	3.35	-0.48
E-payment system	3.76	3.39	3.30	3.29	3.13	-0.63
Delivery services	3.56	3.30	3.11	3.25	3.07	-0.49
Regulatory environment	3.69	3.29	3.25	3.21	3.05	-0.64
Human resources	3.68	3.32	3.26	3.06	2.90	-0.78
Average	3.77	3.40	3.28	3.29	3.15	-0.61

Source: data from VECITA (2014)
Note: The results of the survey are rescaled to a typical 1-5 scale. 1=no concern; 5=most serious concern.

4.5. Regulatory environment

By 2013, Vietnam had made significant efforts to build a solid legal foundation for the development of the digital economy. The legal documents that regulated Vietnam's digital economy could be classified into three categories: laws (passed by the National Assembly); decrees, directives, and decisions (made by the Prime Minister); and circulars (introduced by Ministry of Information and Communication). Table 4.3 provides a list of selected laws and decrees that shape Vietnam's digital regulatory environment.

Table 4.3: The key legal documents regulating Vietnam's digital economy

Document	Year of Introduction
Laws	
Law on E-transactions	2005
Law on Intellectual Property	2005
Law on Information Technology	2006
Law on Telecommunications	2009
Law on Radio Frequencies	2009
Law on Intellectual Property, Amendments	2009

Document	Year of Introduction
Regulations	
Decision (No. 169/2006) on the investment and procurement of information technology products by agencies and organizations using the state budget	2006
Directive (No. 04/2007) on enhancing the protection of copyright on software	2007
Decree (No. 26/2007) on digital signatures	2007
Decree (No. 27/2007) on e-transactions in financial activities	2007
Decree (No. 35/2007) on e-transactions in banking	2007
Directive (No. 03/2007) on enhancing information security over the Internet.	2007
Decree (No. 90/2008) on anti-spam	2008
Decision (No. 50/2009) on management of the software industry development program and the digital content industry development program in Viet Nam	2009
Decree (No. 102/2009) on the management of investment in information technology applications using the state budget	2009
Decree (No. 43/2011) on the provision of information and online public services on websites or portals of state agencies	2011
Decree (No. 72/2013) on management, provision and use of the Internet service and online information	2013

Source: Compiled from MIC (2013)

5. The ICT Production Sector

Vietnam's ICT production sector, which includes three industries: hardware, software, and digital content, has experienced tremendous growth. The sector's average growth rate over the period 2009-2012 was 60.4% for revenues, 34.4% for number of companies, and 16.5% for employment (Table 5.1). In 2014, hardware was the largest of these industries and it grew fastest in terms of revenues (70.7%) and employment (20.3%). Software and digital content were smaller, and rather similar to each other in size and growth. Over 2009-2012, software grew fastest in terms of the number of companies (60.4%), while digital content was the second performer in terms of growth in revenues (21.4%) and employment (15.4%) (See Table 5.1 and Figure 5.1).

5.1. ICT hardware industry

Rapid expansion of the hardware industry was fuelled by investments by leading technology firms such as Samsung, which has shifted production of smart phones and tablets from China to Vietnam, to tap Vietnam's abundant low-cost workforce and benefit from government incentives. Beginning in 2009, Samsung rapidly expanded production in Vietnam, investing $2.5 billion in Bac Ninh for production of smart phones, $2.0 billion in Thai Nguyen for telecommunication components and mobile devices, and $1.0 billion in Ho Chi Minh City for high-resolution displays used

for smartphones and tablets.[38] In 2013, Samsung accounted for most of Vietnam's exports of $21 billion of smart phones and spare parts.[39]

In 2014, Samsung planned further expansion in Vietnam and, together with other giant technology firms such as Nokia, Intel, and LG Electronics, the company had made a powerful push to transform Vietnam into a global hub of ICT hardware production and trade. Vietnam's exports of ICT hardware soared from $3.4 billion in 2009 to $22.9 billion in 2012, growing at average rate of 89.5%; imports grew from $6.5 billion in 2009 to $19.3 billion in 2012, at a 43.9% rate; in addition, Vietnam's ICT hardware trade turned from deficit to surplus in 2011 (Figure 5.2).

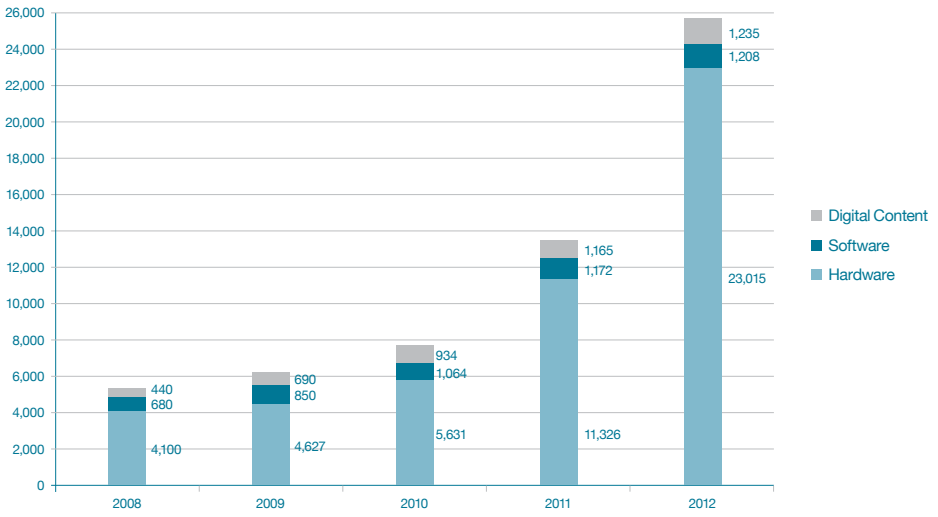
Also in 2014, Microsoft, after its acquisition of Nokia's phone and tablet business in April, decided to turn Vietnam into the main base of its Nokia smartphone production.[40] The government embraced this decision with strong and unprecedented supports. In particular, the Prime Minister agreed to revoke a decree, which banned the import of old equipment, in order to allow Microsoft's shipment of Nokia production factories from other countries to Vietnam.

Table 5.1: ICT production sector: revenues, number of companies, and employment

	2009	2010	2011	2012	Average Growth 2009-12 (CAGR)
Revenues (US$ Million)					
Total ICT	6,167	7,629	13,663	25,458	60.4%
Hardware	4,627	5,631	11,326	23,015	70.7%
Software	850	1,064	1,172	1,208	12.4%
Digital Content	690	934	1,165	1,235	21.4%
Number of companies					
Total ICT	5,592	6,543	13,096	13,560	34.3%
Hardware	992	1,273	2,763	2,431	34.8%
Software	1,756	2,958	7,044	7,246	60.4%
Digital Content	2,844	2,312	3,289	3,883	10.9%
Employees ('000)					
Total ICT	222.7	250.3	306.8	352.4	16.5%
Hardware	119.9	127.5	167.7	208.7	20.3%
Software	61.8	71.8	78.9	80.8	9.3%
Digital Content	41.0	50.9	60.2	63.0	15.4%

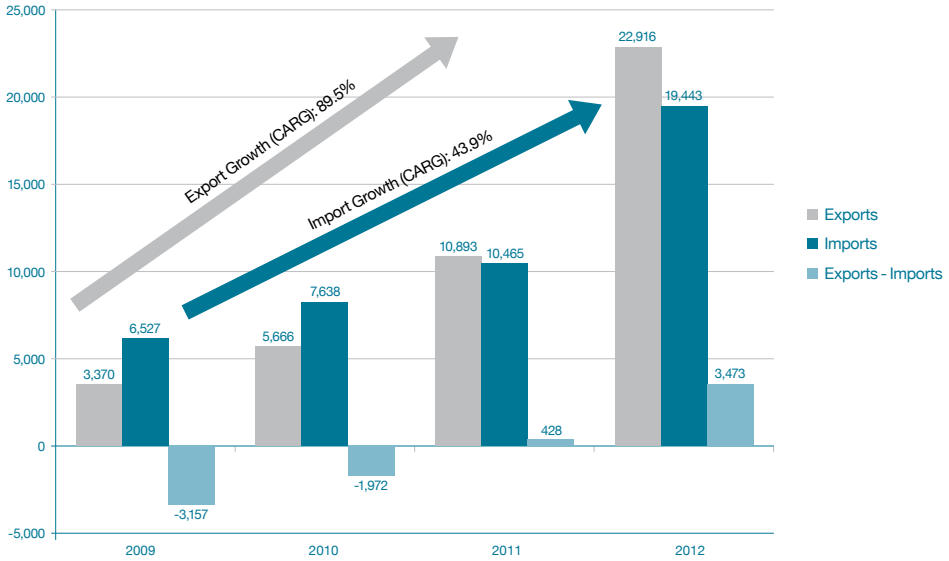
Data source: MIC (2013)

Figure 5.1: Vietnam's ICT Producing Sector Revenues by Industry (US$ million)



Source: Data from MIC (2013)

Figure 5.2: ICT hardware exports and imports (US$ million), 2009-2012



Source: Data from MIC (2013)

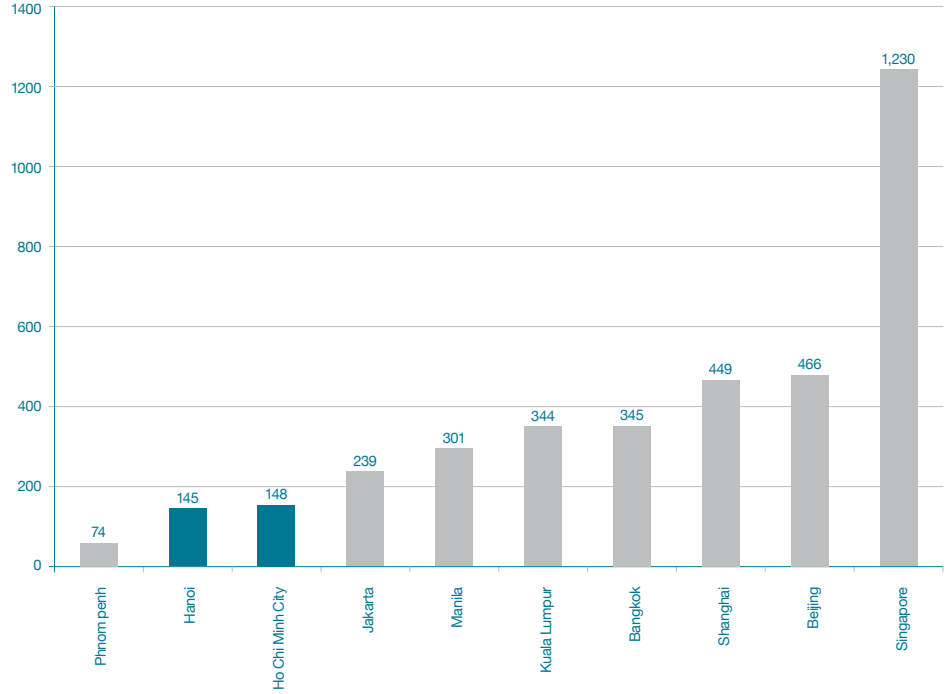
With a boost from mega projects, such as those of Samsung and Microsoft, Vietnam quickly became a hub of the global ICT production network. It was projected that Vietnam's exports of ICT hardware would continue to grow at staggering rates over the years to come, reaching at least $40 billion by 2017.

As is evident from the case of Samsung, low labour cost was a key factor driving the rapid expansion of Vietnam's ICT hardware industry. Because labour cost in Vietnam was only one third of labour cost in China (Figure 5.3),[41] there was a strong motivation for foreign investors in labour-intensive industries, such as ICT hardware production and assembly, to relocate factories to Vietnam, especially when they were offered attractive tax incentives and special supports.

5.2. Software and digital content industries

Vietnam's software and digital content industries also appeared to have promising prospects; Vietnam had become an appealing destination for IT outsourcing (ITO). According to a 2011 A.T. Kearney report, Vietnam's rank in terms of attractiveness as a destination for ITO was up by 18 places, from 26th in 2005 to 8th in 2011. Again, low cost was the main factor that determined this attractiveness of the country (Table 5.2).

Figure 5.3: Wages of general workers in selected Asian cities (USD/month)



Source: Data from JETRO (2013)

Table 5.2: The A.T. Kearney Global Services Location Index: Top 10 Most Attractive Locations

Rank	Country	Financial attractiveness	People skills and availability	Business environment	Total score
1	India	3.11	2.76	1.14	7.01
2	China	2.62	2.55	1.31	6.49
3	Malaysia	2.78	1.38	1.83	5.99
4	Egypt	3.10	1.36	1.35	5.81
5	Indonesia	3.24	1.53	1.01	5.78
6	Mexico	2.68	1.60	1.44	5.72
7	Thailand	3.05	1.38	1.29	5.72
8	Vietnam	3.27	1.19	1.24	5.69
9	Philippines	3.18	1.31	1.16	5.65
10	Chile	2.44	1.27	1.82	5.52

Source: Data from A.T. Kearney Global Services Location Index, 2011.
Note: Financial attractiveness (cost-saving) is rated on a scale of 0 to 4 (best), and the categories for people skills and availability, and business environment are on a scale of 0 to 3 (best).

5.3. Differences in the growth patterns of three ICT industries

Revenues per worker grew at a staggering rate of 41.9% for hardware, but at a more modest rate for digital content (5.2%) and software (2.8%). The average wage grew faster than revenues per worker over the same period, for both digital content (14.1%) and software (7%) (Table 5.3), which suggested emerging skills shortages and raised concerns about productivity and growth sustainability in these two industries.

Table 5.3: ICT production sector: average revenues and wage

	2009	2010	2011	2012	CAGR, 2009-12
Average revenues per employee (US$)					
Hardware	38,582	44,148	67,555	110,287	41.9%
Software	13,750	14,816	14,855	14,957	2.8%
Digital Content	16,829	18,339	19,352	19,615	5.2%
Average revenues per company (US$'000)					
Hardware	4,664	4,423	4,099	9,467	26.6%
Software	484	360	166	167	-29.9%
Digital Content	243	404	354	318	9.4%
Average wage (US$)					
Hardware	1,809	2,201	2,279	2,281	8.0%
Software	4,093	5,123	5,034	5,009	7.0%
Digital Content	3,505	4,896	5,267	5,201	14.1%

Source: Data from MIC (2013)

6. The Role of Government and Policy Challenges – the Way Forward

6.1. The role of government

The government has played a crucial role in advancing Vietnam's ICT readiness. Until 2000, Vietnam was still in a laggard in the global ICT picture. The Global Information Technology Report 2001-2002 ranked Vietnam at 74th out 75 economies, giving it a low score at 2.42 on a scale of 1-7 with a concern for the country's poor performance on network use and access, e-government, and e-business.[42] The E-ASEAN/IBM report, assessing the E-readiness of ASEAN in 2001, ranked Vietnam in the lowest category among the 10 countries of the group, and noted that Vietnam was "among those countries least equipped to prosper in networked economy."[43]

Vietnam, however, moved fast and emerged as an energetic player in the global ICT landscape. The Global Information Technology Report ten years later, in 2011, highlighted Vietnam's rapid progress, comparing the country with Venezuela:[44]

> "The two countries were initially both ranked in the second-lowest decile, and now Vietnam ranks almost five deciles higher."[45] (p. 23)

The report also identifies the important role of the government in in driving this rapid advancement:

> "Ranked 55th, Vietnam has made impressive strides. […] Like many of the emerging economies in the region, Vietnam's main comparative advantage is its level of preparedness to use ICT (35th, up two positions). Yet, unlike most countries at a similar stage of development, government readiness (20th, up four) is the highest among the three main actors. ICT development is one of the top priorities for the government (18th), which sees the sector as a key driver for national competitiveness (26th)." (p. 25)

The role of the government in enabling the country to achieve this initial success could be attributed to a number of factors, which ranged from vision to commitment, and from strategy to implementation. At the core of Vietnam's strategy and policy initiatives to leverage ICT for economic development was the Politburo's Directive No. 58, "On Accelerating the Use and Development of Information Technology for Industrialization and Modernization," announced in October 2000. The directive called for Vietnam to achieve parity with the advanced ICT levels in the region by 2010, by seeking three main objectives: "(1) ICT will be widely used across sector and become one of the most important factors in promoting socio-economic development and ensuring national security; (2) The information network shall be developed for a full nation-wide coverage, with large bandwidth, high speed and quality, and low user costs; and the Internet penetration will reach the world's average rate; (3) The ICT industry shall become a spearhead economic sector with the leading growth rate and rising contribution to the country's economic growth."

The directive states five guiding principles for promoting ICT and five strategic directions for policy formulation and implementation. The details are provided in Box 6.1 below.

Box 6.1: Vietnam's guiding principles and policy measures for ICT promotion

Five guiding principles

i. The use and development of ICT is a priority in the country's socio-economic development strategy. It is a major engine for the country to leapfrog and catch up with advanced nations;
ii. All sectors, be they economic, cultural, or defence-related, must embrace ICT in order to develop;
iii. The national information network is a strategic socio-economic infrastructure. It must be upgraded to create favourable conditions for the use and development of ICT, with high speed, high quality, and low user costs;
iv. Development of ICT human resource is a vital factor, which determines the success of the use and development of ICT;
v. ICT industry, especially the software industry, should be developed into a strategic economic sector.

Five strategic directions for policy formulation and implementation

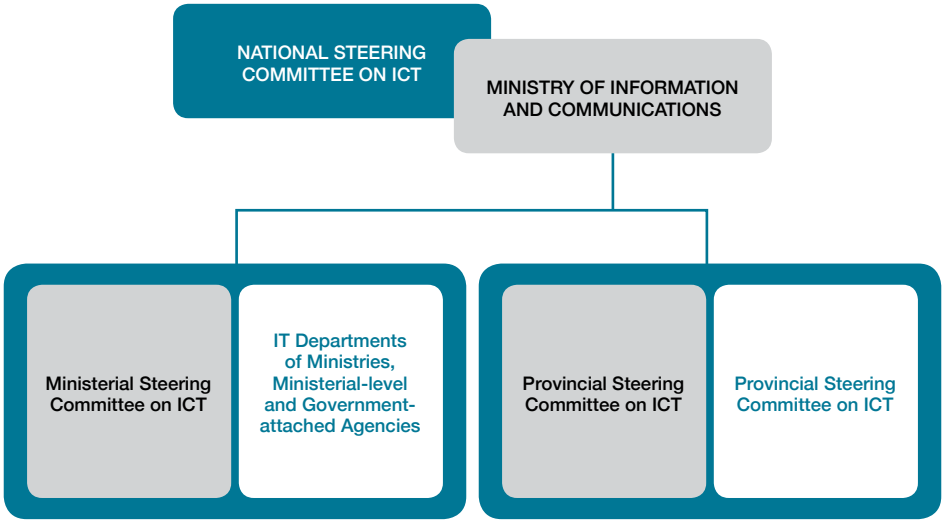
i. Promoting widespread and efficient usage of ICT across socio-economic sectors. In this direction, the state agencies should take a pioneering role.
ii. Creating a favourable environment for applications and development of ICT. Notable policy measures in this direction include:
   - Encouraging investment in the ICT sector with highest possible levels of incentives, with the aim to be competitive compared to those offered by other countries in the region.
   - Fostering foreign language proficiency of the population, especially the young people; while developing platforms that support the use of ICT in Vietnamese language.
   - Giving top priority to the application and development of ICT in socio-economic development plans and programs, especially in financial resource allocations.
   - Providing incentives to businesses for investment in ICT to boost growth and competitiveness.
   - Encouraging the use of ICT products and services produced locally. Domestic ICT products and services are exempted from value-added taxes (VAT). ICT companies enjoy the highest possible preferences on corporate tax rates, access to bank credits, and land use.
   - Developing export support programs for the ICT sector, firstly for the software industry.
   - Providing favourable conditions for personnel working in the ICT sector to enable them to work abroad and return to the country.
   - Developing major high-tech parks with special policies and measures; attracting foreign investment into these parks with stronger incentives compared to those offered by countries in the region.
   - Enhancing legal documents and enforcement concerning intellectual property right protection, including the protection of copyright of software and other ICT products.
iii. Accelerating the training and utilization of human resources for ICT application and development, with the target to reach the average rate of the countries in the region on the number of ICT specialists per 10,000 inhabitants.

iv. Speeding up the establishment of the national information network; creating a competitive environment, which enables companies of all types of ownership to participate in provision of telecom and Internet services.
v. Renovating and strengthening the state management of the ICT sector. Every state agency at the central and provincial levels needs to assign a senior leader to be in charge of ICT application.

In order to strengthen the role of the government in ICT strategy formulation and implementation, in 2008, Prime Minster Nguyen Tan Dung signed the Decision 343/QD-TTg to establish the National Steering Committee on ICT (NSCICT), which consists of 12 ministerial leaders and chaired by Deputy Prime Minister Nguyen Thien Nhan. A similar structuring committee on ICT was also set up at the ministerial and provincial level (Figure 6.1). The NSCICT has the following four functions:

1. Advising the Government and the Prime Minister on policies and strategic solutions to promote ICT application and development;
2. Assisting the Prime Minister in directing and coordinating the implementation of strategies, programs, plans, projects, policies, and mechanisms on ICT application and development across ministries, sectors, and localities;
3. Providing support for ministries, sectors, and localities on policy dissemination and implementation.
4. Monitoring and evaluating the progress of the application and development of ICT across ministries, sectors and localities to periodically report to the Prime Minister.

Figure 6.1: Vietnam National Steering Committee on ICT



Source: MIC (2011)[43]

6.2. Additional developments

The initial successes of ICT promotion strengthened national leader's determination to leverage ICT for economic growth and catch-up. In 2010, Prime Minister Nguyen Tan Dung signed the Decision No. 1755/QD-TTg to launch a new national ICT strategy under the title "transforming Vietnam into an advanced ICT country." The strategy set out the following objectives:

- Develop ICT human resources to international standards;
- Build ICT industry, especially software industry, digital content industry, and ICT services to become a leading economic sector, which play a key role in economic growth and exports;
- Establish broadband infrastructure throughout the country;
- Foster effective applications of ICT across socio-economic sectors and in national security-defence areas.
- Sustaining the annual growth rate of the value-added generated by the ICT industry at least 2-3 times higher than the growth rate of GDP. By 2020, the contribution of ICT industry to GDP should reach 8-10%.

To further enhance the effectiveness of the government's coordination efforts, in January 2014 Prime Minister Nguyen Tan Dung signed the Decision No. 109/QD-TTg to replace the National Steering Committee on ICT by the Nation Committee for ICT Applications. The committee is chaired by the Prime Minister himself, with Deputy Prime Minister Vu Duc Dam serving as Vice-Chairman.

6.3. Policy challenges

In 2014, Vietnam faced a number of policy challenges as it pursued its ambition to fully benefit from the ICT revolution. Among these were challenges important for the country to sustain its progress on ICT readiness and also those that had critical implications for the long-term development of its Internet ecosystem.

Sustaining progress on ICT readiness

Between 2012 and 2014, the pace of Vietnam's progress on ICT readiness slowed, especially in comparison to peer countries in the region, such as the Philippines and Indonesia. As shown in Table 6.1, Vietnam's global rank on ICT readiness declined by one place (from 83rd to 84th) while Indonesia's was up by 16 places (from 80th to 64th) and the Philippines jumped 8 places (from 86th to 78th). Vietnam continued to significantly improve its ranks on affordability (by 68 places, from 76th to 8th), and business environment (by 9 places, from 109th to 100th).[47] At the same time, however, Vietnam's rank deteriorated substantially on Infrastructure and digital content (by 20 places, from 101st to 121st), Skills (15 places, from 73rd to 88th), Political and regulatory environment (12 places, from 79th to 91st), Business usage (10 places, from 78th to 88th), and Government usage (10 places, from 48th to 58th). In contrast, Indonesia and the Philippines did not enhance their ranks on affordability, but made considerable improvements on Political and regulatory environment (by 20 places), Government usage (26 places for Indonesia and 12 places for the Philippines), Business usage (13 places for Indonesia and 20 places for the Philippines). It should also be emphasized that Indonesia and the Philippines far outperformed Vietnam on Economic impacts in both rank and improvement over 2012-2014 (Vietnam: 6 places, from 102nd to 96th; Indonesia: 20 places, from 106th to 86th; Philippines: 29 places, from 77th to 48th).

Urgent issues to be addressed if Vietnam was to sustain its progression on ICT readiness included fostering e-government application, addressing the shortage of ICT skilled labour, and expanding the mobile network coverage.

Table 6.1: Global Ranking on ICT Readiness of Vietnam, the Philippines and Indonesia: 2014 vs. 2012

	2012* (A)			2014* (B)			Change in rank over 2012-2014 (A-B)		
Indicator	Vietnam	Indonesia	Philippines	Vietnam	Indonesia	Philippines	Vietnam	Indonesia	Philippines
Networked Readiness	83	80	86	84	64	78	-1	16	8
A. Environment Sub index	96	72	111	96	63	90	0	9	21
1st pillar: Political and regulatory environment	79	88	107	91	68	87	-12	20	20
2nd pillar: Business and innovation environment	109	64	107	100	62	92	9	2	15
B. Readiness Sub index	86	74	77	77	65	81	9	9	-4
3rd pillar: Infrastructure and digital content	101	103	80	121	85	89	-20	18	-9
4th pillar: Affordability	76	34	72	8	37	75	68	-3	-3
5th pillar: Skills	73	69	77	88	61	69	-15	8	8
C. Usage Sub index	69	85	86	78	69	76	-9	16	10
6th pillar: Individual usage	80	103	95	84	95	91	-4	8	4
7th pillar: Business usage	78	49	63	88	36	43	-10	13	20
8th pillar: Government usage	48	75	79	58	49	67	-10	26	12
D. Impact Sub index	79	86	84	75	72	62	4	14	22
9th pillar: Economic impacts	102	106	77	96	86	48	6	20	29
10th pillar: Social impacts	61	66	88	62	63	76	-1	3	12

Source: Data from WEF (2012, 2014)
Note: *the numbers of countries are 142 for 2012 and 148 for 2014

Fostering e-government applications

Vietnam has made notable improvements in e-government. The level of e-government development of a country can be captured by the value of its government online service index (GOSI), constructed by the Global Information Technology Report.[48] From 2012 to 2014, Vietnam's GOSI increased from 0.30 to 0.42 (Table 6.2), which indicates significant progress.

However, Vietnam needed to make a more robust improvement on this front for at least three reasons. First, Vietnam's GOSI of 0.42 in 2014 remained below the average of 0.50, which all countries in the region had reached or exceeded. Second, compared to Vietnam, most countries in the region had made a larger improvement on this measure. In particular, this improvement was 0.26 for Indonesia, only 0.12 for Vietnam. Third, due to vibrancy of the progress across countries on e-government development, in spite of Vietnam's improvement in absolute term on this measure, its global rank declined by 11 places, from 77th in 2012 to 88th in 2014 (Table 6.2).

Table 6.2: Government Online Service Index: Vietnam vs. Peer Countries

Country	Index value			Rank		
	2012	2014	2012-2014 Change	2012	2014	2012-2014 Change
Vietnam	0.30	0.42	0.12	77	88	-11
Indonesia	0.24	0.50	0.26	99	67	32
Malaysia	0.63	0.79	0.16	16	20	-4
Philippines	0.39	0.50	0.11	48	67	19
Thailand	0.33	0.51	0.18	65	64	1
China	0.37	0.53	0.16	53	59	-6
India	0.37	0.54	0.17	53	55	-2

Source: Data from WEF (2012, 2014)

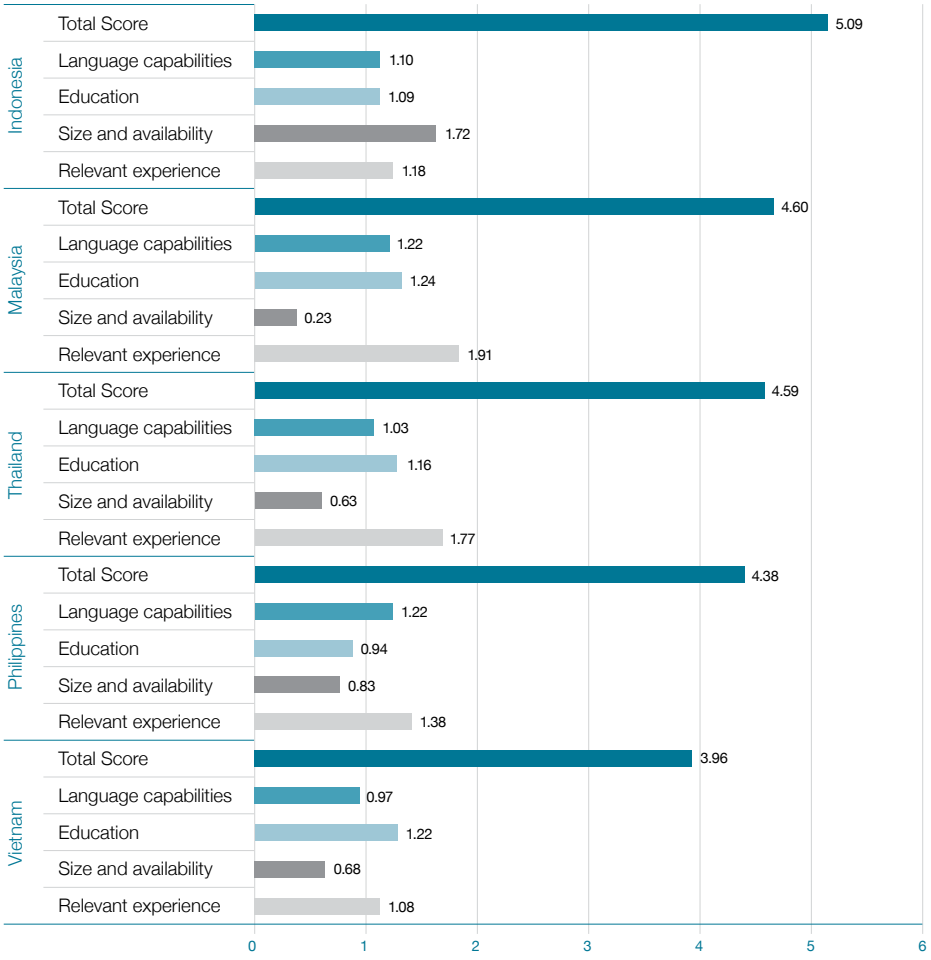
Addressing the shortage of ICT skilled labour

Human capital has been one of Vietnam's main potential strengths in realizing its ICT ambition. However, in 2014, a shortage of skilled labour in this area was a serious problem facing the country. The shortage manifested in both quantity and quality.

About 40,000 students with ICT-related majors graduated from Vietnamese universities and colleges in 2012, which was nearly the same as in 2011.[49] Without substantial change in this rate, Vietnam would face increasingly serious shortages of ICT skilled labour. As estimated by the Ministry of Information and Communication (MIC), Vietnam will have a total of 600,000 graduates with ICT skills in 2020, while the demand for them is estimated to reach one million by that time.[50] The problem is even more pronounced in specialized areas such as cyber-security; the MIC estimated that state agencies alone would need more than 7,800 cyber-security experts by 2020, while the number of graduates with this expertise will be about 4,600 by then.[51]

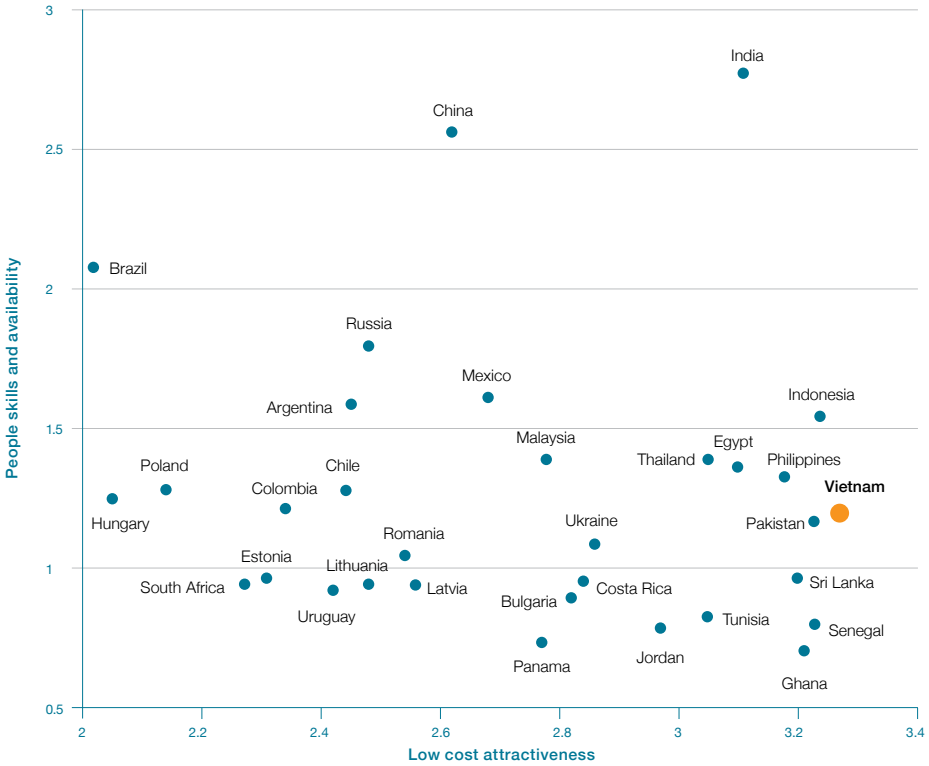
In terms of skills, the 2011 A.T. Kearney report[52] provides a comparative assessment for the nations with potential ICT prowess. Within this global picture, Vietnam is notably behind peer countries in the region. As shown in Figure 6.2, the total score on ICT skills is 3.96 for Vietnam, compared to 5.09 for Indonesia, 4.60 for Malaysia, 4.59 for Thailand, and 4.38 for the Philippines. Vietnam is not weak on ICT education, but it is behind on language skills, relevant experience, and size and availability. Vietnam's ranking as the most attractive location for IT outsourcing was largely driven by the country's low labour cost advantage relative to other countries, not strength or availability of skills (Figure 6.3).

Figure 6.2: ICT Skills: Vietnam vs. Peer Countries



Source: Data from A.T. Kearney (2011)

Figure 6.3: Attractiveness as a destination for ICT outsourcing



Source: Data from A.T. Kearney (2011)
Note: Cost attractiveness is rated on a scale of 0 to 4 (best), and people skills and availability is on a scale of 0 to 3 (best).

Expanding mobile network coverage

In 2014, the rate of mobile network coverage was only 70% for Vietnam, much lower than for many other countries in the region: 100% for Indonesia, above 99% for Thailand, Malaysia, and China, and 82% for India.[52] On this measure, the Global Information Technology Report ranked Vietnam 132nd among 148 countries, which is a further decline from its rank at 120th in 2012. Some experts attributed this problem to the industry's intense price competition. Competitors focused on the urban areas, where the density of mobile population was high and the unit cost of investment low.

Creating an environment conducive for long-term growth of the Internet ecosystem

In 2014, three issues stood out as most essential to supporting long-term growth of the Internet ecosystem in Vietnam: cyber security, control of software piracy, and development of a strategic policy approach to boost cloud computing adoption. Moreover, these policy issues were interrelated. Adoption of cloud computing made it more affordable for individuals, firms, and governments to expand their digital capabilities. But increasing users' confidence in cloud computing required better cyber security and control of software piracy.

Cyber security

In the second decade of the 21st century, cyber security must be a major concern in every country. The European Commission report "Cyber Security," published in 2013, pointed out that more than 150,000 viruses and other types of malware remain in circulation and that millions of people are victims of cybercrime every day.[54]

In recent years, Vietnam's cyber security has been considered highly vulnerable. According Michael Mudd, Chair of Information Technology, Intellectual Property and Telecommunications Committee at the American Chamber of Commerce, the country was among the top five distributors of spam and malware in the world in 2013, and this malware "epidemic" was caused mainly due to lack of awareness of the problem.[55]

A nation-wide survey of 500 organisations, public and private, conducted in 2013, showed that Vietnam needed to do much more to assure cyber security. According to the survey, only 30.5% of surveyed organisations had technical solutions in place to deal with cyber security problems; 19.4% had little ability to detect even the most basic forms of network attacks.[56]

Software piracy

Malware is often introduced into computer networks when it is downloaded with pirated software. Thus, pirated software makes computers and the organisations that use them far more vulnerable to malware. According to the estimates by International Data Corporation (IDC), in 2014 the total expenses caused by malware associated with pirated software amounted to $491 billion worldwide ($127 billion was for dealing with security issues and $364 billion dealing with data breaches).[57]

In recent years, Vietnam had made progress on control of software piracy. According to the survey published by The Software Alliance in 2014,[58] the rate of unlicensed personal computer software installations in Vietnam was down from 85% in 2009 to 81% in 2013. However, this rate was still quite high, and higher than in many peer countries (for example this rate was 74% for China, 69% for the Philippines, and 60% for India).

Cloud computing

Cloud computing enables Internet users, through digital networks, to access, on demand, a scalable and elastic pool of data storage and processing resources. According to the "Information Economy Report 2013",[59] cloud economy can offer the following benefits (among others): efficiency (lower costs spent on IT hardware and software compared to investment in in-house equipment and IT management), scalability (storage and processing capacity can be scalable to demand), flexibility and mobility (access to data and services at any time and any location). On the other hand, potential disadvantages associated with cloud computing include data security, privacy protection concerns, and costs for migration and integration. It is apparent that the advantages provided by cloud economy are particularly valuable for lower-income countries and small businesses.

Table 6.3: Cloud Readiness Index 2014

	1. Privacy	2. International Connectivity	3. Data Sovereignty	4. Broadband Quality	5. Government Regulatory Environment and Usage	6. Power Grid and Green Policy	7. IP Protection	8. Business Sophistication	9. Data Centre Risk	10. Freedom of Information	CRI 2014 Score	Rank
Japan	9.5	5.5	8.0	9.1	5.0	7.1	8.1	8.2	6.6	9.7	76.8	1
New Zealand	8.8	4.6	7.9	7.6	5.6	9.2	8.6	6.8	7.8	9.5	76.3	2
Australia	8.8	4.4	7.6	8.0	5.3	7.8	7.6	6.7	9.4	9.6	75.1	3
Singapore	6.0	8.2	7.8	8.8	6.1	5.9	8.7	7.3	7.4	8.6	74.8	4
Hong Kong	6.8	7.7	7.6	9.3	5.1	5.6	8.1	7.5	7.4	9.6	74.7	5
South Korea	9.7	5.5	7.2	9.4	5.1	6.6	5.7	6.9	8.6	8.6	73.3	6
Taiwan	4.6	6.3	6.8	8.5	5.0	6.7	7.4	7.4	6.9	8.6	68.2	7
Malaysia	5.8	5.8	6.7	7.1	5.2	4.9	6.9	7.2	8.5	8.2	66.2	8
Thailand	4.0	5.0	6.2	8.0	3.7	6.3	4.4	6.3	7.6	7.8	59.3	9
Philippines	5.8	5.4	5.9	4.1	3.7	5.5	5.1	6.1	5.5	9.0	56.1	10
China	5.9	3.0	4.8	5.9	4.3	4.3	5.6	6.2	6.5	7.0	53.3	11
Indonesia	4.4	2.9	6.2	3.1	3.9	5.7	5.6	6.3	6.4	7.9	52.4	12
India	4.6	2.3	6.5	3.6	4.1	5.0	5.3	6.3	3.4	7.8	48.8	13
Vietnam	3.6	3.2	5.6	4.2	3.8	4.7	4.1	5.3	6.4	7.0	47.8	14

Source: Asia Cloud Computing Association

Although adoption of cloud computing is expected to be a major trend in the years to come, in 2014 Vietnam's cloud readiness remained modest, compared to its peers. Based on the Cloud Readiness Index 2014,[60] Vietnam was ranked at the lowest place among the 14 Asian-Oceanian economies under assessment (Table 6.3). As shown in the table, Vietnam was significantly behind other countries on three indicators: Privacy, IP Protection, and Business Sophistication.

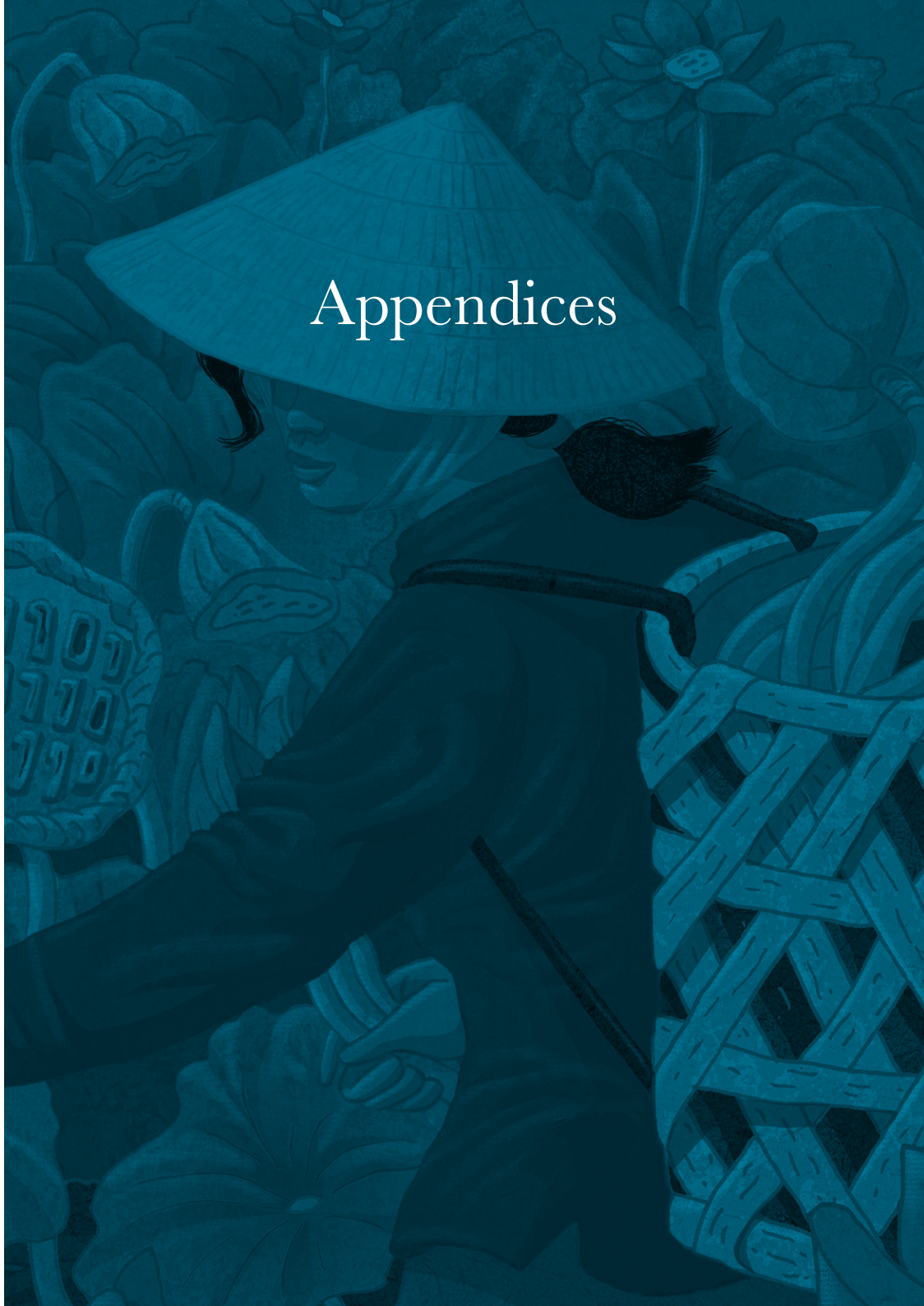
6.4. Questions on the way forward

1. What are the lessons Vietnam can learn from its successes in the past?

2. What factors have kept Vietnam from achieving more success in using ICT for economic development? Why is the overall rating of such an important project as Vietnam-ICT development so low (Appendix 6.1), given the country's burning ambition to use all possible resources for this effort?

3. What fundamental concepts and critical priorities should Vietnam undertake to make breakthrough progress in designing and implementing its ICT strategy in the next ten years?

Appendices



Appendix 1.1. The VINASA Think Tank Group[61]

Mission and objectives

The purpose of VINASA Think Tank Group is to promote policies for developing and applying IT in Vietnam, with the goal of positioning the country as a modernized, integrated economy boasting a globally competitive position in the knowledge-based economy and information society. Priorities focus on three strategic objectives:

- Enhance the country's national economic competitiveness through IT.
- Leverage ICT to upgrade the agricultural sector to enable the country to enter the global market with high-value agricultural products.
- Vietnam becomes a tourist destination known globally for its technology savvy in addition to its current strengths in natural beauty, cultural uniqueness, and safety.

Major Activities of the Group

- Consulting with and proposing policies and strategies to the Party, the National Assembly, and the Government
- Conducting surveys and research
- Organizing scientific seminars and conferences to complement research efforts
- Organizing information delivery seminars to convey recommendations to the leaders of the Party, the National Assembly, and the Government
- Organizing an annual high-level forum addressing Vietnam's IT
- Raising awareness about the unique importance of IT in developing Vietnam's knowledge-based economy and information society

Specific activities the Group has conducted

- Advising about the formulation of Resolution 13/NQ-TW dated 16/01/2012 of the Party Central Committee and Resolution 16/NQ-CP dated 06/08/2012 of the Government: "building synchronous infrastructure and converting Vietnam into a modern industrial country by 2020";
- Proposing the establishment of the National Committee for IT Application, chaired by the Prime Minister; the Committee was formally established in 02/2014;
- Advising about the formulation of Resolution 29-ND/TW dated 04/11/2013 of the Party Central Committee, regarding fundamental and comprehensive reform in education and training;
- Advising about the formulation of Resolution 20-NQ/TW dated 31/10/2012 of the Party Central Committee, regarding the development of science and technology for industrialization and modernization in socialist-oriented market economies, and international integration;
- Advising about the formulation of Resolution 19/NQ-CP dated 17/03/2014 of the Government, regarding key strategies to improve Vietnam's domestic business environment and enhance national competitiveness;
- Advising about the formulation of the Special Resolution of the Politburo, regarding the promotion of IT development and application to meet the needs of rapid and sustainable development;
- Conducting research and making recommendations for restructuring Vietnam's agriculture sector towards new models of production;
- Promoting the organisation of the Vietnam–ASOCIO ICT Summit 2014:
  - The most important international event covering ICT in Asia and Oceania
  - Annually organized by the Asian-Oceanian Computing Industry Organization (ASOCIO)
  - Aims to share global IT development and application trends
  - Promotes bilateral and multilateral cooperation for IT among economies and businesses in the region
  - The summit will be hosted by VINASA in Hanoi from 28–31/10/2014 with the theme "IT – A New Method of Economic and Social Development"

Members

Members of the Group are prestigious and influential experts from a variety of disciplines including technology, economics, and management. Below is the list of key members of the Group.

No.	Name	Designation/Organisation
1	Dr Vũ Ngọc Hoàng	Member of the Party Central Committee; Standing Deputy Head of the Central Committee Propaganda Commission
2	Mr Trương Đình Tuyển	Former Member of the Party Central Committee; Former Minister of Trade
3	Dr Bùi Mạnh Hải	Former Standing Deputy Minister of Science and Technology; Chairman of the Advisory Council on Vietnam's Software Industry Development
4	Dr Mai Liêm Trực	Former Standing Deputy Minister of Post and Telecommunication
5	Dr Nguyễn Bá Ân	General Secretary of the National Council on Sustainable Development and Enhancing Competitiveness
6	Dr, Major General Nguyễn Quang Bắc	Former Deputy Head of the General Technical Department, Ministry of Defence
7	Ass. Prof., Dr Trương Gia Bình	Chairman of VINASA; President of FPT Corporation
8	Ass. Prof., Dr Trần Đình Thiên	Director of the Vietnam Institute of Economics – Vietnam Academy of Social Sciences
9	Dr Võ Trí Thành	Deputy Director of the Central Institute for Economic Management
10	Ass. Prof., Dr Vũ Mạnh Lợi	Deputy Director of the Vietnam Institute of Sociology – Vietnam Academy of Social Sciences
11	Mr Phạm Tấn Công	Chief of the Office of the Party Committee of National Enterprises; Vice Chairman and General Secretary of VINASA
12	Dr Nguyễn Nhật Quang	Vice Chairman of VINASA; Director of the VINASA Science and Technology Institute; President of Harmony Software Technologies JSC
13	Dr Nguyễn Việt Hải	Member of the Advisory Council on Vietnam's Software Industry Development; Director of eDT
14	Mr Nguyễn Hữu Thái Hòa	Chief Strategy Officer of FPT Corporation
15	Mr Lê Xuân Hòa	Deputy General Secretary of VINASA; Deputy Director of VINASA Science and Technology Institute
16	Dr Nguyễn Ái Việt	Director of Institute of Information Technology – National University of Hanoi

Appendix 2.1. A brief profile of Vietnam

Official name	Socialist Republic of Vietnam
Form of state	One-party rule
National government	The Communist Party of Vietnam (CPV), and in particular its politburo, controls both the electoral process and the executive
Location	Southeast Asia, bordered by China, Laos and Cambodia; with a coastline of 3,444 kilometres
Land area	330,951 km2
Population (2012)	88.8 million
Major cities	Ho Chi Minh City (7.68 million) Ha Noi (6.84 million) Hai Phong (1.90 million) Da Nang (0.97 million)
Language	Vietnamese (spoken by about 90% of the population); English (increasingly favoured as a second language); minority languages in more remote rural areas
GDP (2012)	US$ 155.8 billion (PPP$ 443.7 billion)
GDP per capita (2012)	US$ 1,755 (PPP$ 4,998)
Real GDP growth (2007-2012, CAGR)	5.8%
Exports (2012)	US$ 124.7 billion
Imports (2012)	US$ 119.2 billion

Appendix 4.1: Vietnam's Network Readiness Index, 2014

		Rank (out of 148)	Value (1–7)
Networked Readiness Index 2014		**84**	**3.8**
Networked Readiness Index 2013 (out of 144)		84	3.7
A.	Environment sub index	96	3.7
	1st pillar: Political and regulatory environment	91	3.5
	2nd pillar: Business and innovation environment	100	3.9
B.	Readiness sub index	77	4.7
	3rd pillar: Infrastructure and digital content	121	2.7
	4th pillar: Affordability	8	6.6
	5th pillar: Skills	88	4.7
C.	Usage sub index	78	3.6
	6th pillar: Individual usage	84	3.2
	7th pillar: Business usage	88	3.4
	8th pillar: Government usage	58	4.2
D.	Impact sub index	75	3.4
	9th pillar: Economic impacts	96	3.0
	10th pillar: Social impacts	62	3.8

The Networked Readiness Index in detail

	Indicator	Rank/148	Value
1st pillar: Political and regulatory environment			
1.01	Effectiveness of law-making bodies*	55	3.8
1.02	Laws relating to ICTs*	86	3.7
1.03	Judicial independence*	89	3.4
1.04	Efficiency of legal system in settling disputes*	93	3.4
1.05	Efficiency of legal system in challenging regs*	79	3.3
1.06	Intellectual property protection*	116	2.9
1.07	Software piracy rate, % software installed	89	81
1.08	No. procedures to enforce a contract	55	36
1.09	No. days to enforce a contract	30	400
2nd pillar: Business and innovation environment			
2.01	Availability of latest technologies*	134	3.7
2.02	Venture capital availability*	78	2.6
2.03	Total tax rate, % profits	65	35.2
2.04	No. days to start a business	119	34
2.05	No. procedures to start a business	119	10
2.06	Intensity of local competition*	51	5.2
2.07	Tertiary education gross enrolment rate, %	88	24.6
2.08	Quality of management schools*	125	3.3
2.09	Gov't procurement of advanced tech*	30	4.0
3rd pillar: Infrastructure and digital content			
3.01	Electricity production, kWh/capita	96	1,129.1

3.02	Mobile network coverage, % pop.	132	70.0
3.03	Int'l Internet bandwidth, kb/s per user	90	13.4
3.04	Secure Internet servers/million pop.	99	6.7
3.05	Accessibility of digital content*	61	5.3
4th pillar: Affordability			
4.01	Prepaid mobile cellular tariffs, PPP $/min.	23	0.09
4.02	Fixed broadband Internet tariffs, PPP $/month	34	22.79
4.03	Internet & telephony competition, 0–2 (best)	69	1.87
5th pillar: Skills			
5.01	Quality of educational system*	95	3.4
5.02	Quality of math & science education*	85	3.9
5.03	Secondary education gross enrolment rate, %	96	77.2
5.04	Adult literacy rate, %	74	93.4
6th pillar: Individual usage			
6.01	Mobile phone subscriptions/100 pop	23	147.7
6.02	Individuals using Internet, %	83	39.5
6.03	Households w/ personal computer, %	99	17.5
6.04	Households w/ Internet access, %	94	15.6
6.05	Fixed broadband Internet subs./100 pop.	79	4.9
6.06	Mobile broadband subscriptions/100 pop.	72	18.8
6.07	Use of virtual social networks*	105	5.1
7th pillar: Business usage			
7.01	Firm-level technology absorption*	135	3.8
7.02	Capacity for innovation*	86	3.4
7.03	PCT patents, applications/million pop.	92	0.2
7.04	Business-to-business Internet use*	32	5.5
7.05	Business-to-consumer Internet use*	38	5.1
7.06	Extent of staff training*	98	3.7
8th pillar: Government usage			
8.01	Importance of ICTs to gov't vision*	60	4.2
8.02	Government Online Service Index, 0–1 (best)	88	0.42
8.03	Gov't success in ICT promotion*	36	4.9
9th pillar: Economic impacts			
9.01	Impact of ICTs on new services & products*	39	4.8
9.02	ICT PCT patents, applications/million pop.	86	0.0
9.03	Impact of ICTs on new organisational models*	59	4.4
9.04	Knowledge-intensive jobs, % workforce	107	7.4
10th pillar: Social impacts			
10.01	Impact of ICTs on access to basic services*	53	4.5
10.02	Internet access in schools*	41	5.1
10.03	ICT use & gov't efficiency*	67	4.2
10.04	E-Participation Index, 0–1 (best)	92	0.11

Source: WEF (2014)
Note: Indicators followed by an asterisk (*) are measured on a 1-to-7 (best) scale

Appendix 4.2: Key Telecommunications and Internet Services Providers

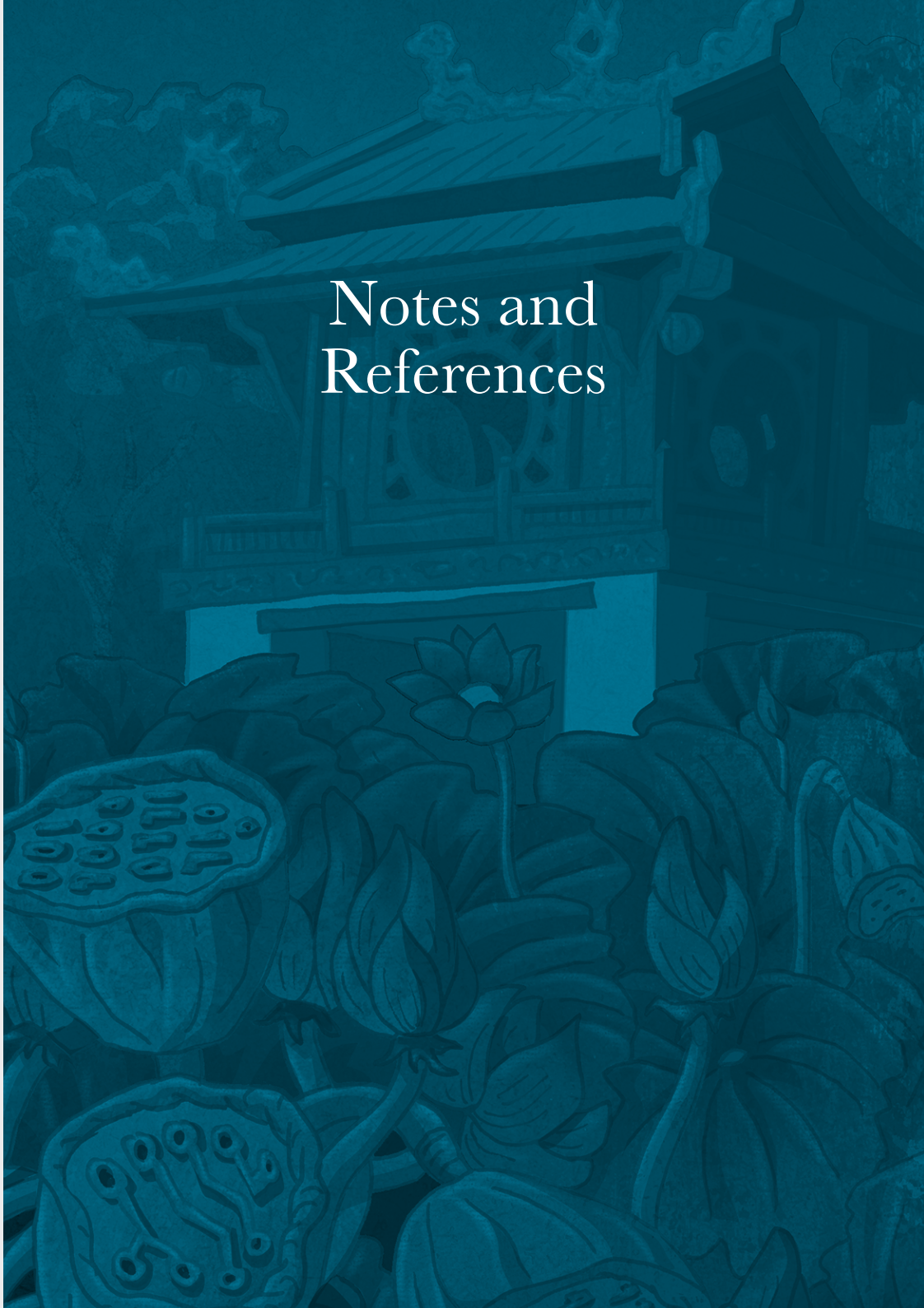
Classification	2011	2012	Companies
Licensed fixed telecom operators	10	10	VNPT, Viettel, FPT Telecom, HTC, CMC Telecom, Gtel, Đông Dương, VTC, SPT, Vishipel
Current fixed telecom operators	6	9	VNPT, Viettel, FPT Telecom, HTC, CMC Telecom, Gtel, Đông Dương, VTC, SPT
Licensed 2G mobile telecom operators	7	6	Vinaphone, VMS (Mobifone), Viettel, GTel Mobile (GMobile), SPT (SFone), HTC (Vietnamobile)
Current 2G mobile telecom operators	7	6	Vinaphone, VMS (Mobifone), Viettel, GTel Mobile (GMobile), SPT (SFone), HTC (Vietnamobile)
Licensed 3G mobile telecom operators	5	4	Vinaphone, VMS (Mobifone), Viettel, HTC (Vietnamobile)
Current 3G mobile telecom operators	5	4	Vinaphone, VMS (Mobifone), Viettel, HTC (Vietnamobile)
Licensed Internet operators	91	85	VNPT, Viettel, FPT Telecom
Current Internet operators	50	57	VNPT, Viettel, FPT Telecom

Source: MIC (2013)

Appendix 6.1: World Bank's Vietnam - ICT Development Project: Performance and Progress on Funding Disbursement[62]

The Vietnam-ICT Development is a World Bank-funded project, with the following main objectives: (a) to support the institutional development and technical and regulatory capacity of the Ministry of Communications (MIC) for ICT sector oversight and to increase the efficiency and transparency of public service delivery in MIC, General Statistical Office (GSO), Ministry of Foreign Affairs (MOFA), and two cities – Hanoi and Danang; and (b) to foster private sector development by increasing access to business-related government services and raising awareness and usage of ICT in Hanoi and Danang.

The total estimated cost of the project is US$106.97 million, of which US$93.72 million is borrowed from the World Bank. The implementation of the project took more than seven years, from June 1st 2006 to December 30th 2013. The World Bank's overall rating of the project is "Moderately Unsatisfactory" on progress towards achievement of projective development objectives and "Moderately Satisfactory" on overall implementation progress.



Notes and References

Notes and References

1 World Bank (2008). *The growth report: Strategies for sustained growth and inclusive development.* World Bank, Washington, DC.
2 WEF (2002). *Global Information Technology Report 2001-2002: Readiness for the Networked World*. Oxford University Press, Oxford.
3 ITU (2002). *Vietnam Internet Case Study.* International Telecommunication Union, Geneva.
4 Vietnam was officially reunified in 1976 after the war was ended in 1975.
5 This discussion is drawn from Vu (2009). Economic Reform and Performance: A Comparative Study of China and Vietnam. *China An International Journal*, 7(2): 189-226.
6 Computed from World Development Indicators data.
7 "Well Begun, Not Yet Done: Vietnam's Remarkable Progress on Poverty Reduction and the Emerging Challenges," 2012 Vietnam Poverty Assessment, World Bank, Hanoi, 2012.
8 "Vietnam Urbanization Review", Technical Assistance Report, World Bank, November 2011.
9 "2014 Tholons Top 100 Outsourcing Destinations: Rankings", Tholons, December 2013.
10 World Bank (2013). *Taking Stock: An Update on Vietnam's Recent Economic Developments – July 2013.* World Bank, Washington, DC.
11 GSM, which stands for Global System for Mobile communications, reigns as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area (Source: http://cellphones.about.com/od/phoneglossary/g/gsm.htm).
12 CDMA, or Code Division Multiple Access, is a competing cell phone service technology to GSM, which is the world's most widely used cell phone standard (Source: http://cellphones.about.com/od/phoneglossary/g/cdma.htm).
13 W-CDMA (Wideband CDMA) is high speed third generation cellular technology, which can reach speeds from 384 Kbps to 2 Mbps or 6 to 35 times more than what regular landline modems can do. This technology accommodates wideband services such as streaming video and video-conference (Source: http://cellphones.about.com/od/cell_phone_glossary/g/wcdma.htm).
14 Source: http://economics.adelaide.edu.au/downloads/services-workshop/Telecommunications-In-Vietnam.pdf
15 VNNIC (2013). *Report on Vietnam Internet Resources 2013.* Vietnam Internet Network Information Center, Hanoi.
16 VNNIC (2013).
17 A helpful discussion on this issue can be found in McKinsey (2012). Online and Upcoming: The Internet's Impact on Aspiring Countries. McKinsey & Company, New York.
18 McKinsey (2012).
19 The other two priorities are on human capital development and institutional reforms.
20 VNNIC website, http://www.vnnic.vn/, accessed July 3, 2014.
21 MIC (2013). Vietnam ICT White Book 2013. Information and Communications Publishing House, Hanoi.
22 LTE (Long Term Evolution), which can also be referred to as 4G, is a wireless broadband technology designed to support roaming Internet access via mobile phones and handheld devices.
23 VNPT (2011). *Vietnam Telecommunications Report.* VNPT Information and Public Relation Centre, Hanoi.
24 WEF (2014). *Global Information Technology Report 2014.* World Economic Forum, Geneva.
25 The results of the survey are from a sample of 781 Internet users (VECITA, 2014).
26 A firm is classified as being large if it has at least 300 workers. Details on the survey and its results can be found in VECITA (2014).

27 ERP and CRM, respectively, are acronyms of "Enterprise Resource Planning" and "Customer Relationship Management".
28 The E-Participation Index assesses the quality and usefulness of information and services provided by a country for the purpose of engaging its citizens in public policy making through the use of e-government programs (UN, 2012). *UN E-Government Survey 2012.* Department of Economic and Social Affairs, United Nations, New York.
29 WEF (2014).
30 ITU (2002, p. 22).
31 Elmer L. (2002). *Vietnam ICT Assessment: Synthesis of Findings on ICT Policy, Infrastructure and Applications.* U.S. Agency for International Development, Hanoi.
32 ITU, Vietnam Profile (latest data available: 2012); available at http://www.itu.int/net4/itu-d/icteye/CountryProfile.aspx, accessed July 5, 2014.
33 The Internet and telephony competition score measures the degree of liberalization in 19 categories of ICT services for a given economy, which include 3G telephony, retail Internet access services, international long distance calls, and international gateways. The level of competition in each of the categories ranges from monopoly (score=0) to full competition (score=2.0). (Source: WEF, 2014, p. 325)
34 WEF (2012, 2013, 2014). WEF (2012). *Global Information Technology Report 2012.* World Economic Forum, Geneva. WEF (2013). *Global Information Technology Report 2013.* World Economic Forum, Geneva. WEF (2014). *Global Information Technology Report 2014.* World Economic Forum, Geneva.
35 MIC (2013)
36 Techinasia, *"NTT Docomo Invests in Vietnam Mobile Content Company,"* August 10, 2011.
37 VECITA (2014). *Vietnam E-commerce Report 2013.* Vietnam E-Commerce and Information Technology Agency, Hanoi.
38 "Samsung Electronics Adds to Buildup in Vietnam," by Vu Trong Khanh and Min-Jeong Lee, World Street Journal, July 3, 2014.
39 Ibid.
40 According to this plan, Microsoft would relocate to Vietnam its Nokia production in Hungary, China, and Mexico.
41 According to the JETRO investment-related cost survey conducted in 2012, a general worker received $145 per month in Hanoi, $148 in Ho Chi Minh City; while this rate was $466 in Beijing and $449 in Shanghai (JETRO, 2013). *The 23rd Survey of Investment Related Costs in Asia and Oceania.* Overseas Research Department, Japan External Trade Organization (JETRO), Tokyo.
42 WEF (2002).
43 Elmer (2002)
44 WEF (2011, p. 25)
45 Ibid, p. 23
46 MIC (2011). *Vietnam ICT White Book 2011.* Information and Communications Publishing House, Hanoi.
47 This improvement on business environment of Vietnam over 2012-2014 was largely driven by two factors: increased availability of venture capital and improvement in government's procurement of advanced tech.
48 The index value takes values between 0 (worst) and 1 (best).
49 MIC (2013). *Vietnam ICT White Book 2013.* Information and Communications Publishing House, Hanoi.
50 Source: "ICT firms have personnel problems: seminar", *Vietnam News,* June 7, 2014.
51 Ibid.
52 A.T. Kearney (2011). *The A.T. Kearney Global Services Location Index 2011 – Offshoring Opportunities amid Economic Turbulence.* A.T. Kearney, Chicago.

[53] WEF (2014).
[54] European Commission (2013) European Commission (2013). Special Eurobarometer 404: Cyber Security. Brussels: European Commission.
[55] "Vietnam's Digital Dreams Held Back by Malware 'Epidemic'", by Marianne Brown, Voice of America, November 14, 2013.
[56] MIC (2013)
[57] IDC and NUS (2014). White Paper: The Link between Pirated Software and Cybersecurity Breaches. A Joint Study by National University of Singapore and IDC.
[58] The Software Alliance (2014). *The Compliance Gap: BSA Global Software Survey, June 2014.* Washington, DC: BSA The Software Alliance.
[59] UNCTAD (2013). Information Economy Report 2013: The Cloud Economy and Developing Countries. New York: United Nations.
[60] ACCA (2014). *Asia Cloud Computing Association's Cloud Readiness Index 2014.* Asia Cloud Computing Association (ACCA).
[61] Provided by the VINASA Think Tank
[62] Bhatia, D.T. (2014). *Vietnam - ICT Development : P079344 - Implementation Status Results Report: Sequence 12.* World Bank, Washington, DC.


Lee Kuan Yew
School of Public Policy
National University of Singapore


Microsoft